RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor.

EDWIN N. LEWIS, Manager.

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THE subject of hot boxes was accorded interesting discussion at the last two sessions of the Chicago Car Foremen's Association. There are various causes for hot boxes, but the trouble is that these causes are not always accurately determined. Mr. J. N. Barr, in addressing the association at the last meeting, made the excellent suggestion that the better way to adopt in studying the cause of hot boxes would be to systematically examine boxes that are just a little hot—and not wait until everything was so hot and in such shape as to conceal the initial cause of the trouble.

THERE has from time to time been occasional criticism of some of the pressed and rolled steel trucks, such criticism dwelling upon the difficulties which they present to the car inspector. In the columns which we devote to the work of the Car Foremen's Association of Chicago, in this issue, will be found a communication in which this criticism is made by a car inspector. The writer states that it is very hard to find defects in wheels in this kind of truck, as the truck sides cover up so much of the wheels. It is true that it is more difficult to inspect trucks of this type, but it can be done—it is simply a question of convenience. The writer referred to admits as much himself and states that he is going to give a particularly close inspection to wheels in these trucks.

IT has been a hobby for many years with Mr. J. N. Barr, of the Chicago, Milwaukee & St. Paul Railway, to dwell upon the value of watching "the little things" in railway shops. In a recent lecture before the Purdue University railway course by Dr. Charles B. Dudley, chief chemist of the Pennsylvania Railroad, it is shown how the costs of the distinctively little things mount up in the offices of a large railway system. For instance, he shows that it costs the Pennsylvania Railroad each year about $1000 for pins, $5000 for rubber bands, $5000 for ink, $7000 for lead pencils, etc. The fact that it costs nearly as much for stationery with which to carry on the business of the Pennsylvania Railroad as it does for iron, as Dr. Dudley asserts, is indeed startling. A large amount of money undoubtedly leaks out in the way of careless use of little things. Some roads have realized the extent of waste in such directions and have, among other measures, ordered that a large part of the communications between their various officials shall be written on pads of manila paper instead of on regular letter heads.

WE wish that we could give space to the admirable paper on the conduct and character of railway employees presented at the November meeting of the New York Railway Club by Mr. M. N. Forney. Its extreme length, however, makes it impossible. But we advise all our readers to address the secretary of that club for a copy of the paper. Than Mr. Forney we know of no one who is better fitted by wide experience, correct mode of life and breadth of view, to present such a paper. He presents his subject in the remarkably eloquent and forceful style that characterizes all of his writings. In the course of his paper he gives a partial enumeration of the characteristics, traits, gifts, endowments, capacities and possessions which are useful in the struggle of life to achieve success, and this enumeration we present elsewhere in this issue. It forms one of those little notes which fully merit clipping and pasting. If one could possess all these characteristics one would certainly be reasonably sure of success in the sense, as he puts it, of a wise and beneficent life. We are sure that it would do any one good to occasionally reread this impressive list of the personal essentials to success.

WE are glad to be able to note the active interest that the Atchison, Topeka & Santa Fe Railway is taking in the way of providing Railway Y. M. C. A. rooms along its lines. We shall give, in our next issue, illustrations of a beautiful structure which is going up at Argentine, Kansas, and to the cost of which the company has contributed very generously. The company gives the land which forms the site of the building and in addition very liberally donates toward the cost of the structure $3 for every $1 subscribed by the railway men of Argentine. It is about to aid the men, on practically the same basis, to erect similar structures at Temple and Cleburne, Texas. Such active and practical interest in advancing the welfare of employees cannot be too highly commended. This work has not been as common in the west as in the east; but it will be remembered that about two years ago the Chicago & Northwestern aided in the erection of a building of about the same class as that at Argentine, also contributing cash in the ratio of three to one. This latter building, which was erected at the Northwestern's West Fortieth street shops in Chicago, was illustrated in our issue of February, 1897. It has proved of great value to the moral and spiritual welfare of the North-western employees located at that point.

The value of railway Y. M. C. A. work in general cannot be overestimated, and it is a fact that the value of such buildings as those above referred to becomes immediately apparent as soon as they are ready for occupancy. In treating of this class of work some two years ago we said in substance: There are hundreds of saloons not very far from the terminals of railroads that are very attractive. They are comfortably heated and beautifully lighted, and men gather there to discuss politics and isms of all kinds because there is no other place where they can go and spend an hour in the company of men that are agreeable to them. It is a mistake, by the way, to suppose that because a man is in a barroom he is necessarily roistering. He may be, and very frequently is, there because it is a pleasant meeting place, possibly the only available one. And he while there often spends most of his time in seriously discussing the details of shop practice and of locomotive running, and talks earnestly and profitably of literature, art and even of religion. But it would be much better, as he knows, if he had a common meeting place where the incidental drink did not come in. These Y. M. C. A. buildings, with their gymnasiums, smoking rooms, libraries and baths, provide just the place that is needed; and we hope to see many more of them go up.

WE wish to direct particular attention to the forms used in collecting and classifying information regarding the causes of trains parting, or breaks-in-two, which we give elsewhere in this issue. There is a very deep interest being manifested in this matter at present, and it is confidently expected that the Master Car Builders' committee which is investigating it, and which is to report at next June's convention, will present data, and deductions therefrom, that will prove of material value. It becomes a matter of special interest just at this time to know how those railroads which are actively seeking to collect facts concerning trains parting go about their undertaking, and the forms and tabulations which we present should be of aid to those roads which have as yet done nothing particular in this line, but which are about to; and it should, moreover, serve to stimulate those roads which have as yet been inactive in this matter to a similar work of investigation. It is a fact that wherever records of this nature have been kept the results have been of distinct value. Through the information thus gained the officials of the road have been enabled to take steps which have materially reduced the number of breaks-in-two. These investigations have also resulted in revealing costly errors in practice. There are, in fact, a great many lessons to be drawn from compilations of figures of this nature. They suggest themselves at every turn of the figures. We will not now attempt to dwell upon the various features that have been developed; but one thing stands out in bold relief in the little summary that we have made of the records of the Nashville, Chattanooga & St. Louis Railway, viz.: the high percentage of slip pin failures shown therein should serve to strongly intensify the feeling of dislike for that form of fastening.

This present active investigation into the causes of trains parting will have an important bearing on the coupler situation. The Western Railway Club has at work a vigorous committee on M. C. B. couplers which is trying to make, if possible, some recommendations looking toward the standardizing of the principal dimensions of M. C. B. couplers, securing greater uniformity of parts and pointing out the weak features of some types of couplers. This committee has no particular time set on which to make a report, but it made a progress report at the last meeting of the club which was of a nature indicating that the committee was getting at its work in a very systematic manner. It will be remembered that the appointment of this committee came about through the presentation of a paper before the club by Mr. Peter H. Peck, in which the adoption of a standard knuckle, or at least a small number of standard knuckles, was urged. We do not consider this suggestion practicable, at least for the present, but Mr. Peck presented some very impressive figures showing why a standard knuckle is extremely desirable. For instance, he showed records of 77 different bars and 83 different knuckles—nine bars having two and two bars having three knuckles each. As we have stated, we consider Mr. Peck's suggestion of a standard knuckle impracticable, yet his paper served the very excellent purpose of starting the club into a work of investigation of the whole coupler situation that will, we confidently believe, result in much good.

THE FRAMING OF CARS.

The necessity of taking advantage of every favorable condition possible in the design of heavy capacity cars is appreciated more today than ever before, and whereas it was the general practice a year ago to seek out the parts of the cars which seemed to be too light and make them heavier, it is necessary now, with some parts in particular, to find a more favorable distribution of the material used to carry the loads. This is particularly true with the bolsters, and more so with the body than with the truck bolsters, because of the limited space available for the former.

In a paper read at the November meeting of the Western Railway Club on the above subject it was shown that the distribution of the load on the body bolster can be so arranged as to favor the bolster more than is the case at present. Such distribution can be secured through a rearrangement of the truss rods and needle-beams, or cross-tie timbers, end sills and other co-related parts.

The M. C. B. dictionary, in defining the term "needle-beam," says: "A transverse timber bolted to the under side of the longitudinal sills and floor timbers of a car-body between the bolsters, and to which the body king or queen posts, or truss-blocks, are attached when truss-rods are used under a car-body." The dictionary seems to favor the term cross-frame-tie-timber, and such favoring, together with the definition, would seem to indicate that the committee which revised the dictionary had in mind only one (and perhaps the one of least importance today) function of the needle-beam—that of binding together the longitudinal sills, and that they overlooked their own explanation of how the term "needle-beam" was taken from civil engineering practice, and also overlooked the fact that in civil engineering "the term seems to be more particularly used in bridge construction, as applying to the cross-pieces of queen-post trusses, supporting the floor and themselves supported by the truss."

The idea in the minds of the committee which prepared, or revised, the definition was not sufficiently broad, but it is safe to say that the definition as it stands agrees very closely with the general misunderstanding today of the functions of the needle-beam in car construction, and it is believed that it is such misunderstanding that makes the term "cross-frame-tie-timber" seem more appropriate when referring to this part of a car and makes the use of the term so general. Knight ex-

plains the compouud word "needle-beam" as "A transverse floor-heam of a bridge;" so that in civil engineering it is a beam, and when it is considered such in car construction it will be manipulated to the advantage of the hody holster.

Some of the criticisms of the paper have been based on the idea that too much stress was laid on the advantages to be obtained by distrihuting the load through the needle-beams and truss-rods, and it is claimed that only about 5 per cent can be thus obtained. Even 5 per cent will help a good many bolsters and if 5 per cent can be obtained it is possihle to gain more. The criticism which we would make is that the paper did not go into details sufficiently to show how the strains in the various parts may be calculated; but it is possible that the almost entire absence of mathematics in the paper resulted in its being more widely read and, therefore, in a more general consideration of the proposition.

Those who are manufacturing bolsters for sale will do well to make a study of the relations existing between the bolsters and the other parts of the car and exert their efforts to having their material favored as much as possible both for their own good and for the satisfaction of their customers. It may not be possible to change old cars to suit conditions, but special bolsters are generally put under new cars and the truss-rods and needle-beams can be enlarged without difficulty and their location changed generally with little, if any, alteration in the design.

TESTING LOCOMOTIVE MATERIAL IN ENGLAND.

There was begun in the December, 1898, issue of the Railway Master Mechanic an article describing the methods followed in testing locomotive materials at the locomotive works of the Midland Railway of England, and the article will be concluded in our next issue. This description of the methods pursued by the Midland Railway will be of particular interest to our readers just now because this company has within the past month placed good sized orders for locomotives with the Baldwin aud the Schenectady locomotive works.

The descriptions of the different machines will be interesting to railroad men here hecause it is shown that in England, also, it is sometimes neccssary to adapt old machiues to changed conditions. It must require considerable patience to continue the use of a machine the observations taken from which require so much manipulation as those taken from the tension testing machine illustrated in the December issue.

An instructive part of the description is that referring to the friction caused by cup-leather packing; with a cylinder about 8 inches in diameter and subjected to a pressure of about 1700 pounds per square inch the friction was about 450 pounds. The width of the cup-leather bearing on the cyliuder was ¾ inch. The above was the maximum friction obtained, and as the pressure in the cylinder increased from 16 to 20 cwt. the friction decreased about 1 cwt.

The idea of using dies which are circular on the back for holding plates uneven in thickuess will he a new one to some, but to those who are using jaws with ball and socket hearing on the back it would appear that we are not behind on this count.

The method of testing tubes in the original section was explained in the December issue, but it is worth a short repetition here. Two nuts, with extended flanges threaded on the outside and conical shape inside, are placed back to hack and placed on the length of tube to be tested; a solid conical shaped wedge is then driven into each end of the tube and the nuts are screwed into the heads of the testing machine, thus gripping the tube between the wedge and nut.

There was shown to be considerable difference in the tensile streugth of copper and bronze firebox stays when cold and when subjected to the temperature corresponding to the pressure in the boiler, the reduction in tensile strength being from 14 to about 22 per ccnt between the temperatures of 60 and 370 Deg. F., 370 Deg. corresponding to a pressure of 165 lbs. per sq. in.

The interesting part of the installment to appear in our next issue is that referring to the method of preparing test specimens. Much care is used to remove all scratches and tool and file marks from machined surfaces, even to the extent of grinding in emery and oil. Also, a complete test of any material includes four tensile tests (two each in different directions), four compressious, one bending and one torsiou test. It will occur at once to ask how much of the material is given a "complete" test. It is presumed that crank axles are so tested, and it is stated that every crank axle is tested, also every stcel and copper boiler-plate.

On the whole, a perusal of the articles will impress one with the idea that in England, either the specifications crowd well onto the best manufacturing practices or the manufacturers are very careful not to get too well within the specifications, otherwise there would uot he shown the extreme care in grinding test pieces. Such fine requirements here would be extremely irritating to those upon whom it would devolve (the manufacturers generally) to prepare the test specimens. However, in theory, it is the correct method.

TRAINS PARTING, OR BREAK-IN-TWO REPORTS.

Leading Examples of Practice.

There is perhaps no one detail of railway investigation that is now commanding more interested attention than that concerning the parting of trains. The matter has been before the Master Car Builders' Association off and on for several years; but this year it is taken up with renewed vigor, and the circular of inquiry on this topic, which we puhlished in our last issue, indicates with what minuteness of detail the investigation by the association is being now undertaken.

In view of this, and of the inquiry which the Western Railway Club is making into the whole coupler question, it will be of iuterest to take a brief glauce at the methods employed by various railways to secure data upon which to hase conclusious as to the causes of the over-frequent break-in-twos. With this in mind we have gathered together some memoranda from those roads which have been particularly active in securing and classifyiug the class of information referred to.

Nashville, Chattanooga & St. Louis.

On the Nashville, Chattanooga & St. Louis, whose reports have beeu made puhlic for some months, this work of recording break-in-twos has been very closely followed. Reports originatiug with the trainmen are made out in a blank form, of which the following is the substance, it being uuderstood that the sheet has ample blank lines for filling in the information forwarded. This report is forwarded to the superiutendents, who in turn forward it to the assistant general mauager. If there is any disagreement between the engineer and the conductor, both are required to make reports. The broken parts are sent to the storehouse, and about the 10th of the month, or as uear that time as is possihle, the reports are given to an inspector, who numhers them and puts a corresponding number on the brokeu parts, if said part or parts have heen sent in. The assistant general manager then inspects the broken parts aud makes such notations on the reports as are deemed advisable. The reports are then condensed, gotten out in hlue print form and posted on the bulletin boards. Mr. J. W. Thomas, the assistant geueral manager of the road (now general manager) tells us that he finds that the bulletined reports excite considerable discussion on the part of the men and stimulate them to more care in the handling of trains. The Nashville, Chattanooga & St. Louis commenced keeping these records on February 1, 1898, and Mr. Thomas assures us that since particular attention has heen given to this matter, the number of trains parted has decreased 50 per cent.

The blank original report, above referred to, is in substance given in the next column:

NASHVILLE, CHATTANOOGA & ST. LOUIS RY.

REPORT OF TRAIN PARTED.

.....Division.

Date....Day of....., 189..; Hour....M.; Train No.....; Section No.....; Engine No....., At or near.....Station; Nearest Mile Post.....

1. Speed,.....miles per hour.
2. Track straight or curved.....Grade level, ascending or descending?.....
3. Exact position of trainmen.....
4. What signals, if any, were given, and were they obeyed?.....
5. How far did train run after parting?.....
6. How many cars in train? Total.....; Loaded .....; Empty,.....
7. (a) How many air brake cars in train?.....
   (b) How many air brake cars next to engine?.....
   (c) If all air brake cars were not next to engine, why not?.....
   (d) How many of the air brake cars next to engine were cut in?.....
   (e) How many of the air brake cars next to engine were cut out?.....
   (f) Why were they cut out?.....
8. (a) Between what cars did train part (give initials and nnmbers) .....
   (b) Give position of cars in train, reckoning from engine .....
9. (a) What kind of couplers in cars where train parted? (*See notc).....
   (b) If M. C. B. conplers, state which knuckle opened? .....
10. (a) Why did train part? .....
    (b) Was train going ahead or backing?.....
    (c) Did train part while stopping, starting, or running along? .....
    (d) If running along, was engine using steam?....
11. Give initials and numbers of cars and engines damaged, and state extent of damage to each.....
12. Give names and occupation of persons injured, and state extent of injury in each case.....
13. Was there any rough handling of train, either before or at the time train parted?..... If so, give detail account.....
14. (a) Did parts that failed show any flaws, old breaks, or cracks? .....
    (b) Was broken part or parts found and disposed of as per instuctions on back of this report?...

On the back of this form appears the following, which in the folding of the form makes a memorandum caption:

NASHVILLE, CHATTANOOGA & ST. LOUIS RY.

TRAIN PARTED REPORT.

..... Division.
Date.....day of .....189..
Hour.....M.
Train No..... Section No.....
Engine No.....
At or near.....Station.
Nearest Mile Post .....
Conductor .....
Engineer .....
Fireman .....
Baggagemaster .....
Porter .....
Brakemen: .....

*All M. C. B. couplers are not Janney couplers, there being several makes of the M. C. B. couplers, snch as the Janney, Gould, Barfield, Gallagher, Chicago, St. Louis, Williams, Detroit, etc., etc. In reporting defects or failures, be snre to give the correct name of the maker of the coupler.

As far as practicable, broken pieces of couplers, slip pins, slip pin keys, straps, links, and pins must be sent to Nashville for inspection.

Condnctors on the Chattanooga and Northwestern Divisions, New Town and Lebanon Branches, must bring broken pieces to Nashville.

W. & A. conductors will ship their broken couplers, etc., from Atlanta; Memphis and Padncah Division conductors from Paducah, and condnctors on branches from jnnction with main line.

THE NASHVILLE, CHATTANOOGA & ST. LOUIS TABULATION.

No.	Date.	Train No.	Engine No.	Conductor.	Enginem'n	Cars. Ld.	Cars. Mt.	Ser. Air Cars.	Cause.	Remarks.
1	1	17	22	Gatlin	Mimms	18	0	14	Slip pin key lost.	Slip pin key in S. I. C. L. 2730 gone. Drawbar fell on track, breaking three brake beams
2	2	9	5	Vandivere	Boston	20	0	11	Link broken.	Link not sent in for examination.
3	2	12	39	Whittaker	Price	6	29	8	Slip pin broken.	1⅛ in. slip pin in S. I. C. L. 8698 gave way.
4	3	11	11	Hildebra'd	Kiser	20	0	10	Drawbar pulled in two.	Drawbar gave way in shank. Bar not sent in for examination.
5	5	13	28	Johnson	Woolbri'ht	20	0	5	Slip pin gave way.	1⅜ in. slip pin broken in key way. Evidence of rough handling.
6	6	17	111	Hildebra'd	Kiser	18	0	6	Knuckle broken.	Lower lug of knuckle in Thurmond coupler, Georgia, 1765, gave way. Cars were coupled with link and pin.

Special care must be taken to send in broken M. C. B. couplers.

A tag, Form 876, must be filled out with indelible pencil or ink and securely fastened to broken parts.

When M. C. B. couplers part without apparent cause, and conductors have time to investigate the matter on line of road, would be pleased if they would do so with a view of ascertaining why they came apart. If this is impracticable, report to superintendent by wire, in order that he may have the yard men give the matter attention.

This report must be made out in addition to the regular accident report and sent to your superintendent, who will forward to this office. J. W. Thomas, Jr. Ass't Gen'l Manager.

There is ample space on back of this form for "remarks," and a space for the signatures of the engineer and of the conductor.

As above stated, the reports coming in on these blanks are condensed into monthly trains-parted report sheets, which are posted on bulletin boards. As showing the style of these blue-print sheets, we give the heading and first few notations of the report for one division for September. (See page 2.) (Similar reports are made for each division of the road.)

From reports of all divisions of the Nashville, Chattanooga & St. Louis from February to October, 1898, inclusive, we compile the following list of causes of break-in-twos, for the purpose of showing the relative frequency of the different causes for a rather extended period.

Slip pin key lost, 31; slip pin key broken, 5; slip pin key sheared in two, 3; slip pin broken, 30; slip pin gone, 2; link broken, 19; continuous rod key lost, 1; pin jumped out, 17; pin worked out, 2; pin broken, 22; draft timber bolts broken, 3; draft timbers defective, 1; knuckle broken, 13; coupling pin broken, 26; draft timber cracked, 1; M. C. B. coupler parted, 25; coupling pin gone, 11; M. C. B. knuckle cracked, 1; M. C. B. coupler broken, 3; weak side spring in Miller hook, 2; draft timbers came down, 2; drawhead pulled out, 1; end of pushbar pulled out, 1; tail pin of Miller hook broken, 1; drawbar dropped down, 1; knuckle pin worked out, 3; knuckle pin gone, 1; draft timber pulled out, 3; pulling bar between engine and tender broken, 1; pin worked out, 1; bolt used as knuckle pin gave way, 1; swing head in combination coupler open, 1; coupler head pulled off, 2; knuckle worn, 2; shank of coupler gave way, 1; cast drawbar pulled in two, 1; knuckle pulled out, 1; knuckle opened, 10; draft rigging pulled out, 1; Miller hook uncoupled, 1; Miller hook casting broke, 1; drawbar yoke broke, 1; drawbar attachment gave way, 1; drawbar broke, 4; Miller hook broke, 1; knuckle pin broken, 3; locking pin broken, 1; locking pin jumped out, 1.

Lake Shore & Michigan Southern.

On the Lake Shore & Michigan Southern, the careful detailed recording of the causes of trains parting was undertaken long ago, and the results of this work placed the officials of the road in the possession of information which enabled them to take steps which reduced the number of such cases quite materially. On this road the desired information originates with the train conductors, who report on a blank, the substance of which is as follows:

THE LAKE SHORE & MICHIGAN SOUTHERN RAILWAY CO.

CONDUCTOR'S REPORT OF TRAINS BREAKING IN TWO.

To Superintendent.............Division.
Train,.... Engine..... Engineman,...... Date,.....
Location on Division. ....
Numbers and initials of cars between which break occurred ....
Loaded or empty,..................................
Location in train relative to head end,..............
Speed of train, ...
What kind of draw-bars.............................
Were there any visible defects in any part of the draw rigging, ...
If so, state fully what they were,..................
How many air brake cars in train and in use,........
Total number of cars in train,......................
Did the train run together, causing damage,..........
What caused train to part,..........................
........................Conductor.

Note—Under the last question all information must be given in detail that will make clear the cause of train breaking in two. Conductors must send this report by mail promptly. P. S. Blodgett, General Superintendent.

The tabulation of the various reports received on this form is made on a very large sheet, the headings of which we give on the third column of this page. It will be seen that the final tabulation is in very exhaustive detail.

Erie Railroad.

On the Erie this matter of trains parting is followed up very systematically. The substance of the conductor's report is as follows:

ERIE RAILROAD COMPANY.

Chicago & Erie Railroad Company.

CONDUCTOR'S REPORT OF THE CAUSES OF THE PARTING OF TRAINS.

To Superintendent...........Division.
Train.... Engine.... Engineman...... Date......
Location on Division..............................
Numbers and initials of cars between which break occurred ....
Location in train relative to head end of both cars between which the break-in-two occurred..........
Speed of train at time of parting..................
Total number of cars in train at time of parting......
Name or Kind of Draw-bar failing...................
If there were any visible defects in any part of the draw rigging, state fully what they were........
Were the cars between which the coupling parted on a curve at the time parting occurred?............
Was air applied just before train parted?...........
What caused train to part?..........................
................Conductor.

Note—Under the last question all information must be given in detail that will make clear the cause of the train parting. Conductors must send this report to Division Superintendent promptly by mail. They must also telegraph from first station to Division Superintendent giving the car number and initial of car each side of break, so arrangements can be made to have the cars inspected. Every case of the parting of trains must be reported upon one of these forms. If train parts more than once between the same cars, state this fact clearly. If a train parts between more than two cars, one of these forms must be used to report the break between each pair of cars. Parts of draft rigging which fail on the road must be carried to division termini for inspection.

A report in much fuller detail comes in from the inspector, who fills out a blank of which the following is the substance:

ERIE RAILROAD COMPANY.

Chicago & Erie Railroad Company.

INSPECTOR'S REPORT OF THE CAUSES OF TRAINS PARTING.

.............Station...............189..
Train No.....Parted between Car........("A") and Car........("B"), at or near...........Station, on...............189..
Name of Coupler on Car ("A")........................
Spindle, pocket, or continuous coupler on car ("A")....
Name of Coupler on car ("B")........................
Spindle, pocket, or continuous coupler on car ("B")...
Did knuckle unlock on car "A" or "B"?...........
Was draft spring broken on car "A" or "B"?........
Was draft spring too short on car "A" or "B"?.....
If too short, how much so?........................
Were followers bent or straight on car "A"?..........
Were followers bent or straight on car "B"?.........
Give distance that coupler can be moved back and forth without acting on draft springs, car "A"....
...............Car "B" ....
If interior arrangement of coupler in car "A" or car "B" is worn or defective, preventing locking device from working properly, or knuckle from locking positively, state condition on car "A"........
Condition on car "B"..........................
The following dimensions to be taken with coupler pulled out as far as can be done by hand:
Distance from end of car to end of uncoupling lever to which uncoupling chain is secured, car "A"....
......................Car "B" ....
Distance from end of car to point where coupling chain enters coupler, or where chain is attached to unlocking dog or pin, car "A"......Car "B"........
What distance can chain end of uncoupling lever be raised before chain acts on unlocking arrangement, car "A"............Car "B" ....
Was knuckle badly worn, car "A"......Car "B"....
Was spindle broken in car "A" or car "B"?..........
If so, at what point?.............................
Give size of spindle if broken......................
Was spindle head pulled through end of coupler on car "A" or car "B"?..............................
Would shape of spindle head permit its turning round in end of coupler in car "A" or car "B"..........
Give length and width of key ways in spindle of car "A"; of car "B"..............................
Was key lost out of spindles of car "A" or "B"?......
Does any part of lock or lock pin project beyond face of coupler when knuckle is closed?.............
Give opinion as to cause of break-in-two.............
.......................Inspector.

Note—Inspectors must give as much as possible of the information called for above.

The information thus gathered is classified and tabulated on large sheets, a copy of a portion of one of which we give in the next column. The columns of this sheet are numbered with reference to the items proposed by a previous committee of the M. C. B. Association; the Erie endeavors to answer these questions in all possible detail in its tabulation. For the purpose of making clear the scheme of this tabulation we first give the M. C. B. committee's queries, referred to, as follows:

1. Give period covered by report (number of days)....
2. Give total number of cases of trains parting......

Erie Railroad Tabulation.

No.	4			5	8	9	10	11	12	13	14	15	17		18	19		20	21	22	23	24	25		26	27	28	29	Couplers	31	33		34	35	36	37	38	39	42	43	44	45	Division	47	48	49	Cause.	
	1	2	3										1	2		1	2						1	2							1	2																
4000	1			30					1				1																A / B		1					1							Mead'v				Knuckle and lock badly worn	Straight
4001			1	5						1																1			Link and pin / C														New York			1	Broken coupling link (condr's report)	Straight
4002	1					1			1				1													1			D / C		1					1							Mead'v				Worn knuckle lock	Straight
4003			1			1		1	1				1					1									1		B / E	1		1				1							Mead'v				Bolt badly bent, worn knuckle, short chain	Straight
4004	1					1			1				1														1		F / F		1												Alleg'y				Cause unknown	Straight
4005			1	20						1																			Link and pin / Link and pin			1											Mead'v	1			Broken Coupling pin	Straight

Lake Shore & Michigan Southern Tabulation.

								Conditions existing when train parted.				Draw-Bar and Attachments.				Causes of Break in Two.																																								
																Knuckles Unlocking.																					Coupler or Draw-Bar Pulling Out.											Other Causes.							
Date.	Division.	Location on Division.	Train No.	Engine No.	Engineman.	Initial and Numbers.		Location in Train.	Speed of Train.	Was Train Slacking Up or Pulling Out?	Was Air Being Applied.	Name of Coupler or Kind of Draw Bar.		Spindle, Pocket, or Continuous.		Did Knuckle Unlock on "A" or "B"?	Was Draft Spring Broken on "A" or "B"?	Was Draft Spring too Short on "A" or "B"?	If Too Short, How Much?		Were Followers Bent?		Give Distance that Coupler can be Moved Back and Forth.		If Interior Arrangement of Coupler is Defective, State Condition.		Distance from End of Car to End of Uncoupling Lever to which Chain is Secured.		Dist. from End of Car to Point wh'e Chain is Secured to Lock.		Distance Chain End of Uncoupling Lever Can be Raised, etc.		State Whether Knuckle was Badly Worn.		Did Lock or Lock Pin Project Beyond Face of Coupler?		Was Spindle Broken?		If so, at What Point?	Give Size of Spindle.	Was Spindle Head Pulled Through End of Coupler or Draw-Bar		Would Shape of Spindle Head Permits its Turning Around in Coupler or Draw Bar.		Give Length and Width of Key Ways in Spindle.		Was Key Lost Out of Spindle?		Defective Draw Gear, State Conditions.		Coupling Pin Breaking in "A" or "B".	Coupling Pin Working Out of Place "A" or "B"	Coupling Link Breaking.	Opinion of Inspectors or Trainmen as to Cause	Did Train Run Together Causing Damage?	Remarks.
						A	B					A	B	A	B				A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B			A	B	A	B	A	B	A	B	A	B						

3. Give average number per day.....
4. Give percentage of cases occurring.....
   (1) In forward part of train.....
   (2) In rear part of train.....
   (3) In middle part of train.....
5. Give average speed of trains when parting occurred .....
6. Give maximum speed of trains when parting occurred. .....
7. Give minimum speed of trains when parting occurred. .....
8. Give percentage of cases where, after parting, cars ran together, doing material damage.....
9. Give percentage of cases occurring as train was pulling out .....
10. Give percentage of cases occurring as train was slacking up .....
11. Give percentage of cases occurring when air was being applied. .....
12. Give number of cases where M. C. B. couplers were at fault. .....
13. Give number of cases where link and pin drawbars were at fault.....
14. Give number of cases where spindles or continuous rods of M. C. B. couplers or drawbars were at fault. .....
15. Give number of cases where pockets of M. C. B. couplers or drawbars were at fault.....
16. Give names of M. C. B. couplers causing trains parting, and number due to each, where due to defect in coupler not including rear end or uncoupling attachments.....
17. Give number of cases of parting where knuckle opened from known cause; from unknown cause..
18. Give number of cases where couplers parted without knuckle opening, due to change in contour lines of M. C. B. coupler by reason of change in position of knuckle due to worn lock, knuckle tongue, knuckle pin or pin hole.....
19. Give number of cases of parting caused by knuckle pin breaking when coupled to adjoining coupler with link and pin; also when coupled with M. C. B. couplers .....
20. Give number of cases where knuckle opening was caused by improper adjustment or incorrect length of uncoupling lever or connecting chain.....
21. Give number of above cases where there was less than 1 in. slack in chain.....
22. Give number of above cases where there was less than 2 in. and more than 1 in. slack in chain.....
23. Give number of cases of parting due to breakage of draft springs.....
24. Give number of cases due to short draft springs...
25. In such cases give minimum amount such springs were short; also maximum.....
26. Give number of cases of parting due to followers bent. .....
27. Give number of cases where coupler could be moved back and forth from 1 in. to 1½ in.....
28. Give number of cases where coupler could be moved back and forth 1½ in. or more.....
29. Give number of cases where parting was due to some defect of locking arrangements.....
30. Give names of couplers and number of cases with each due to defect in locking arrangement.....
31. Give number of cases of parting of M. C. B. couplers where lock projected beyond face of coupler..
32. Do your reports show any prevalent causes of trains parting not named above, such as knuckle breaking, coupler shank breaking back of head, locking pin lifting? If so, what are they and how many cases occurred from each?.....
33. Give percentages of cases of parting between M. C. B. couplers where caused by defect on the rear car of the two; percentage on forward car.....
34. Have you had any cases of parting caused by difference in hight of cars? If so, how many?.....
35. Have you had any cases caused by ice in coupler causing pin to work up? If so, how many?.....
36. Give number of cases caused by locking pins or blocks breaking. .....
37. Give number of cases due to worn condition of knuckle.... .....
38. In your opinion should lifting levers or lock blocks or locking pins have some arrangement so that lock pin cannot be raised by sudden shock or jar?..
39. Give number of cases of parting due to broken spindle .....
40. Give general location of breaks in spindles.....
41. Give maximum size of broken spindles; minimum size; average size. .....
42. Give number of cases of parting due to spindle pulled through end of coupler.....
43. Give number of cases where spindle turned so key would drop out.....
44. Give maximum size of key ways in broken spindles; minimum size .....
45. Give number of cases of parting where key was missing.... .....
46. Give number of cases due to defects in draw gear not elsewhere mentioned.....
47. Give number of cases caused by breaking of uncoupling pin.... .....
48. Give number of cases caused by coupling pin working out.. .....
49. Give number of cases caused by link breaking....
50. Have you any suggestions to make to the committee? ....
    Extra—Break-in-two on curve.....
    Break-in-two on Straight Line.....

Referring now again to the tabulation, we may explain that the numbers over the vertical columns in these classification sheets correspond with the uumbers of the items given on the queries above presented. Therefore there is no need of a column for item No. 1, because the information given under this head can be compiled only at the end of the period covered by the report. Some of these items, it will be noticed, are subdivided, as, for instauce, item No. 4 which has three subdivisions, aud it will be noted in the classification sheet that a column is devoted to each subdivision. When one of the circumstances of a break-in-two comes under the head of one of the items called for a mark is placed in the column having the same number as the item. Each break-in-two is given a serial number, and these serial numbers are placed in the column at the left of the table; therefore each horizontal line of the table having a serial number at its left-hand end contains a complete record of a break-in-two. In column 5 is given the speed in miles per hour at the time of parting, this being estimated and furnished by the conductor. On this sheet there is also kept a record of the division upon which each break-in-two occurred, and it will be noted that the cases given in our sample occurred upon the Meadville, New York and Alleghany divisions. In the column headed "couplers" the names of two couplers appear in connection with each break-in-two, the upper one being the coupler on the car nearer the eugine and the lower one being the coupler on the car farther from the engine. Although the cause of the break-in-two may be fully explained by the marks in the table, it has been found convenient to write out the cause under the column headed "cause." The last column at the right of the sheet shows whether the break-in-two occurred on straight track or on a curve. By adding the marks in the various columns the statistics required by the M. C. B. Association can be readily compiled. Each report of a break-in-two is endorsed with a serial number and the date upon which it occurred and is filed for reference. The company, we may add, is recording all break-in-twos, and it will be noted that some of them are between link and pin couplers. In the column headed "couplers" in our sample we designate the couplers by letters instead of by name, for obvious reasons.

Chicago, Burlington & Quincy.

On the Chicago, Burlington & Quincy experience has been had with a number of forms of conductor's report, but as they have not been entirely satisfactory a new form was recently drawn up, and this we append:

BURLINGTON ROUTE.

CONDUCTOR'S REPORT OF TRAINS PARTING.

To Superintendent.....Division.
Train.... Going.... Engine.... Engineman.....
Parted in.....places, at (give location).....
abcut..... M. .....189.
Condition of weather.....
How many cars in train? Loads..... empties.....
Total exclusive of caboose .....
Number of cars with air brakes or with air in main train pipe..... .. ..
Number of cars without air brakes or without air in main train pipe .....
Train parted between the....and....car from engine.
Give initials and number of each car involved, with name of coupler on each.....
What parts failed, give full details.....
Did broken parts show old crack, flaw, or clean break?
Was there any difference in hight of drawbar of the two cars? ....
Was there any serious damage?.....
Was there any delay to your train?.....To other trains? ....
Up or down grade?.....Straight track or curve?.....
How fast was train running?.....
Was break caused by engine jerking train?.....
Was train slacking up or pulling out when break occurred? ....
Were loaded cars ahead?.....
How far did head end go?.....
Did train run together, causing damage?.....
What was done with head end?.....
Who first discovered break?.....
Did engineman sound proper signals?.....
Was answer given from rear?.....
Where were the brakemen?.....
General remarks..... .....
.....Head Brakeman.
.....Rear Brakeman.
....Conductor.
.....Foreman Car Inspectors.

Notes—(a) This report must be made out by the Conductor in every case of a break-in-two, whether delay results or not, and handed to Foreman of Car Inspectors immediately on arrival at terminal. The Foreman will carefully check, add any necessary information, sign and forward to Superintendent.

(b) The proper name of the automatic coupler is the M. C. B. coupler. The term "Janney" should only be used in reporting couplers which are marked "Janney." The name of the bar will usually be found in raised letters on the top of the drawbar head.

Chicago, Milwaukee & St. Paul.

On the Chicago, Milwaukee & St. Paul the record covers M. C. B. couplers only. We have no copy of the form of report upon which the record is based, but we give a sample of the monthly resume of coupler failures, as follows, the make of couplers being identified by the numbers given in the top line. (This company also has a monthly report in tabular form giving the number of knuckles opening on foreign cars, the side headings giving the name of the road owning the car and the top headings giving the names of the couplers opening. This table we omit.)

Cause.	1	2	3	4	5	6	7	Msc	Tot
Knuckle defective	....	3	2	2	1	1	1	..,.	10
" wrong	....	.....	...	....	....	....	....	....	...
Lock pin worked up	....	5	....	....	....	....	....	2	7
" " defective	...	2	....	1	....	....	....	2	5
" " wrong	....	.....	....	....	....	....	....	....	...
Knuckle pin defective	....	6	....	....	....	1	1	1	9
" pin wrong	....	.....	1	....	....	....	....	....	1
Lock block defective	...	1	.....	...	3	....	4	....	2	10
" " bolt bent	....	.....	....	....	....	....	....	....	...
Foreign subst'ce under lock	3	.....	....	....	....	....	....	....	3
Uncoupling lever bent	....	.....	....	....	....	2	....	....	2
Chain too short	...	1	....	1	....	1	2	1	6
Locki g dog would not drop	....	.....	....	....	....	....	....	....	...
Lock pin hole too large	....	.....	....	....	....	....	....	....	...
Split key to kn'ckle l'ck miss'g	....	.....	....	....	....	....	....	....	...
Exc'sse forw'd and aft motion	....	.....	....	....	....	....	....	....	...
Lever casting broken	....	.....	....	....	....	....	....	....	...
Lock to lock defective	....	10	....	....	....	....	....	....	10
No defects	14	17	2	5	2	5	9	12	66
Total	18	44	5	12	3	14	13	20	129
Number of cars equipped	8033	10850	1217	584	87	4617	113	....	...

Chicago, Milwaukee & St. Paul cars, 72—56 per cent.
Foreign cars, 57—44 per cent.

July	....	15	37	3	11	0	4	6	18	94
August	....	14	50	6	5	2	15	4	15	111
September	....	18	44	5	12	3	14	13	20	129
Total 1898	....	106	334	24	99	22	54	8	173	820
Total 1897	....	50	286	20	84	20	13	1	107	

Chicago & Northwestern.

On the Chicago & Northwestern a report, of which the following is a sample, is made out monthly. We have no form for the conductors' reports upon which this tabulation is made. We have supplied letters instead of the names of couplers.

Statement of trains parted during month of August, 1898.

No. trains parted.	M. C. B. Couplers.	Miller Hooks.	Links and Pins.
128	89	4	35

M. C. B. Partings as follows:

A	52
B	19
C	4
Miscellaneous	14
	89

Cause M. C. B. Partings.

	Coupler A	B	C	Misc.
Knuckle	11	5	3	3
Pin	3	..	..	1
Body	2	2	..	..
Bolt	7	..	..	1
Strap	9	..	..	..
Key		1	..	2
Pulled out	12	7	..	5
Miscellaneous	8	4	1	2
Total	52	19	4	14

Links and Pins.

Pins jumped out	5
Links broken	8
Pins broken	18
Drawbars pulled out	2
Miscellaneous	2
	35

Miller Hooks.

Drawbar pulled out	1
Uncoupled	...
Miscellaneous	3
	4

It must be understood that in the various blanks herewith given the substance and not the form of the blank is given, it being impracticable to present fac similes—although the form is closely approached in most of the tabulation blanks.

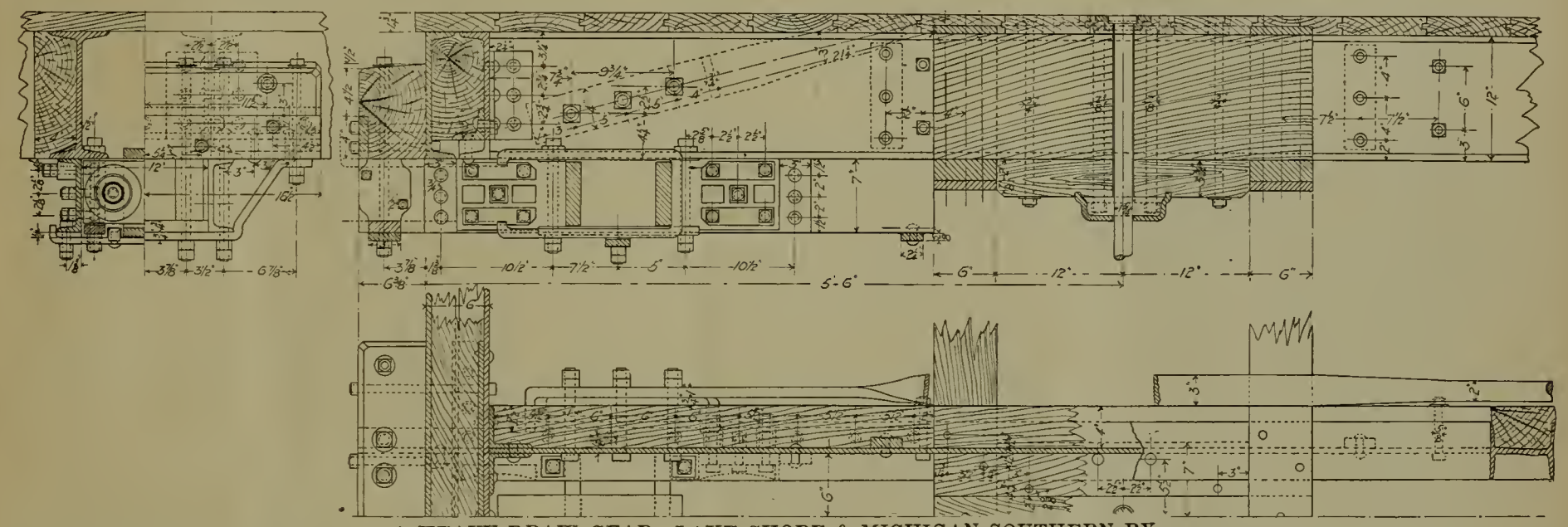
A HEAVY DRAW GEAR.

With the increasing demand for heavy capacity cars, everything which must accompany them is of equal interest, and as an example of a draw gear which seems particularly well designed for heavy service, there is shown with this description drawings of such a gear which was designed by Mr. A. M. Waitt, general master car builder of the Lake Shore & Michigan Southern Railway, for use on the pile-driver car which we illustrated in our issues of September and October, 1898.

The center sills are two 12-in. I-beams, to the lower flanges of which are attached two 7-in. channels, the latter extending in to the bolster and forming the draft sills. Each channel is placed with flanges outward and is secured to the flange of the center sill with seven ¾-in. rivets and to the inner channel of the end sill with one ¾-in. rivet, which passes through the flange of the draft sill, end sill and short angle which is riveted to the end sill channel, there being a filling block between the latter two.

The irons which support the follower plates are supported by four ⅞-in. bolts which pass through the stop-castings and the lower flange of the center sills. The stop-castings are fastened to the draft sills by five ¾-in. bolts each, and at the extreme ends of the stops are plates 3x1 ins. secured to the draft sills with three ¾-in. rivets each.

The two draft sills at each end of the car are tied together at three places—one cross tie, 2¼x⅝ ins., is placed immediately beneath the draft springs and another, of the same dimensions, is located near the bolster; both are bolted to the lower and outer flange of the center sills; the yoke tie at the outer end extends across the draft sills and is continued upward, the ends bearing on the dead-wood block, and the six bolts which hold it in position extend through the dead-wood blocks. Double draft springs are used and are placed side by side.



A HEAVY DRAW GEAR—LAKE SHORE & MICHIGAN SOUTHERN RY.

MASTODON COMPOUND LOCOMOTIVE, SOUTHERN PACIFIC RY.

The Schenectady Locomotive Works has recently built 10 remarkably heavy mastodon compound locomotives for the Southern Pacific Ry., and one of this lot we now illustrate. This engine has cylinders 23 and 35 by 32 ins.; 55-in. drivers; a 72-in. boiler with 3025 sq. ft. of heating surface and 35 sq. ft. of grate area; and weighs 192,000 lbs., of which 155,000 are on the drivers. The engine is to carry 200 lbs. pressure. The main features of interest concerning this engine are given in the appended data:—

GENERAL DIMENSIONS.

Gage	4 ft. 8½ in.
Fuel	Bituminous coal.
Weight in working order	192,000 lbs.
Weight on drivers	155,000 lbs.
Wheel Base, Driving	15 ft. 6 in.
Wheel Base, rigid	15 ft. 6 in.
Wheel Base, total	26 ft. 5 in.

CYLINDERS.

Diameter of Cylinders	23 in. and 35 in.
Stroke of Piston	32 in.
Horizontal thickness of Piston	5¾ in. and 4¾ in.
Diameter of Piston Rod	3¾ in.
Kind of Piston Packing	Cast iron rings.
Kind of Piston Rod Packing	Jerome Metallic.
Size of Steam Ports	H. P. 20 in. x 2⅛ in. L. P. 23 in. x 2⅛ in.
Size of Exhaust Ports	H. P. 20 in. x 3 in. L. P. 23 in. x 3 in.
Size of Bridges	1⅜ in.

VALVES.

Kind of Slide Valves	Allen-American.
Greatest Travel of Slide Valves	6½ in.
Outside Lap of Slide Valves	H. P. 1¼ in. L. P. 1⅛ in.
Inside Lap of Slide Valves	Clearance H. P. ¼ in. L. P. ¼ in.
Kind of Valve Stem Packing	Jerome.

WHEELS, ETC.

Diameter of Driving Wheels outside of Tire	55 in.
Material of Driving Wheel Centers	Cast steel.
Tire held by	Shrinkage.
Driving Box material	Main, cast steel; Intermediate F. & B. steeled cast iron.
Diameter and length of Driving Journals	9 in. dia. on main only; 8½ in. dia. x 10 in.
Diameter and length of Main Crank Pin Journals	Main side 7 in. x 5¼ in.; 6½ in. dia. x 6 in.
Diameter and length of Side Rod crank pin Journals	Inter. 5½ in. x 5 in. front and back; 5 in. dia. x 3¾ in.
Engine Truck, kind	4-Wheel Swing Bolster.
Engine Truck Journals	6 in. dia. x 10 in.
Diameter of Engine Truck Wheels	28 in.
Kind of Engine Truck Wheels	Krupp No. 3 cast iron spoke center.

BOILER.

Style	Extended Wagon Top.
Outside diameter of first ring	72 in.
Working pressure	200 lbs.
Material of barrel and outside of fire box	Carnegie steel.
Thickness of plates in barrel and outside of fire box	11-16 in., 13-16 in., 1-2 in., 9-16 in. and 3-4 in.
Horizontal Seams	Butt joint sextuple riveted, with welt strips inside and outside.
Circumferential Seams	Double riveted.
Fire Box, length	120 3-16 in.
Fire Box width	42 in.
Fire Box depth	Front 77 in. back 73½ in.
Fire Box material	Carnegie steel.
Fire Box plates, thickness	Sides 5-16 in., back 5-16 in., crown ⅜ in., tube sheet ½ in.
Fire Box water space	Front 4½ in., sides 3½ in. and 4 in., back 3½ in. and 4½ in.
Fire Box Crown Staying	Radial stays 1⅛ in. diam.
Fire Box Stay Bolts	1 in. diam.
Tubes, material	Charcoal Iron No. 12, B. W. G.
Tubes, number of	332
Tubes, diameter	2¼ in.
Tubes, length over tube sheets	14 ft. 6 in.
Fire Brick, supported on	Studs.
Heating surface, tubes	2819.34 sq. ft.
Heating surface, water tubes	— sq. ft.
Heating surface, Fire Box	206.51 sq. ft.
Heating surface, total	3025.85 sq. ft.
Grate surface	35.0 sq. ft.
Grate, style	Rocking, R. R. Co's. style.
Ash Pan, style	Hopper, dampers front and back.
Exhaust Pipes	Single.
Exhaust Nozzles	5¼ in., 5½ in., 5¾ in. dia.
Smoke Stack, inside diameter	16 in. near bottom, at top 18 in.
Smoke Stack, top above rail	14 ft. 11 in.
Boiler supplied by	Two Injectors, Ohio No. 10 R. S.; Monitor No. 10 L. S.

TENDER.

Weight, empty	39,650 lbs.
Wheels, number of	Eight.
Wheels, diameter	33 in.
Journals, diameter and length	5 in. dia. x 9 in.
Wheel Base	15 ft. 4 in.
Tender Frame	Channel Iron.
Tender Trucks	4-Wheel Channel iron, center bearing F. & B.
Water capacity	4500 U. S. gallons.
Coal capacity	10 tons.
Total Wheel Base of Engine and Tender	53 ft. 6½ in.

SPECIAL EQUIPMENT.

Engine equipped with three 3 in. Consolidated encased safety valves.

Westinghouse-American Brake on all drivers operated by air.

Westinghouse Automatic Air Brake on Tender and for train. 9½ in. air pump.

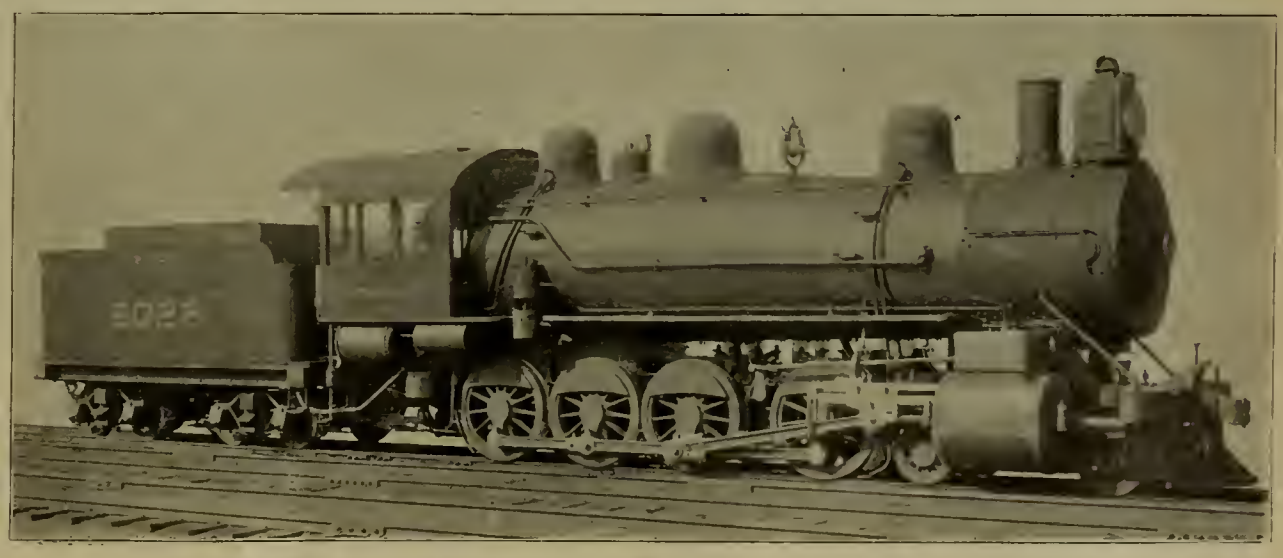
Franklin Monarch Magnesia Sectional Lagging.

Sweeney Brake arrangement on L. H. St. Chest.

De Chatelier Water Brake on L. P. Cylinder.

The Transportation and Engineering Department of the Paris Exposition.

Hon. Ferdinand W. Peck, commissioner general for the United States to the Paris Exposition of 1900, announces the appointment of Willard A. Smith, of Chicago, as director of the Transportation and Engineering Section. Mr. Smith does not



MASTODON COMPOUND LOCOMOTIVE—SOUTHERN PACIFIC RY.

expect to relinquish his private business, but will have the control and responsibility of this department of the American exhibit, with able assistants to attend to details. It is the desire of the Commissioner General that the transportation exhibit shall be one of the most important divisions of the American Section.

THE FRAMING OF CARS.*

There has been much discussion, verbally and in print, concerning the strength of bolsters, both body and truck, and the necessity of providing stiffer bolsters has been appreciated very generally; but that there has been much difficulty in providing bolsters which shall deliver to and receive from, the center plate the load imposed, and maintain the side bearings free of contact with each other, and at the same time fulfill the several requisites of the commercially successful bolster, viz., of lightness, and of cheapness in first cost and in cost of repairs, is indicated very strongly by the fact that more than a few men in charge of rolling stock have considered whether it is advisable to support a part of the load on the side bearings. If further evidence of the weakness of a majority of the so-called "metal" bolsters is required, it is furnished by the large number of friction reducing (not "frictionless") side bearings which have been devised. It is probably unnecessary to present arguments in proof of the opinion that the load should be carried on the center plate independent of any assistance from the side bearings; the general opinion, judging from expressions made at the May, 1898, meeting, and the explanations made since, is that it is advisable to support the load entirely on the center plate. Efforts to do this, however, have met with failure in many instances, and when such is the case it is entirely fair to question whether it is better to entail considerable expense in providing amply stiff bolsters or to carry a part of the load on the side bearings, and to provide side bearings which shall have as little friction as possible.

THE TRUCK BOLSTER.

Beyond providing a bolster sufficiently stiff vertically, to carry the loads imposed, and sufficiently stiff crosswise to resist shocks received lengthwise of the car, little can be done. This bolster is simply a beam supported at both ends and loaded in the middle; the length of the beam may be changed, but as the springs are moved in from the side frames and supported on transoms, as with the swing motion type, then the transoms must be made correspondingly heavier as the bolster becomes shorter and lighter. Considered in a general way, it is easier to provide a substantial truck bolster which will give satisfaction commercially, than to provide a body bolster which shall be satisfactory both commercially and mechanically, because there is more room available for the truck bolster, and the truck bolster is generally shorter than the body bolster. This is the principal reason why more rapid progress has been made in the design and adoption of a satisfactory truck bolster than of a body bolster, and the result has been the very common error of putting a substantial truck bolster under a very weak body bolster; cars so equipped are running with side bearings just as firmly in contact as would be the case were both the body and truck bolsters of the previous weak design.

THE BODY BOLSTER.

At the present time the weakest part of the car is the body bolster; in a few designs the strength of the sills and of the draft timbers have been sacrificed in an effort to make room for a stiffer body bolster, and on this account it might be better to qualify the declaration and say that the cars at present are weakest *at* the body bolster. Fig. 1 shows a very common distribution of the load on the bolster; the center sills are

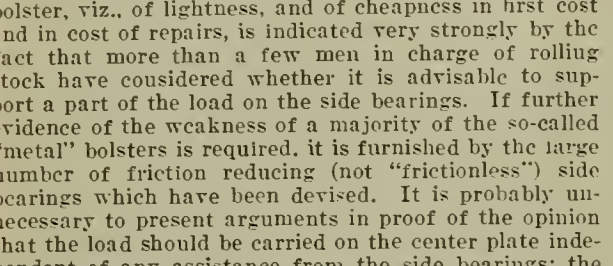


FIG. 1.

placed close together in order to receive the buffing strains, and also because the draft timbers are usually located immediately beneath them, and the proximity of the timbers facilitates the attaching of the draft rigging; the side sills are, of course, placed at the extreme ends of the bolster, or, better, the bolster extends the full width of the framing; the two or four, as the case may be, intermediate sills are located in such a way as to give proper support to the flooring, and the truss rods are generally located as shown in the full lines. The location of the center and side sills is, therefore, fixed by conditions which are not strictly under control of the designer, and there is no alternative but to place them in the usual position. The center sills being directly above the center plates, the part of the load carried by them is transmitted to the bolster at the place most favorable to the bolster, and every means possible should be adopted to load them to their full capacity and make them as heavy as it proves expedient; the load carried by the side sills is transmitted to the bolster most disadvantageously, and, therefore, just as little of the load as possible should be carried by the side sills.

LOCATION OF SILLS.

It will be understood from the above that in so far as the position on the bolster of the center and side sills is concerned, it is probable that nothing can be done to favor the bolster; this assumes that the width of the car is fixed, and that any improvement which is to be wrought through these sills must be gained through manipulating other parts, to the end of decreasing the percentage of the total load carried by the side sills, and increasing the percentage of the total load carried by the center sills. There are several conditions to be considered when determining the location of the intermediate sills, the most important of which is the proper support of the floor between the center and side sills.

The bolster should be made as deep as possible at the middle and when the most favorable distribution of the loading to the bolster is found the stresses in the top and bottom members of the bolster may be calculated and the parts proportioned accordingly. The moments about the center are found by multiplying that part of the load which is delivered to the bolster by each sill and truss rod, by the distance of each from center of the bolster. For example, referring to Fig. 1, the total moment at the center is equal to $(W^1 \times r^1) + (W^2 \times r^2) + (W^3 \times r^3) + (T^1 \times r^5) + (T^2 \times r^4) + (T^3 \times r^6)$, where the "W's" and "T's" represent loads transmitted by the sills and truss rods respectively, and the "r's" are respective distances of each sill or truss rod from the center. The duty of the designer, therefore, is to so locate the sills and rods, and other parts of the framing, that the total moment at the center of the bolster calculated as above, shall be as small as possible.

THE TRUSS RODS.

The load on the truss rods is transmitted to them through the needle beams, or cross center sills, and is transmitted by them to the body bolster. Disregard, for the present, the means by which the truss rods receive their load near the center of their length; given the diameter and number of rods and the angle which they make with the horizontal or vertical, the load which each will transmit to the bolster can be calculated from a quite common formula. Assume that there are two truss rods each side of the center of the car, that they are located at T^1 and T^2, Fig. 1, a very common arrangement, and that the vertical component of the stress in each is 5000 lbs.; assume, further, that the distance from center of bolster to T^1 is 50 ins. and to T^2 is 35 ins. Then the moment of each at the center of the bolster is:

For T^1, 5000×50 equals 250,000 in.-lbs.
For T^2, 5000×35 equals 175,000 in.-lbs.

A total at the center of..425,000 in.-lbs.

or the equivalent of 425,000 lbs. applied 1 in. from the center of the bolster, or about 35,400 lbs. placed 1 ft. from the center. Assume, now, that the truss rods are located at T^2 and T^3, the latter being 30 ins. from the center, a very reasonable location; then the moments at the center are:

For T^2, 5000×35 equals 175,000 in.-lbs.
For T^3, 5000×30 equals 150,000 in.-lbs.

A total at the center of 325,000 in.-lbs.

or the equivalent of 325,000 lbs. placed 1 in. from the center, or about 27,000 lbs. placed 1 ft. from the center.

The error must not be made of assuming that the improved condition is always as great as would be indicated by the difference of the two total moments given above; this amount and more can be gained by suitable arrangement, but the method of attaching the needle beams and the designs of them must be suitable if so much improvement is to be made.

THE NEEDLE BEAMS.

Ordinarily, all the sills rest on the needle beams, and Fig. 2 will show that although the needle beams may transit a part of the load from the side sills to the truss rods, and the latter deliver the same nearer

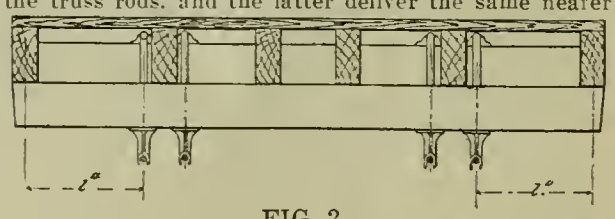


FIG. 2.

the center of the bolster, there may be a considerable part of the load from the center sills similarly transferred to the truss rods, and by them delivered to the bolster at a point farther from the center of the bolster than would be the case were no trussing used. It is clear that the side sills should rest on the needle beams, and the latter on the truss rods, and that the nearer the center of the bolster the truss rods are supported, provided they are loaded the same under various conditions, the better for the bolster. It is also quite certain that the center sills should not be supported on the same needle beams and truss rods, unless, indeed, the truss rods are located inside of the center sills, or the needle beams are sufficiently stiff to carry the load of the side sills without bending upward between the truss rods. This leads to the general statement that, in order to favor the bolster as much as possible through the medium of the truss, the rods should be placed as far inside, that is, toward the middle of the bolsters of the sills on which the rods act as trusses, as the strength of the other parts will allow. The other parts referred to are the end sills and the needle beams, both of which are used to distribute the trussing over all the sills.

It will probably be considered inexpedient to do all the trussing with rods placed between the center sills; still it is quite possible to place one truss rod immediately outside of each sill, and this will not be contrary to the general statement made above, because rods so placed will, generally, rest on the bolster within the radius of the bearing surface of the center plate. This will suggest two arrangements, viz.: One, that the center sills do not bear on the needle beams, but that these sills be trussed independently of the main needle beams by means of secondary needle beams extending, to advantage, across the intermediate sills. With such an arrangement, however, dependence must be placed in the flooring, to make the sills act together, or other desirable means should be provided for the same purpose. The second, and probably the better method, is to locate a truss rod either inside or just outside of each center sill, and another truss rod at the inside of each intermediate sill, or even closer to the center of the bolster if found expedient to do so, all four truss rods to bear on the two needle beams, as is ordinarily the case, but these beams to be designed so stiff that they will not bend between the two outside truss rods with the load imposed by the side and intermediate sills.

THE END SILLS.

The advantage derived from trussing the longitudinal sills is due to the fact that, when trussed, these sills carry the load partly as columns and partly as untrussed beams; in order to take advantage of the former principle, it is necessary to provide the strut or struts in the middle, the needle beams, and to distribute the truss-rod strains over the ends of the longitudinal sills so as to put these sills in compression.

In freight equipment it is usual to extend the truss rods to the outer face of the end sills and distribute over the ends of longitudinal sills, by means of the end sills, the stresses incident to the use of the rods; the end sills, therefore, must be of sufficient stiffness to make the distribution properly. Therefore, as the truss rods are moved toward the middle of the car, the end sills must be made correspondingly heavier. The ends of the end sills, extending from the truss rod to the side sills, are of the same class beam as the needle beams, and calculation for the strength of each is made in the same way, and any change in one, made necessary by change in location of the truss rods, must quite certainly be provided for in the other.

THE UPPER FRAMING.

If the car under consideration has an upper framing, unless there is something different from ordinary car construction, there is not much that can be done with it that will affect the bolster. The side frames probably cannot be manipulated to affect the distribution on the bolster, but it is possible to adjust the end framing to advantage. For instance, the diagonal bracing at the ends generally extends from the upper end of the end posts, or from near the middle of the end plates, to the lower end of the corner posts; these braces are compression members, the connections being made in such a manner that if the braces assist in carrying the roof load to the sills they must be in compression, and are, therefore, transmitting some of the load, which would naturally be transmitted to the center sills, to the side sills. If it is considered necessary to put in these braces in the usual manner, rods extending parallel with them and adjacent to them might be secured to side sills and to the end plates near the middle of them, and through these and the end posts a part of the load overhanging the side sills be transferred to the overhang of the center and intermediate sills.

In the reference to the longitudinal sills above, it has been assumed that all the sills were of equal section; sometimes some of the sills are made of heavier section than are the others, and quite generally the side sills have been selected for such increase; there are occasions when there is no choice, only to make the side sills the heavy ones, but this should not be done when it is possible to gain the same advantage by making the center preferably, or the intermediate sills the heavy ones. If some sills are to carry heavier loads than

*Extracted from a paper by Mr. F. M. Whyte, read before the Western Railway Club at the November meeting.

others, such heavier sills should be located as near the middle of the bolsters as possible. By suitable connections between the sills and the needle beams, the heavier and stiffer sills can be used to advantage, even to assist in supporting lighter outside sills. If some sills are lighter than others, and the lighter ones spring sufficiently to get out of line with the others, or bend downward, then the flooring may affect the distribution of the load to the bolsters; if the side sills deflect more than the other sills the flooring will transmit to the intermediate sills a larger portion of the load than did all sills deflect together, and this would favor the body bolsters. Contrary would be the case were the side sills the very stiff ones.

A KINK ON BREAKDOWNS.

BY FRED E. ROGERS.

Locomotive failures are more or less unavoidable, depending to a certain extent upon the care given to the general repairs in the back shop and upon the personnel of the engineers and firemen. But with the greatest vigilance and the most rigid inspection and care the number of road failures can be only reduced to a minimum.

The larger part of these failures are of such a nature as to necessitate the disconnecting of the mainrods and valve rods and the blocking of the crossheads and valves in certain positions so that the engine can be safely towed in.

If the breakdown happen to be a broken piston rod, or of a nature that does not affect the other side, the usual practice is to disconnect and block that side and take in the part of the train that can be handled at the regular schedule rate.

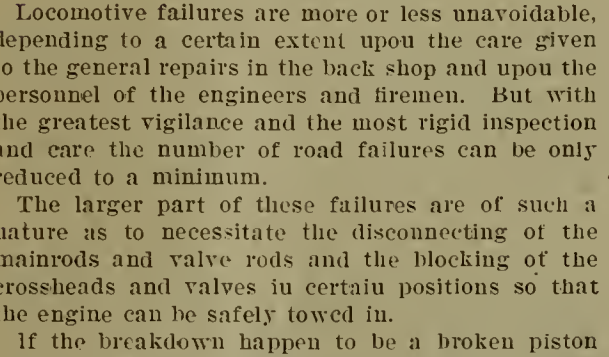
It is evident in the latter case, that it is highly desirable to effect the temporary repair as speedily as possible to avoid general confusion of the train service.

Now the blocking of a crosshead after disconnecting the mainrod seems like such a simple job that the material for doing it is rarely or never provided, but the engineer is left to skirmish for it, at a time when handsaws are scarce and moments are golden.

Acting upon this idea Mr. Wm. A. Foster, superintendent of motive power of the Fall Brook Railway, has provided each locomotive with two sections of two inch plank sawed to the right length and painted black, with the respective number of each engine plainly stenciled in white. Each of these for the Laird crossheads has eight pins driven in two rows lengthwise and projecting about one-half an inch. These pins slip over the sides of the lower guide and prevent the plank from working out sideways, and some thin wedges driven in on top securely hold it from working up.

Again, the placing of the slide valve on lap or so that both ports are covered is a simple job but in the hurry and confusion incident to such times, mistakes often occur and much valuable time is lost, in securing it in the proper position.

All the Fall Brook locomotives have valve stem carriers as shown in the sketch, which consist of a



A KINK ON BREAK-DOWNS.

guide B bolted to the top of the cylinder and the carrier A. This carrier is bored out to encircle the valve stem D and the guide B.

The rig forms an inexpensive and efficient device for keeping the stem up in a central position and saving it from the wear incident to carrying its own weight on a bushing in the stuffing box. They are also indispensable with the style of packing used on the valve stems, a cut of which appeared in these columns in January, 1897.

When the valve setter takes the port "openings" of the valves, the points are lightly pricked on the stems and with the dividers the center between the two is found.

The valve is then brought to a position so that the train will drop in the center mark and a nine-sixteenths-of-an-inch hole drilled through the carrier A and the guide B, as shown at C.

To correctly block the valve is now a simple matter of knocking out the upper rocker pin and slipping in the hole C a one-half-inch bolt or in the absence of the bolt a plug of hard wood.

Such minor details while of seeming unimportance are often profitable, as is proved in practice, and in connection with this the following is given:

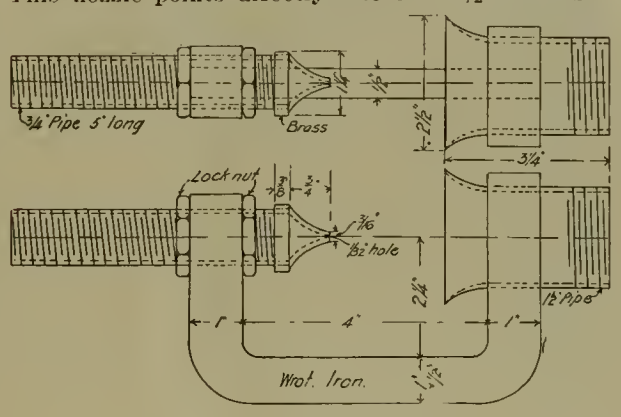
We are advised by standard authorities, in the case of a broken valve yoke, to lift the steam chest cover and to block the valve in a central position with pieces of wood. While this is good advice it is usually an appalling job to undertake on the road with only a hammer, chisel and broken-backed monkeywrench.

In most breakdowns of this description, the valve stem, especially if equipped with the carrier just described, can be fastened in the proper position. Then the relief valve, if in the front side of the chest, can be removed and the valve pushed back until the broken ends strike. Now cut a stick of wood to the right length and size to enter the hole in the neck of the relief valve and to shoulder on the end of it and to also press against the slide valve when the relief valve is screwed up to its proper position.

This can be usually done quicker and easier than by the other method and is reliable, as the forces tending to displace the valve are practically nothing.

AIR JET FOR FORGE.

At the West Burlington shops of the Chicago, Burlington & Quincy Railroad, the forge for heating coupler pocket straps is supplied with blast by air from the shop piping. The compressed air is brought up to the forge through a ¾ inch pipe carrying a nozzle of the form shown in our engraving. This nozzle points directly into the 2½ inch bell



AIR JET FOR FORGE.

mouth of the 1½ in. pipe which is attached to the forge to lead up to the coal bed, which mouth is several inches away from the nozzle. The jet of compressed air, carrying with it the entrained air of the surrounding atmosphere, gives a perfectly adequate and easily controlled blast to the fire, the flow in the ¾ inch supply feed pipe being governed by a simple cock conveniently located. Careful experiment has shown the proper diameter of the aperture in the nozzle to be 1-32 inch when the nozzle is set as shown.

Mr. John Bean, master mechanic of the Cleveland, Canton & Southern road, whose success in keeping up his locomotives and cars with a very sleuder outfit of machinery and shop room is widely recognized, has made a discovery which may become of general importance. He has found that an occasional diet of snapping turtles enables men to accomplish more hard work in a given time than any other food. After thoroughly satisfying himself of this he took measures to have a supply of snapping turtles always on hand so that those of his men who were liable to be called on for severe exertion should have, every two or three weeks, a full ration of this remarkable food. This was, naturally, the wrecking crew, for while wrecks do not often happen on this road yet when one does occur it must be cleared up with great rapidity. It was the writer's good fortune to participate in one of these dinners in the dining room of the wrecking train recently and he can testify to the wonderful recuperative and strengthening power of the snapping turtle soup, which was served in liberal quantities. On such diet even ordinary men become giants, and brain as well as body is stimulated and given increased strength. The "snap" from the turtles evidently is extracted in the soup, and if there is any secret in the process it is in the manner in which this result is secured. A supply of living turtles is kept in a tank in the tool house so that they can be used at any time. Whether a diet of this kind would put needed "snap" into some of the railroad papers is well worth trying. We may say in this connection that the wrecking train referred to is a model of its kind.

The office of Locomotive Engineering in New York City was recently destroyed by fire, with all its contents. The full extent and meaning of such a loss can be appreciated only by publishers and editors. We deeply sympathize with Mr. Sinclair, but have no doubt but that the current issue of his paper will appear promptly, and with a full amount of its usual high grade of matter.

The Personal Essentials to Success.

A partial enumeration of characteristics, traits, gifts, endowments, capacities and possessions which a person is called upon to employ and which are useful in the struggle of life to achieve success, is of itself interesting. But before giving them in alphabetical order it will be explained that by success is meant not merely pecuniary acquisition, but success in the sense of a wide and beneficent life. To achieve such an end a person needs—

Acquaintances,	Luck,
Advice,	Mirthfulness,
Affection,	Moderation,
Ambition,	Modesty,
Application,	Money,
Benevolence,	Morality,
Candor,	Opportunities,
Capital,	Originality,
Caution,	Patience,
Charity,	Patriotism,
Cheerfulness,	Peacefulness,
Civility,	Perseverance,
Conciliation,	Pertinacity,
Confidence,	Philosophy,
Constancy,	Prosperity (achieved, not
Contentment,	inherited),
Courage,	Poverty,
Courtesy,	Precaution,
Dexterity,	Pride (honorable),
Dignity,	Principles,
Diligence,	Pleasures (innocent,
Discipline,	in the beginning of life),
Discretion,	Prudence,
Economy,	Punctuality,
Education,	Purity,
Endurance,	Push,
Energy,	Reasonableness,
Enterprise,	Refinement,
Experience,	Resignation,
Faith,	Resolution,
Fidelity,	Reticence,
Forbearance,	Righteousness,
Foresight,	Sagacity,
Friends,	Self-assertion,
Frugality,	Self-control,
Generosity,	Self-denial,
Genius,	Self-mastery,
Gentleness,	Self-reliance,
Good manners,	Self-respect,
Good memory,	Self-restraint,
Good sense,	Sensibility,
Health,	Sincerity,
Honors,	Sobriety,
Humanity,	Studiousness,
Imagination,	Subtlety,
Impartiality,	Temperance,
Incredibility,	Thoughtfulness,
Industry,	Thrift,
Ingenuity,	Toleration,
Judgment,	Truthfulness,
Justice,	Understanding,
Kindness,	Uprightness,
Knowledge,	Valor,
Kindred,	Vigilance,
Learning,	Virtue,
Liberality,	Wisdom and
Liberty,	Zeal.

—M. N. Forney before the New York Railroad Club.

LAYING OUT MOULDING MACHINE KNIVES.

BY H. M. PERRY.

In all shops where woodworking machinery is in use, it is often a difficult problem to lay out some of the machine knives that are required to make the various mouldings in use, and as very few of the men, in these shops, understand the principles of drafting, the following method may be of service to them:

Let A represent a section of moulding for which the tool is to be made, B C the base of the moulding and also the top of the machine table, E F the back of the moulding, which runs against the face plate or guides of the machine.

From each of the principle points on the moulding, as 1, 2, 3, 4, 5, 6, 7, 8, draw lines parallel to B C and to E F and number these lines to correspond with the points on the moulding.

At any convenient point on the base line B C erect a perpendicular line D D and set off the point H as the centre of the cutter head.

This is an essential point, as any difference in the size of the cutter head, or in the distance from the centre of the head above the moulding, makes a variation in the shape of the moulding.

In this sketch the cutter head is assumed to be 3 inches square and the centre of the head 2⅜ inches above the top of the moulding: the moulding being 1¾ inches high and 2 inches wide.

From the centre H set off a 3 inch circle for the diameter of the cutter head, and from the same point H as a centre extend the line 1, 2, 3, 4, 5, 6, 7, 8, in the same direction as the cutting tool travels.

From the point J, where the perpendicular line D D crosses the line 1, draw the line I K bearing on the outside of the circle L.

This represents the position of the cutting tool after each point has completed its cut, consequently the distance from J to K would be the length of the cutting edge of the tool.

Now lay off the line b c parallel to the base line and crossing all the perpendicular lines from the moulding, and with a pair of dividers, take the distances K 1, K 2, K 3, etc., on the line I K and transfer them to the perpendicular lines of the moulding, the measurement of each one of these lines being made from the line b c, as K 1 = b c 1, K 2 = b c 2, K 3 = b c 3, etc., then trace the face of the tool through these points as shown and we find the cutting edge of the tool measures 2 inches deep, or one-quarter of an inch larger than the face of the moulding which it has cut.

This same plan answers for all machine tools where the cutters revolve, the only change required being in the size of the cutter head and the distance from the centre of the head above the work.

In shaper knives where the work runs against the collar holding the cutters, the point J would be against the outside of the collar, and the point L the inside face of the groove in the collar that holds the cutter in place.

The extension of the lines 1, 2, 3, 4, 5, 6, 7, 8 would be made from the center of the collar, and the line I′ K′ would be drawn on the same angle as the groove in the collar, when the collar was placed so that the inside face of the groove just touched the point J on the outside face of the collar.

The dimensions would then be taken on line I′ K′ from K′ and transferred to the perpendicular lines of the moulding the same as shown in the other plan.

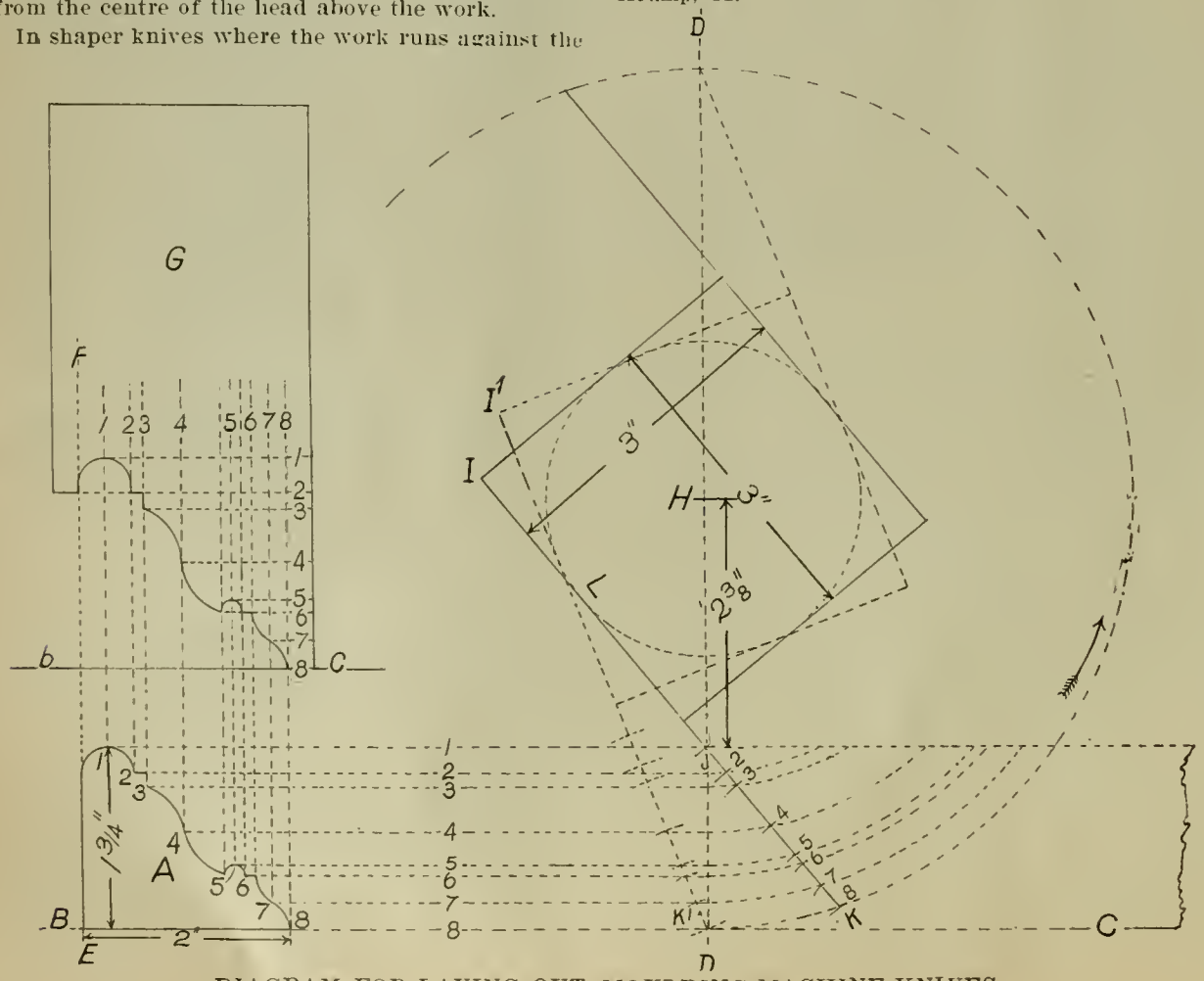


DIAGRAM FOR LAYING OUT MOULDING MACHINE KNIVES.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.

DECEMBER MEETING.

The regular monthly meeting of the Car Foremen's Association of Chicago was held at the Great Northern Hotel, Chicago, December 8. President Morris called the meeting to order at 8 p. m. Among those present were:

Barr, J. N.
Bates, B.
Baikie, J. P.
Bates, M.
Bell, W. A.
Blohm, Theo.
Callahan, J. P.
Constant, E. J.
Cook, W. C.
Davies, W. O., Sr.
Davies, W. O., Jr.
Erieksou, G.
Fritz, Chas.
Ford, Geo.
Groobey, Geo.
Guthenberg, O.
Gardner, Lewis.
Gruilke, E.
Godfrey, J.
Gehrke, Wm.
Guthenberg B.
Goehrs, Wm. H.
Grieb, J. C.
Hunt, T. B.
Helwig, Henry
Hauson, A.
Heden, A.
Hennessey, J. J.
Hushand, E.
Johannes, A.
Johnson, G.
Jones, R. R.
Johnson, A.
Kamen, F.
Keebler, C. F.
Kidder, S. J.
Kuhlman, H. V.
Kroff, F. C.
Krump, M.
Konze, Wm.
Lutz, Jos.
Manthey, H. H.
Morris, T. R.
Metz, C.
Martin, J. F.
Mallory, Wm. J.
McCrudden, H.
Nightengale, H.
Nixon, F. J.
Northam, F. R.
Nordquist, C.
Olsen, Louis.
Prickett, James
Reinhard, F. B.
Redman, O. P.
Sharp, W. E.
Shannon, S.
Smith, R. G.
Stuckie, E. J.
Swoboda, Jas.
Smith, E. B.
Shutt, W. F.
Stagg, C. S.
Silvus, W.
Schultz, F. H.
Schoeneberg, C.
Schultz, Aug.
Spohnholtz, John.
Saums, G. W.
Schultz, H. E.
Thomson, Geo.
Taylor, H. G.
Thompson, Isaac.
Williams, Thos.
Wentsel, Geo.
Wolfe, Chas.
Weschler, H.

President Morris: As the minutes of the previous meeting have been published in the Railway Master Mechanic, if there are no objections they will stand approved as published.

Secretary Cook: The following names have been submitted to the executive committee and approved, and will be enrolled as members:

Henry Helwig, Jos. Swohoda, Axel F. Johnson and A. Richmond, of the Armour Car Lines; F. R. Northam and James Martin, A. A. P. Co.; Lewis Gardner, Canda Cattle Car Co.; H. G. Taylor, J. B. Sipe & Co.; C. L. Sullivan, Cloud Steel Truck Co.; A. L. Streeter, Railway Supplies; Joseph Gibson, N. Y., C. & St. L.; W. A. Bell, Wabash; Wm. Konze, Chicago Junction Ry.; J. W. Taylor and James F. Malloy, C., M. & St. P. Ry.; Henry Wesehler, P., F. W. & C.; James Prickett and O. A. Penn, C. & E. I.; Thos. Fildes, L. S. & M. S.; O. L. Bundy, C., R. I. & P.; E. Gruilke, Belt Ry.

President Morris: The next order of business is reports of committees.

Secretary Cook: The committee on meeting rooms for the association is not ready to report, not having made any definite arrangements as yet. There are no other committees.

President Morris: We now come to the discussion of M. Kidder's paper on air brake practice. Mr. Kidder himself is here, and we would like to have him start the talk.

Mr. Kidder's Address on Brake Leverage.

At the time of presenting to the club my paper on the subject of air brakes it was my intention to consider brake leverage somewhat in detail and point out important features in connection therewith. It not infrequently happens that the car foreman or his men should determine whether the leverage is suitable for the car, and I will endeavor to point out methods for determining its correctness or otherwise, and also say something regarding different classes of levers and the variation in power developed with the same lever when used in the different classes.

What is known as the Hodge system is most generally used on passenger equipment cars and the arrangement is shown in sketch Fig. 1. For convenience, while discussing passenger equipment brakes, 4000 pounds will be assumed as the maximum power derived from a 10-in. cylinder (the quick action triple valve gives about 4700) and a braking force on the wheels equal to 90 per cent. of the weight of the car on the rails.

In Fig. 1 we have a car weighing 44,500 pounds. Ninety per cent. of 44,500 pounds equals 40,000 pounds, the braking force desired.

To determine the braking force exerted on this car we measure the levers, and having found them as noted in the sketch, first multiply the cylinder pressure by the end of the cylinder lever next to the cylinder and then divide the product by the other or outer end of the lever which gives the strain on the rod connecting the cylinder and Hodge levers. This rod being connected at the center of the Hodge lever, one-half the pull goes to the hand brake rod, the other to the rod connecting the Hodge and top end of the live lever. The live lever being of the second class, is subjected to a strain at the brake beam connection equal to that on both ends of the lever. The brake beam pull is most readily obtained by dividing the total length of the lever by the short end. Now multiply the pull on the top rod by the proportion of the live lever, 5, and the result is the braking force on the brake beam. If the live and dead levers are all of the same proportions, regardless of their total lengths, the Hodge levers have equal ends and the cylinder levers are both of the same proportions, the power found applied to the one beam multiplied by four, the number of beams on the car, gives the total braking force.

EXAMPLE.

4000 by 15 equals 60,000.
60,000 divided by 15 equals 4000 or pull on long rod.
4000 divided by 2 equals 2000 or pull on top rod.
30 divided by 6 equals 5 or proportion of live lever.
2000 multiplied by 5 equals 10,000 or pull on brake beam.
10,000 multiplied by 4 equals 40,000 or total braking force of car.

We thus find that the braking force on the car is correct.

Suppose we now substitute a live lever of the same total length but with the intermediate or beam connection hole one inch lower than in the above sketch, in other words make the distance between the holes 25 in. and 5 in. instead of 24 in. and 6 in. This gives a proportion of six instead of five and a braking force on the brake beam of 12,000 pounds or 875 pounds more than the total weight of the wheels on the rails.

Another form of gear frequently employed is known as the "Stevens" the difference between it and the Hodge being seen by comparing Figures 2 and 1.

The formula for computing this leverage is the same as in Fig. 1 excepting that the pull on the outer end of the cylinder lever is not divided by 2, no Hodge lever being employed.

EXAMPLE.

4,000 mul. by 15 equals 60,000.
60,000 divided by 30 equals 2,000.

2,000 mul. by 5 equals 10,000.
10,000 mul. by 4 equals 40,000.

The Hodge system is believed to be the better arrangement as it provides a more effective band brake; does away with the transverse pull on the lower rods, is more convenient for taking up the slack and permits a practically constant piston travel when the car is either on a tangent or a curve.

The standard freight car brake is a somewhat modified form of the Stevens system, so arranged as to militate against the objectionable features above enumerated, and is illustrated in Fig. 3.

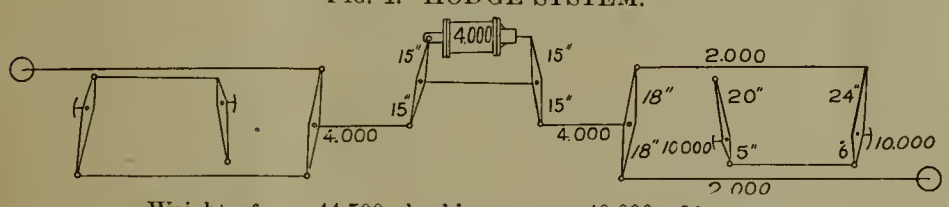
The formula for finding the braking force in Fig. 3 is the same as that given for Fig. 2. It will be observed that the floating cylinder lever is considerably shorter than the cylinder lever. This is to obtain a better alignment of cylinder and top rods than would be possible with cylinder levers of equal length and also obviates the objection urged regarding Fig. 2 in the matter of curving.

Fig. 4 has the same arrangement of levers as Fig. 3 with the exception that the live and dead levers are of the first instead of the second class with the brake beams attached to the lower ends of the levers and the lower rods occupying the intermediate position.

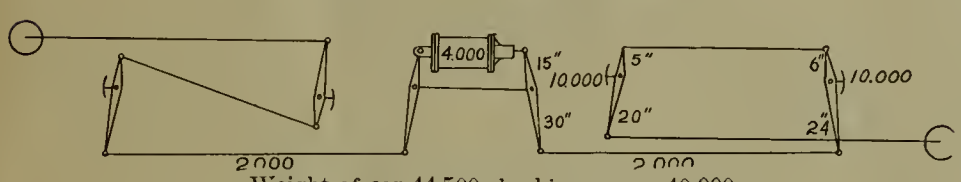
It will be seen that in the last illustration while using live and dead levers of the same proportions, but as first instead of second class, the braking force of the car is reduced from 70 per cent to 52.5 per cent of the light weight of the car.

The floating cylinder lever serves as an illustration of a lever of the third class the power being applied at the intermediate connection. In figures 3 and 4 the pull on the cyliuder lever rod is 3,000 plus 1,500 or 4,500 pounds. The floating cylinder lever being of the same proportion as the cylinder lever the cylinder lever rod gives a pull of 3,000 pounds at the fulcrum connection and 1,500 pounds on the rod extending to the top of the live lever.

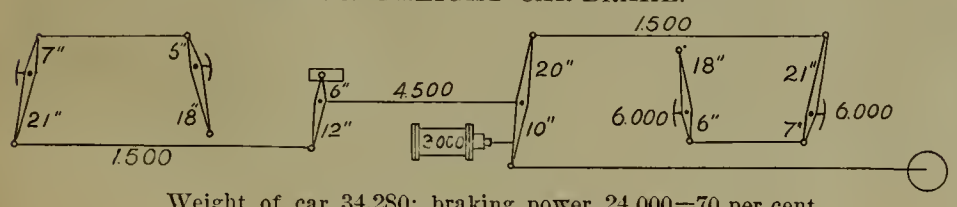
FIG. 1.—HODGE SYSTEM.



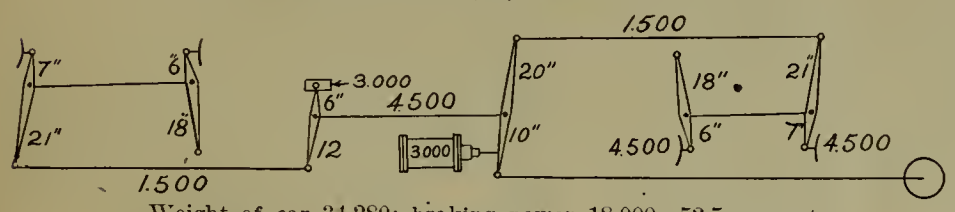
Weight of car 44,500; braking power 40,000 = 90 per cent.
FIG. 2.—STEVENS SYSTEM.



Weight of car 44,500; braking power 40,000.
FIG. 3.—FREIGHT CAR BRAKE.



Weight of car 34,280; braking power 24,000 = 70 per cent.
FIG. 4.



Weight of car 34,280; braking power 18,000 = 52.5 per cent.
DIAGRAMS ACCOMPANYING MR. KIDDER'S PAPER.

Mr. J. N. Barr followed with a few remarks, in which he explained the working of the different classes of levers, illustrating the same by sketches of the ordinary balance scale.

President Morris: Are there any questions the members would like to ask Mr. Kidder? If not, we will pass to the next order of business, the discussion of the treatment of hot boxes on the road, which was continued from last meeting.

Discussion on Hot Boxes.

Several of the members were called upon by the president touching their experience with hot boxes. They responded as follows:

Mr. Hunt: Being at a terminal point, I have not had much experience treating hot boxes on the road; but I think I know about how they go at it. We find that the best way to treat a hot box is to take it before it gets too bad and keep giving it a little oil before it gets ahead of us. Of course, when the journal gets real hot, that is, red hot, the quickest way, and a way that is resorted to a great deal, is to put water on it. That is the quickest and the only way, I guess, of cooling it. Some people use a cooling compound. This, no doubt, is good, as it carries with it ingredients that are supposed to reduce the heat. But possibly as good a thing as can be done is to have plenty of good oil and packing at hand and get at it as early as you can and doctor it up in that way. Cooling compounds, I believe, contain a great deal of sediment (at least those I have tried contained a great deal) and, for that reason, after once used the compound ought all be taken out of the waste, because it forms a crust through which the oil will not penetrate. But no doubt it is a very good thing to use at the time the journal is hot.

Mr. Sharp: I think that it is not a good practice to use a cooling compound. There is, as one of the members said at the last meeting, too great a danger of burning off the journal. I think it is the best practice to furnish the train crew with plenty of well soaked waste and an extra can of black oil, so that in case they find a journal getting warm they can, by applying a little oil at the proper time, prevent further damage to the journal and brass. Still, on the Erie, especially recently, we were not bothered a great deal with hot boxes. We never used a cooling compound. We used a patent dope, a sample of which I had here about a year ago. It had a certain amount of asbestos in it, which prevented burning. That in itself was not very good for freight cars, from the fact that when a box would get hot, about the only signal to the trainmen was the smoke or the smell of the burning dope. Where you use a dope that will not burn you run the risk of burning off the journal before the trainmen find it out. We also used Dixon's graphite. We found it good for cooling journals or making a rough journal run to destination or a division point where repairs can be made without delay.

Mr. Reinhard: We do not seem to have much trouble on freight cars on our road. Now, it appears to me that it is poor brass that will start a hot box. We find some journal bearings will run for some time until they come to a hard spot in the babbitt of the brass, which will create a hot box. After the brass has been removed it seems it will run all right. Some new journal bearings, after running a distance of four or five miles, cause a hot box, and if another brass is applied it will run cool. The trouble appears to be in the brass instead of in the oil. That is the experience we have had with hot boxes.

Mr. Stagg: I believe on our fast passenger trains we use a compound. We have experienced some trouble with coal cars and we have had a little difficulty with cars loaded with steel rails that we have taken in at South Chicago. I think it is confined mostly to cars that have been used in gravel service, not enough attention having been paid to them in regard to sand getting into the boxes. That is what I attribute the trouble to, and I think that is what causes most of the hot boxes that we have had lately.

President Morris: Do you use a cooling compound?

Mr. Stagg: I think we do on passenger cars; water when it gets red hot.

Mr. Hunt: I believe there are a whole lot of conditions that cause hot boxes. I have seen boxes get hot under the best conditions possible. I believe the extreme cold weather has a great deal to do with hot boxes. I know we have experienced considerable trouble for several winters in extreme cold weather. We had quite a few hot boxes on our passenger trains, and the remedy we applied was to, as soon as the train came in, put men at the boxes and push the packing back at once while it is warm. When the trains came in off the road in extreme cold weather the packing could be handled very nicely. We have tried that for several winters and we find it works all right. We get the packing well to the back of the box and we find that we can put in a great deal of packing in some of the boxes. It is surprising what additional packing you can add. I believe if you get the packing and oil well back you do a great deal of good. A great many hot boxes start at the back of the journal from getting dry, because it is the farthest away from where the journal is oiled, and consequently gets the least oil; if it gets dry in any one spot, away goes your box.

Mr. Jones: One of our conductors made a report the other day of having a hot box, and our superintendent sent down and wanted to know whether this was another case of it running on smell instead of grease. We have had brasses that showed spots in them probably about two inches wide. We have filed these spots down below the surface of the other lining, just to make a test, and just as soon as the brass gets worn down to where the spot is, the journal begins to run hot. We took the brass out and cut it in two and found the metal a kind of grayish color. I believe it is poor brasses that causes hot boxes in general. In several cases we have taken out the packing where there was a hot box, using the same brass, but repacking the box with old waste, but it still run hot. We took out the old brass and put in a new one and the journal run cool. So, in many cases it is the fault of poor brass instead of the packing.

President: Mr. Barr, will you give us your views?

Mr. Barr: I do not like to say anything on this subject here to-night, as I know that there are a lot of your members that have not told one-half of what they know. I know that mighty well too, and I would a great deal sooner listen a little further to what some of the others have got to say. There is no way to learn a thing except by getting right down to it and seeing. Now I am satisfied that there are a good many of these gentlemen here who have seen enough hot boxes to be able to tell us where the heating starts. I would like to watch that myself, but I cannot, and you gentlemen are in a position to. Now in the matter of the starting of the hot box—starting of the heating—I believe that we would learn a great deal more by examining some boxes that are just a little hot. Then we could see where the thing begun. It is too late after it has got so hot as to burn the waste up. Then you can't tell anything. I am satisfied that there are a great many here that have seen these things and could tell us where the heating starts—whether at the front collar or back shoulder, or whether in the middle of the brass. We have had several cases mentioned; one in which the trouble was caused through the fault of the brass, and one very good case where the brass was scraped out and the journal then run cool until it afterwards struck the surface that run hot before. That is a pretty strong intimation that it was in the brass. My notion is, however, that if a car runs for one thousand miles and then runs hot, it is not the brass that does it. The brass is not so liable to change as a good many other things. But what I would like to bear from some of you gentlemen is just where the first heating starts on the journal, so far as your observation goes.

Mr. Stuckie: The experience that we have had with hot boxes coming in off our road, is that it is caused by dust and dirt getting in back of the collar. On a great many cars the dust guard is gone entirely.

Mr. Kroff: There are a good many things that cause journals to run hot. When new wheels are applied the men do not take care to see that the journal is clean and a little waste will get on the journal between the bearing and the journal and it will never burn out. That is one thing that will start it, and when it once gets to heating you may put oil on it but you can never remove that waste. Another thing that causes a journal to heat is trucks being out of square; or the brass may be too long. Last winter we had a steam shovel come from Milwaukee over the Northwestern. Every journal on the shovel was hot. I had to take and shorten up the brasses, and I never heard a thing about it afterwards. I guess it ran cool. I know I would if it handn't. We generally do over our way. I think it best to have a man to keep the journal clean and not allow waste to get under the bearing. We get cars that have had brasses put in at the stock yards. They come up squealing so you can hear them a block. You would think the journal was badly burned. We jack her up, examine the brass and find a litle waste in there We take that out and let her go and never hear any more about it. There are a good many things that will make a hot box. It may be caused by a wheel that binds too tight to the box, pushing the box to the outside collar, and if the outside collar binds, no matter how much oil you put there it will get hot right away. My experience is that in applying new wheels to the oil boxes a little waste will drop down on the journal. Try that as an experiment and see how it works.

Mr. Hennessey: There is another cause of hot boxes that has not been touched on this evening at all, and that is that the radius of the brass is bored out too much for the journal. I have made some experiments with that. We used to put in brasses with a radius one-eighth of an inch larger than the journal. We cut it down to a thirty-second of an inch. I find that on cars now leaving the shop with new journals and new brasses we do not have one hot box where we formerly had a great many, and I attribute that, more than anything else, to having the journal in good condition. If you have only got a small bearing surface on the journal, you get a small bearing on the brass. Just half an inch; that is not sufficient bearing surface.

Mr. Kroff: I would like to say that we use a 4¼-inch bearing upon a 4-inch journal. We do not experience any hot boxes at all. I prefer a larger bearing. We use one extra bearing 4⅛ inches, and we also use a 4x8; one bearing upon the same journal. We have no trouble whatever.

Mr. E. B. Smith: We used to have, years ago, any amount of hot boxes. At that time our brasses were a very poor quality. We labored with our people for a long time before we could get them to buy us lead-lined brasses, but we finally got them won over, and have been buying our brasses of the Hewitt Manufacturing Co. Last month we ordered our bearings made ⅛ inch larger than the journal. With the Hewitt brasses we

have reduced hot boxes 75 per cent. We have little trouble with heating.

Mr. Redman: It is my opinion that a great deal of trouble is with the packing; in a great many cases it is the fault of the brass; and there are cases where the brass hears too heavily against the collar. But I recollect one case in particular. When I found the box it was just a trifle warm; not running hot. There was a little puff of smoke coming out. The brass looked all right. The oil was lubricating at the end of the journal; but I was not satisfied and I had the brass removed. I found a strip of about 1½ inches in the center of the brass that the oil was not lubricating. After removing the packing, I repacked it and put the same brass back and it run all right. I think a great many times, especially in cold weather, the packing settles down and gets away from the journal so that it don't touch the journal or not sufficiently to allow the oil to lubricate. In many cases I have noticed the cause was due to dirt, cinders and saud working in, sometimes from one end and sometimes from the other end of the box, frequently on the back. I think that a hox ought frequently to be repacked; that is, withiu a certain length of time. The packing, after it has been in for a long time, should be pulled out, stirred up and placed back in the box.

Mr. Barr: I would like to ask if auybody has had any experienee with the Cook cooler.

Mr. Jones: We have had on our passenger cars. We have been using it a while; it does the work up in great shape. That is the water we used.

President Morris: Any other gentleman had any experience with the Cook cooler?

Mr. Krnup: We use a water bag that we attach to the car to cool hoxes. When applied it holds about ten gallons of water. So far as hot boxes are concerned, we find the great majority of them are ou grain ears, due mainly to overloading. I think you will fiud that, more than anything else, is the cause of it.

Mr. R. G. Smith: I think the majority of hot boxes are caused by the packing working into the front of the box and getting hard. I think the hest way to look after that is to watch and see that the packing is kept in the back of the hox. The only way to do that is to take the packing iron and punch it back. Putting water in hot boxes, I think, is the worst thing anyone can do. When you put water in it will make a shell on it, and as soon as that shell gets rubbed off it will leave a hole, and no matter what kind of a brass you put ou it, it won't run cool. I think the best way to use a car that has been running hot is to let it cool off itself, or put in some suitable stuff that will rnn the car instead of having to cool it off. At the last meeting we were talking about compounds being used. I think they might use a different compouud to what he used, which would be far more suitable. Take soft soap, for instance, with a little sulphur. I do not say to use that as a general thing for lubricating; but in case a train crew gets out on the road with a train of perishable freight it would be a good thing to have to carry a car to its destinatiou. I think it does it every time.

President Morris: Mr. Barr, I think the members would like to hear from you in regard to the value of this association to the railroads.

Mr. Barr: I do not want to take up the time of the members of the association with any address, and I don't intend to. I simply say this: I have taken a great deal of interest in your association; I believe it a good thing. I believe it is the right thing to do. If you will come here and give your experience, and be sure you give what is experience, not so much ideas—give the results of the actual use of your eyes—you are going to help each other and help the railroads very much indeed. Now, I would very much prefer to listen rather than to talk. I have got several ideas this evening that I consider worth a good bit. I got several ideas that I propose to work out to a certain extent. I, for my part, want to do anything and everything that I can to help make your meetings a success, and help you to do good to the railroads. There are a great many others that feel just exactly in the same way; and I shall do all I can with the officials of the St. Paul Railway, who look on your meetings and discussions here as quite an important thing. In the matter of interchange of cars, I think that the interchange will go on with a great deal less friction on account of your meetings, of your getting acquainted with each other, and getting to know that the other fellow is not trying to beat you all the time. I think the sooner you all get that thing out of your head—and you can get it out no better than through this association—the better off the railroads will be. I heard a general superintendent of a railroad say that a car inspector with a piece of chalk could stop more freight in an hour than he could manage to get by hard work in a week; and there is some truth in it. Now, I think that you are pursuing the right lines, and I am ready to take up the matter, and I believe I can interest a good many more men in it. You have my sincere good wishes, and you can have the assurance that if I can do anything to make the association go, I certainly will do it. Whenever I can make it possible to get away, I am going to come in and listen to what you have to say. I do not want to take up too much of your time, but I was going to say a few words about using the eyes. It is not much to theorize. We can all do that. In most all of our associations we have a little too much theorizing. What we waut is more facts; what we want is facts that you can establish by the use of your eyes. Take, for instance, hot boxes. If you start in and watch a lot of hot boxes as they come into the yard and see where the heating starts, watch the process and watch every point about it, I think you will get a clearer idea of what makes a hot box thau most of you have now. But you must uot take a case that has been standing in the yard for hours; you can't tell anything about that. You have got to commence when they start. If a train parts on the road and nothing happens, we can generally tell what coupler it is that uncoupled, and we can find, possibly, what was the matter. Sometimes we can't. But if a train, after parting, comes together again and smashes up half a dozen cars, you cannot tell anything about it. A hot box comes to our notice chiefly after it has made trouble and when it is too late to tell anything about it. You gentlemen are iu a position where you can possibly find out to what the heating is due, and if you know all the circumstances, I think you will be able, and we will all be able, to figure out a remedy, at least to a certain extent. Some of the geutlemen here in their remarks make the statement that they are not particularly troubled with hot boxes. That is not true on the St. Paul road, I am sorry to say. We have been keepiug a pretty close record of hot boxes, and our record shows 600 or 700 per month. It don't seem to be so very much when you consider that we have one hot box to about 50,000 miles of car mileage. But still it ruus up to 600 or 700, and I think if all were reported they would run up to 1000 per month. We try to get them all, but we don't. I do not think any other road is doing much better or much worse. I do not have any reason for supposing we are doing worse than other roads, and I do not have any reason to believe we are doing better. Of course, we all have a little notion that we are doing better than anybody else, and it is a pretty good thing to have. But when you come down to cold, solid facts, I guess one fellow is not doing much better thau another; and the hot boxes cost us possibly $1000 per month. I do not believe that I am making that too large, possibly not large enough. Now, if we can come down to causes aud get the exact facts in our minds—making hot boxes is not one thing, it is a number of things. It is not bad packing alone; it is not bad trucks alone; it is not any one thing alone. But if we can come down and find what these thiugs are—how much a truck has to he out of square to make a hot hox, and so on (I am putting aside bad wormanship)—we will have less hot boxes, and you are the men above all others that ought to be able to say where they commence, how they commence and what the reason for it is, and theu we can possibly do something to correct it. You have said a good many things, I know, this eveuing, but you haven't told one-half of what you know about this. I would like to hear some more ideas. I would a great deal rather hear them than hear myself talk. I do not believe I will do this association any good by talking any more, so I will sit down and listen for the rest of the evening.

Mr. Callahan: Mr. Barr's question does uot seem to have been replied to—where the box first starts to heat. I think just as he says—to tell anything about it one has got to be there and catch it when it begins to heat. After that there is nothing more than theory that you can advance on it. I think, from my experience, that a box that heats on account of the packing will commence heating at the back part of the hox, because the packing is not kept in the back part of the box. I do uot believe that it is a good thing to shove the old packing back in the box. I think the better way is to pull the old packing out and slip good packing in and get it clear back. I think if cars receive proper attention at terminals there is no danger of running hot between terminals.

Mr. Davies, Jr.: I have heard a good deal said about pushing the packing in the back of the box. I think it is very bad practice. With the majority of cut journals that we take out it is the back half of the journal that is cut. I have watched the packing pretty closely lately, especially since this discussion came up, and in most all cases in taking the packing out the packing in the back of the box was the driest. This shows that the oilers in oiling the box will put a little oil in the front and keep shoving the packing back, and in a very short time the packing becomes very hard and dry and does not give the oil a chance to saturate up to the journal.

Mr. Callahan: I will say further that I do not believe in using an oil can at any time. The oil you put in with an oil can runs out at the back of the box and does the journal no good whatever. If you will drop packing well saturated with oil into the journal box you will have better success.

Mr. Kroff: I would like to hear from the Milwaukee as to whether the cut journals are on old wheels or whether they are on wheels that have lately been applied. That has a good deal of bearing as to hot boxes.

Mr. Davies, Jr.: They are on both old and new wheels. We have not taken out any wheels recently that were new and recently applied. The majority of cut journals, of course, are on wheels that have been in there some time.

Mr. Showers: I have heard a good deal said about packing and oiling of boxes because of the journal running hot, but I have not heard anything said as to the preparation of the packing prior to packing the box. If there is any one here that can give a proper method for preparing packing I would like to hear it.

Mr. Hennessey: The practice at the West Milwaukee shops is to put the packing into a vat of oil and let it remain there from 36 to 48 hours. Then it is thrown up on a grate that allows the oil to drain off and run back into the vat, other than what the packing will retain. The room is kept at a temperature of about 70 degrees. With this we pack all the boxes on new cars, and they get no oil after that. We have been building cars at the rate of from 10 to 15 per day, and we find no cut journals in a year.

Mr. E. B. Smith: There has not been anything said about the kind of waste used. I would like to ask, for my information, which is the best, wool or cotton waste; what the trunk lines are using, especially.

Mr. Hunt: On the Fort Wayne we use wool waste. We believe that wool waste makes the best packing for journals. It has more elasticity to it; we all know that. I believe that is one of the things required. At the same time the hairs are hollow, and they take in the oil and retain it. I do not think you are able to squeeze so much of the oil out of wool waste with an ordinary pressure as you are out of cotton waste. Take a handful of wool waste that is thoroughly saturated with oil, and I will venture to say you can squeeze it for a month and you cannot get all the oil out. On the other hand, with cotton waste, there is no such elasticity to it, and the fibers, I do not think, are hollow, and you are able to squeeze most of the oil out of it. Then, too, cotton waste has a tendency to stay where you press it, while wool waste has not. We think wool waste the best. We have used it for years. I do not think that I remember when we used cotton waste on the Pennsylvania Railroad, although we may have at one time. In preparing the waste we pick out pieces as big as your fist; do not wind it up into a ball, just squeeze it up in the hand, and then throw it into a vat and let it remain from 24 to 48 hours or longer. Before using it we aim to let it drain pretty thoroughly. There are certain seasons of the year that it don't drain much, unless your place is pretty warm. Anyhow, it holds a good deal of oil at this season of the year.

Mr. Reinhard: We use cotton waste, and we go through the same process that Mr. Hennessey has just spoken about. There is one question about hot boxes that I would like to ask, and that is, whether they are experienced more in winter time than in the summer. It possibly may be a fact that, after a train of cars has come into the yard and stood around after being oiled and prepared to go ou the road, the oil will become thick and settled down in the waste. Take and start the cars out ou the road and the chances are that the journal has to get warm before the oil will commence lubricating. If the journal once commences to get warm before the oil can do it any good, you will have a hot box on your hands. I don't know whether I am right or not. In the spring I think you will find that your journal boxes are pretty well filled up with oil. I believe that hot hoxes are reduced in the summer. I have noticed that in the years gone by.

Discussion of Disputed Case.

President Morris: We will now cousider this discussion closed. We will dispense with the usual recess, as the hour is getting late. The case in dispute between two members, which has been written up and is now in your hands, will be considered. It is as follows:

> "In October, 1898, A received one of his cars from B (B being a switching road) with one draw bar spring broken, for which defect he requests M. C. B. card. B replies that draw bar spring is owner's defect. A replies that it is not owner's defect if broken by B. B replies that, according to his understanding, the draw har spring has been entirely left out of the new rules, thus making owners only responsible."

Mr. Davies, Jr.: In this case I should think that B is responsible for the broken drawbar spring. Sec. 23 of rule 5 says what a switching road can charge owuers for. The mere fact of the drawbar spring being omitted in the rules as an owner's defect, in my opinion, has nothing to do with this. If the switching road delivered the owners a car with a broken drawbar spring, it is responsible, unless, of course, it has record of receiving it from connecting line in this way. If it did, it was its place to get a joint evidence card.

Mr. Grieb: I fully agree with this. I think that if no joint evidence card was secured by that helt road, it is proof positive to the effect that the spring was broken while being handled by the switching road. And the rule just quoted (Sec. 23, Rule 5) states very specifically the items for which a switching road can render bill, and the item of springs is not mentioned.

Mr. E. B. Smith: I move that it is the sense of this meeting that the delivering road is responsible for the broken spring.

Seconded.

Mr. Hunt: Rule 5, Sec. 23, says that switching roads will only be allowed to render bill against car owners for the following defects: (Quotes rule.) It don't say that B could repair this spring. It seems to me that B is in for this defect and that he will have to stand it.

Mr. Sharp: I am in favor of the motion that has been put. I think that in view of the fact that it was

left out of the rules, that makes the switching road respousible.

Mr. Wentsel: From the looks of things I guess the switching road is in for it. I do not think there is any use arguing the case.

Mr. Stuckie: A poiut of informatiou. Who broke this spring? Did B break it, or somebody else?

Presideut Morris: In the absence of any informatiou we will have to consider that B broke it.

Mr. Stuckie: Is there any record to show that B broke it?

President Morris: B does not bring any evidence to prove that he did not break it, which is practically an admission that it was broken by him.

Mr. Smith's motion was here put and carried.

Labor Charge for Applying Brake Shoes.

President Morris: Mr. Hunt, you had the questiou up the other day in regard to labor charge for applying brake shoes.

Mr. Hunt: Yes; I would ask, can you charge labor for applying a brake shoe to a car?

President Morris: What is the general custom, you mean, in replacing a missing shoe?

Mr. Hunt: When it is necessary to apply it.

Mr. Wentsel: I take uotice of a great many cars having brake shoes missing, and there is always a charge made for applying a brake shoe.

President Morris: A labor charge?

Mr. Wentsel: Yes; when brake shoe is missing.

Mr. Hunt: On page 32 of the rules, at the bottom, is a note. Now, there is a list of articles which it says there must be no labor charge for. Isn't is a fact that we do not charge labor, either on defect card or otherwise, for a knuckle; and it is in the same category with the rest. Why should we charge for a brake shoe and not for a knuckle; or if we charge for a brake shoe, why uot for a knuckle pin?

Secretary Cook: I think it makes some difference whether a defect card is given with the car or not. In billing on a defect card the other man has the scrap. If you have lost the shoc on your own road and are making the bill, you have the scrap iu lieu of the labor charge. But where you receive a car from connecting line with a missing brake shoe, they have the scrap material and, I think, should pay the labor charge on the defect card.

Mr. Kroff: How would it be if a knuckle was missing? You can get a defect card.

Secretary Cook: I don't see why the same reasoning should not apply in both cases; but where we have one case of a knuckle missing, we have 100 of the brake shoe; so that when we get a knuckle missing we let the labor charge go,—it is not much of an item anyway. But the brake shoes being so numerous, most of us don't feel that we should overlook the right we have to make the labor charge.

Mr. Sharp: I make the motion that the sense of this meeting is that the labor charge is proper if billed on a defect card; and that no labor is to be charged where it is an owner's defect. Secouded.

Mr. Hunt: Take the rule as it reads. If we treat the brake shoe that way, would we not have to treat the other articles in the same manner? Why should we make au exception of the brake shoe; or, in other words, are we not to work this as it reads, or can we fix these things to suit ourselves? The rules are very plain, any way; iu fact it is a note, and it especially says that we shall not do a certain thing.

President Morris: You consider it a violation of the rules to charge labor?

Mr. Hunt: It seems so to me. The note reads: "No charge to be made for labor of replacing or applying M. C. B. knuckles, knuckle pins, locking pins, clevises, brake shoes or brake shoe keys." I think that means just what it says. On page 28 of the Rules it says, "No credit for scrap and no charge for labor shall be allowed in renewing brake shoes."

President Morris: The last refers to an owner's defect and not a missing brake shoe offered in interchange.

Mr. Hunt: That is true; but it does not say anything about it in this note on page 32. (Quotes note on page 32.) There has been a good deal said about charging labor for applying M. C. B. knuckles, and knuckle pins and locking pins, because it takes a little time to apply them. I presume that matter was all talked over, and that they concluded that here are several articles that there ought not to be a labor charge for, and hence this note.

Mr. Davies, Jr.: I take Sec. 4 to read that it is labor only for applying brake beams, including their attachments, such as heads, shoes, jaws and hangers. It would not apply to shoes separately. Missing shoes on a car you can bill the owners for. But if heads are missing, including the beam, charge for labor only.

Mr. Reinhard: I do not see anything iu that rule just cited that says you can make a labor charge for replacing knuckles on a defect card. I think that when a defect card is requested for missing material the labor charge is proper.

Mr. Hunt: Does any body know where labor is charged for knuckles, condition card or otherwise?

Mr. Kroff: We do not charge labor for knuckles or knuckle pins.

President Morris: Do you charge labor for missing brake shoes?

Mr. Kroff: No, sir: we follow up the rules in that note.

Secretary Cook: I would like to ask how far that note at the top of page 28 follows? Does that include all on the following pages? If that is the case, that would settle the question. A missing brake shoe on a defect card would not be an owner's defect. It certainly refers to the first paragraph there, reading, "Whenever scrap credits, etc.," because that refers only to owner's defects there. It seems to me that if that were the case, we might as well follow it all the way through to the bottom of page 32, and in that case the note of "No charge to be made for labor of replacing missing brake shoes" would come in when it is owner's defect. If that is not so, where does this rule stop? I think it goes right through all the succeeding pages.

Mr. Hunt: If that note on page 28 is for owner's defects, then there is only one other condition, that is the other fellow's defects that we find in the note at the bottom of page 32. I think that the note on page 28 simply covers brake shoes and nothing else.

Mr. Gierke: I believe that the allowance for labor charge for replacing missing brake shoes on defect cards is the result of an arbitration case which was decided in May, 1892, which says that a labor charge for missing brake shoes is proper. But the rules have been changed since then, and the note at the bottom of page 32 says very plainly that no labor charge is to be made for missing brake shoes.

President Morris: Can you enlighten us on that, Mr. Barr?

Mr. Barr: I do not feel quite able to enlighten you on that point. My idea is that the note was put there for the reasou that the labor involved in making these little changes is so small that it was not considered proper to make a charge. The labor of replacing a knuckle, aside from getting the key out, is not five miuutes, and the trend of the discussion was in that way—that the time necessary to change a knuckle or brake shoe was so small as to cumber up the bills, and that it was endeavoring to work too fine; that by all roads observing this rule it balances, anyhow, and the attempt to get too fine on these things always leads to trouble. No one thinks of making a one-half hour labor charge, and my impression on the thiug is this: That on these small items it was decided to leave them out of the bills, and no person would suffer by doing so.

Mr. Sharp: In view of these remarks, I would withdraw the motion I made.

Responsibility for Wheels Out of Gauge.

President Morris: Any further remarks on this question? Are there any other questions that any of the members would like brought up for discussion?

Mr. Sharp: I would like to call attention to Sec. 12 of Rule 3, for a little information. It reads, "Wheels loose or out of gauge owners responsible." Is that section meant to cover wheels that are applied by the owners, or would it also cover wheels applied by foreign companies? For illustration: Supposing that repairs are made to a car on account of owner's defect, and that after the car arrives at some terminal the wheels are found out of gauge. Well, suppose that the car has made 100 miles, perhaps been in service a month, yet, when it arrives home the owners find that the wheels are a quarter of an inch or half an inch out of gauge. Under these circumstances, and the construction of this rule, is the owner justified iu declining to pay the bill?

Mr. Showers: I think that case would be covered by a joint evidence card in the way of rebutting repairs. If wheels are applied by a foreign company and car arrives home and you find the wheels are out of gauge, you undoubtedly can procure a joint evidence card for wrong repairs. That will rebut the bill.

President Morris: Is that satisfactory, Mr. Sharp?

Mr. Sharp: Well, not entirely. From the facts of the case I have in mind, a joint evidence card was procured and yet the company making the repairs still contended that they have a right to render bill, and that this section of the rules makes owners responsible for the wheels being out of gauge. The wheels were not loose, were merely too tight.

Mr. Huut: I believe the case is covered by the rules, as Mr. Showers has said. The rules say what the gauge shall be, and when any one puts in a pair of wheels that are out of gauge it certainly is wrong repairs, and a joint evidence card in the case ought to be sufficient record of what the party says who did the work.

Mr. Jones: If there is a repair card on the car showing that wheels were applied, what is the use of having a joint evidence card? All wheels are supposed to be stenciled by the road that applies them.

Mr. Hunt: The joint evidence card is a card showing that wheels are out of gauge. The repair card does not say they are out of gauge, hence we must have the joint evidence.

Mr. Sharp: I would like to get the sense of the meeting on that for my personal information.

Mr. Davies: It would be all right to get joint evidence provided the car returned home. Supposing a party put in a pair of wheels and they were out of gauge and no repair card was attached. The car goes to another road who remove the wheels and bill the owner before car reaches home. That would be another case to look at. If the car came home with a repair card, it would be enough to get joint evidence and refuse to pay the bill; but if car went to some other road with this wrong gauge and they removed the wheels, they would have a right to bill against the owner.

Mr. Hunt: That would be pretty near joint evidence. I think they would be liable.

Mr. Showers: Now I think in case wheels are applied by another company and are removed within a reasonable period a joint evidence card is sufficient to show wheels out of gauge and rebut the bill. In order to get the seuse of this meeting, I would move that where a car, to which wheels have been applied, is received home by the owner, a joint evidence card is proper if wheels are found out of gauge, and that the parties making repairs originally are responsible to the owner.

The meeting here adjourned.

The program for the next meeting, which will be held in the Great Northern Hotel, Chicago, Jan. 12, at 8 p. m., comprises the followiug topics:

(1) A question in interchange between two roads in Chicago will be discussed.

(2) The chief joint car inspectors at their meeting held at St. Louis in Sept., 1898, decided that under Rule 3, section 35 to 43, the owner of a car is responsible for two draft timbers broken at one end of car, the the other end having a combination of defects for which owners are not responsible. It is understood that the damage to both ends apparently occurred at same time. Is this correct?

(3) The joint inspectors also decided that when a car is delivered in interchange with two sills broken and comes back with two additional sills broken, all defects should be considered as belonging to owner. Does the association agree with this?

(4) To what extent can we work compressed air on repair tracks to advantage?

COMMENT BY CAR FOREMEN.

This column is edited by the Publication Committee of the Car Foremen's Association, and the RAILWAY MASTER MECHANIC is not responsible for any of the views expressed therein. Communications and items of interest to car men are solicited. T. R. Morris, chairman.

That the work of the Car Foremen's Association of Chicago is appreciated by those who are in a position to know of the results, is shown in the remarks of Mr. W. E. Beecham, car accountant of the C. M. & St. P. Ry., made at the 14th quarterly meeting of the Central and Western Association of car officers.

In speaking of what the Car Foremen's Association has accomplished in the way of facilitating interchange at Chicago, Mr. Beecham said:

"That association is now but a year old, and the last meeting I attended was held at the Great Northern Hotel some time in the spring; there were over sixty men present; the membership includes superintendents of motive power and others, and had been publicly endorsed by the highest authorities in the mechanical departments. Those men came together and solved problems that vexed them, and it is now a rare occurrence that any car is delayed by reason of the controversies that used to arise on account of the condition of cars. I very often receive a notice from some of our connecting lines, though probably in response to a request that I have made upon them to accept some foreign car, and it generally says: 'We will receive it if it is in good order.' You gentlemen have got nothing whatever to do with the condition of the car, no more to do with it than Marshall Field has. The mechanical department has decided that for you. It will not be received unless it conforms to their rules and regulations, which is perfectly proper and correct. Now that has done away with a great many of the difficulties that confronted us in handling cars at large terminals; in fact I must say it has removed all the difficulty, for we never have anything further to complain of. These men came together, they discussed these matters, and one thing that they did come to a conclusion about was individual interests of railway companies can be much better protected by acting together and taking care of the mutual interests than they can be by each and every railroad going on its own hook. That is one result of the work of this committee. I think that we can bring about this same state of affairs at other places. We can ask the General Foreman, the joint inspectors and others to take part in these proceedings, and try to encourage them in the belief that by working together they will serve the interests of the roads they are employed by."

Communications.

One of the Difficulties of Inspection.

To the Editor:—

One of the things the inspector has to contend against now-a-days is the pressed-steel truck. It is very hard to find defects in wheels in this kind of truck, as the truck side or channel bar that extends from one oil box to the other covers at least one-half of the wheels.

We can examine a little more of the wheel if we

have time to get down on our hands and knees and put our heads underneath the truck. But we stand a chance of having our days of usefulness as a car inspector brought to a close by having our head separated from the rest of our body.

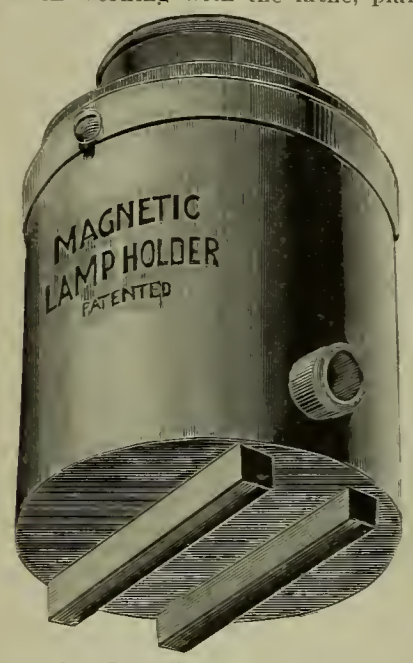
I had a case lately where I missed a seamy wheel on a car with one of these steel trucks. I am sure I gave this car a good inspection; in fact, I always take pains to give all these cars a close going over, but I missed this wheel. Afterward the piece broke off and the car got off the track, but as luck would have it no serious damage was done, as the accident happened in the yard. But it goes to show that we can expect more trouble in the future from this cause.

Most of these cars with steel trucks are pretty new, and as soon as the wheels begin to wear out we are going to have trouble. In order to protect myself, I am going to give all cars with steel trucks a very close inspection, especially the wheels, and I would advise all other inspectors to do the same.

Inspector.

MAGNETIC LAMP HOLDER.

The electric lamp holder shown herewith is intended for use where a portable light is used, as in engine and boiler rooms. When the current is on the holder becomes a magnet and will therefore adhere to any piece of iron or steel in any position. It is very useful in machine shops, as it can be so placed as to have the light shine exactly where wanted when working with the lathe, planer, drill



and other tools. In boiler shops its use does away with torches, as it can be carried inside the boiler. In railway shops it is particularly useful when repairing locomotives, as its position may be changed at will, and it will be found useful in many other ways about the shop. The holder is offered by Jenkins Bros., the packing and valve makers, of 71 John street, New York.

TREATMENT OF HOT JOURNALS--HAS A CURE BEEN FOUND?

Ever since railways were built the question of hot journals has been one which at times has puzzled the oldest and most experienced operators. The causes are numerous; the effective remedies have been few, if any. All kinds of lubrication have been used, in most cases with varying success. Forty years ago many baggage and caboose cars carried as a remedy for hot journals three boxes, one containing sifted hard wood ashes, another beeswax, another tallow. Where a journal was excessively hot cold water was applied until the journal was cooled sufficiently so that these three substances could be mixed in the box and melted together by the heat from the journal. The first hot box compound made exclusively for this purpose was, we are informed, these three ingredients melted together. This was before the days of petroleum and when whale oil was in general use for lubricating purposes for cars. In the early days journals were usually 3x6 and trucks were generally rough. Where this compound was used, as soon as the journal was cool, the packing had to be pulled out and replaced with waste and oil. In recent years petroleum product having entirely superseded the old whale oil and the 3-in. journals having been replaced by those of 4 and 4½x8, and both journals and brasses having been greatly improved, it would seem that the number of hot journals ought to have been very much reduced; but they still continue to delay trains and cause any quantity of trouble.

A great majority of hot journals commence heating at the shoulder. This is particularly the case on crooked tracks. The men who apply oil to car journals are not particular enough to get the lubrication back to the shoulder when the journals are packed. Defective dust guards also have very much to do with causing this trouble.

A new lubricating oil known as Champion fireproof car oil has during the past year come into use on many of the railways in the northwest, and reports from operators demonstrate the fact that in at least 90 per cent of the cases where this oil has been applied as a remedy for hot journals it has been successful, and enables the train men to cool the journals while the train is running, without delay, by simply applying the oil to the journal without any change of packing. In thousands of cases red-hot journals have had this oil applied, without using water, and the train goes on, and, after a run of from 10 to 20 miles, the journal has been found practically cool and without injury.

In some cases, where filled brasses are used and where the babbit has been found melted out, the car has been jacked up, a new brass put in and, without applying any oil to the journal to cool it, the brass has been let down onto the red-hot bearing and in a few minutes, of course, the babbit is melted out again. If the train man had simply poured the oil from his can onto the red-hot journal, allowing the oil to run off into the waste in the box, in two or three minutes, it is claimed, the journal would be sufficiently cool so as not to melt the babbit; then the train could go on and the journal would cool in motion and the trouble be over.

The Chicago & Northwestern, St. Paul, Minneapolis & Omaha, Northern Pacific, Illinois Central and other roads have made very thorough tests of this oil as a remedy for hot journals, and where it has been used with intelligence it has in nearly all cases proved successful. It is not manufactured with a special reference to curing hot journals, but more especially to prevent them. It is, as its name implies, a car oil.

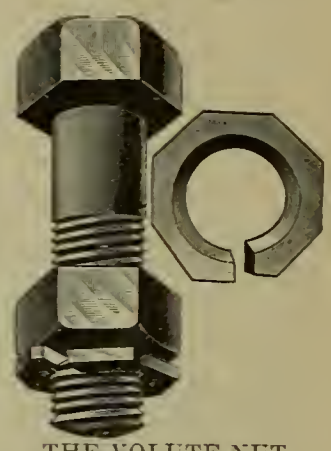
The Freeport train on the Chicago & Northwestern road has been packed with this oil and has run nine months. This train doubles 122½ miles every day, making 14 stops each way; the time is three hours; the average distance between stops is 8 miles; the average speed of this train between stations is about 55 miles per hour. The train has now run somewhere near 70,000 miles. The present cost of lubricating this train of 3 cars, each 12 wheels, is, we are informed, about 8½c per thousand miles, without a hot journal on the train for more than four months. These figures would seem to indicate that the cost of lubrication of 8 wheel passenger equipment with the use of this oil would be under 6c per thousand miles.

To say nothing about the merit of this oil, however, as a lubrication for car journals it is worthy the attention of every railroad operator in the country not only as a preventive but as a remedy for hot journals. The application of water to a red-hot journal changes the character of the surface, renders it almost as hard as a file and causes the journal to throw off from the surface small scales about the size of the head of a pin, leaving the surface rough and uneven, and the journal brittle and dangerous to run. It has been clearly demonstrated that the application of this oil to red-hot journals does not in any way injure them. They are left as smooth and in as good condition after being heated red and cooled with this oil as they were before. Consequently the saving in journals alone might be expected to a great deal more than pay for the cost of lubrication.

Under date of the 30th of August, 1898, Mr. S. Sanborn, general superintendent of the Chicago & Northwestern, writes the Champion Oil Company as follows: "Yesterday I came in from Clinton with the president and general manager, special running at the rate of about 50 miles an hour. When we arrived at Geneva we had a hot journal on the tank truck of our engine (when I say hot it was red hot). We took out the brass, put in another one which the engineer had on his engine, and which was a very imperfect one, but the only one that would fit the engine, and packed it with Champion oil. When we arrived at West Chicago, six miles, I stopped and had a little more oil applied. When we arrived at Chicago the box was as cool as any on the train. I consider this a very severe test for your oil, and judging by the manner in which it worked yesterday I cannot speak too highly in its praise."

THE VOLUTE NUT LOCK.

The nut lock shown in our engraving possesses the very essential features of simplicity and effectiveness; the first is plainly apparent and the second has been amply demonstrated in severe practical service and over long periods of time. It is not an ordinary spring washer set back of the nut; but it has a wedge-shaped edge which follows the thread of the bolt, and is applied to the threaded bolt in front of the nut, and is turned up until it hugs the latter. Its holding power is gained through its peculiar construction. It will be noted, by referring to the small figure of the separate lock, that the latter is not made in a true circle but has a volute drawing in at the last quarter. The lock will start on the bolt easily, but when drawn around to the third quarter it commences to bind on the bolt. In practice it is turned up on the bolt until it just fairly hugs the nut, but no more. The locking is absolute; the holding power is positive, and it is impossible, when once adjusted, for the nut to move a particle. By the use of this lock jaw nuts and cotter pins may be entirely dispensed with: and moreover, there is effected a saving of from two to three inches in the length of bolts. It is made of tempered steel, and for any size of bolt used. It can be applied or removed from any bolt without injuring the thread. This nut lock has successfully undergone the severest tests on locomotives, cars, bridges, frogs and track. It is sold by the Volute Nut Lock Co., of Fort Wayne, Ind.



THE VOLUTE NUT LOCK.

The coal car equipment of the old Philadelphia & Reading Railroad Company consisted originally of cars holding about 4½ tons each. These constituted the majority of the coal cars until 1873, and their construction did not wholly cease until 1884. In 1873 a car carrying 10 tons was introduced and became the standard car, the number of these cars in use from 1873 to 1881 exceeding those of all other coal cars. The last of these cars was built in 1876. In 1881 a car with a capacity of 16 tons was adopted as the standard, but its manufacture was discontinued after a few years. Since 1887 no coal cars have been built of less capacity than 25 tons, and since 1893 all the coal cars built have been of 35 tons capacity. All these classes of cars of less than 25 tons capacity have proved too weak to stand the strain of moving in such trains and at such speeds as are necessary to-day, and all those of less than 16 tons capacity have practically disappeared from the road.

Another relic of the early days of locomotive building is to be placed in Darlington Station, near to "No. 1," which was built in 1825. The engine, says the Railway Herald of England, is the Derwent, No. 25, which was built by Mr. Alfred Kitching, of Darlington, 1837. It was exhibited at the Jubilee Exhibition at Newcastle, in 1887. The engine has outside cylinders, and the door of the furnace is at the chimney end, the fireman standing on a small bogie tender containing the supply of coal. This was placed in front of the engine, while behind the boiler was the water tank. The Derwent was bought from the old Stockton & Darlington Railway Company by Messrs. Pease, and was employed in drawing their colliery traffic in the Crook district, but since the Newcastle Exhibition has not worked. Messrs. Pease have recently given the engine to the North Eastern Railway Company, in order that it may be preserved like No. 1.

PERSONAL.

Mr. J. H. Goodyear, chief clerk in the office of the master mechanic of the Chicago Great Western, has accepted a responsible position with the Buffalo & Susquehanna Railroad and will assume his new duties Jan. 7. Mr. Goodyear commenced his railway career as a telegraph boy when 13 years old, and was thereafter operator, ticket agent, freight agent, traveling

station agent and auditor and chief clerk to general superintendent—this service covering a period of 14 years spent in England and France. In 1893 he came to the United States, becoming machinist's helper on the Chicago Great Western, on which road he was afterward clerk and finally chief clerk in the motive power department. Mr. Goodyear is a well-known contributor to the railway press, and his many friends will wish him well in his new connection in the East.

Mr. Ernest Galbraith has been appointed master mechanic of the Black & White River Railway shops in Brinkley, Ark.

Mr. J. T. Stafford has been appointed assistant master mechanic of the St. Louis, Iron Mountain & Southern, with headquarters at Baring Cross, Ark.

Mr. Howard Curry has been appointed road foreman of engines for the main line and branches of the Northern Pacific east of Mandam, N. D.

Mr. B. Johnson has been appointed master mechanic of the Atchison, Topeka & Santa Fe shops at Topeka, Kan.

Mr. A. C. Robson, master car builder of the Lake Shore at Buffalo, N. Y., has resigned.

Mr. T. H. Yorke, heretofore foreman of the Chicago Great Western machine shops at South Park, Minn., has been appointed division master mechanic of the Southwest division of that road, with headquarters at Des Moines, Ia.

Mr. John Vance has resigned as foreman of the car department of the Michigan Central, and is succeeded by M. F. Campbell.

Mr. L. Dawson has been appointed master mechanic of the Illinois Central at Macomb City, vice W. B. Baldwin, deceased.

Mr. Ethelbert E. Jenks has been appointed foreman of the Atchison, Topeka & Santa Fe shops at Pueblo, Col., vice H. E. Clucas.

Mr. S. J. Dillon, heretofore foreman of the erecting shops of the Pennsylvania at Jersey City, has been appointed general foreman of passenger car repairs at that point.

Mr. W. Snodgrass has been appointed general foreman of the Lake Shore & Michigan Southern car shops at Cleveland, Ohio, vice Mr. O. Antz, transferred.

Mr. George W. Mudd, master mechanic of the Wabash at Springfield, Ill., has been appointed master mechanic at Moberly, Mo., in place of Mr. George S. McKee, who is transferred to Fort Wayne, Ind., to succeed Mr. C. H. Doebler, who is made master mechanic at Springfield. Mr. McKee will also have supervision of the Buffalo division.

Mr. P. J. Harrigan, general foreman of the Baltimore & Ohio shops at Connellsville, Pa., has been appointed master mechanic of the middle division of that road, with headquarters at Cumberland, Md., vice Mr. D. C. Courtney, resigned.

Mr. J. F. Bowden has been appointed general foreman of the Baltimore & Ohio shops at Trinidad, near Washington, D. C., in place of Mr. J. E. Hobbs, assigned to other duties.

Mr. D. C. Courtney has resigned as master mechanic of the middle division of the Baltimore & Ohio at Cumberland, Md., to accept a position with another road.

Mr. David Witherspoon has been appointed general foreman of the Baltimore & Ohio shops at Connellsville, Pa., in place of Mr. P. J. Harrigan, promoted.

Mr. Mord Roberts, master mechanic of the Arkansas division of the St. Louis, Iron Mountain & Southern at Little Rock, Ark., has had his jurisdiction extended over the Missouri division, with headquarters at DeSoto, Mo., following the resignation of Mr. W. H. Harris, heretofore master mechanic of the latter division.

Mr. William T. Moore, formerly for many years master mechanic of the Pittsburg division of the Pennsylvania Railroad, died at his home in Sewickley, Pa., December 1, at the age of 74 years.

Mr. H. T. Bruck, master of machinery of the Cumberland & Pennsylvania, has been given the title of superintendent of motive power.

Mr. J. R. Reniff has resigned as master car builder of the Lake Shore & Michigan Southern at Norwalk, Ohio, and the position has been abolished.

Mr. M. F. Egan has resigned as superintendent of motive power of the Union Pacific, Denver & Gulf.

Mr. Patrick Stack has been appointed foreman of the Union Pacific shops at Laramie, Wyo.

Mr. J. T. Stafford, heretofore general foreman of locomotive repairs of the St. Louis, Iron Mountain & Southern at Baring Cross, Ark., has been appointed assistant master mechanic of that road, with headquarters at that point.

Mr. W. B. Bates has been appointed master mechanic of the shops of the St. Louis, Iron Mountain & Southern at Memphis, Tenn.

Mr. Benjamin Johnson, for several years in the employ of the Westinghouse Air Brake Company as their air brake expert on the Santa Fe, has been appointed master mechanic of the Santa Fe general shops at Topeka.

Mr. W. M. Paul has been appointed master mechanic of the Wabash shops at Tilton, Ill., in place of Mr. G. J. De Vilbiss, transferred to Peru, Ind.

Mr. Wm. Stretton, foreman of the Chicago, Rock Island & Pacific roundhouse and yards in Phillipsburg, Kan., has resigned and is succeeded by Chas. Holtz.

Mr. John Butler, foreman of the La Junta back shops of the Atchison, Topeka & Santa Fe, has gone to Pueblo, where he takes the foremanship of the Santa Fe shops at that point, made vacant by the promotion of H. E. Clacas to the position of master mechanic. Charles Little takes the position made vacant by Mr. Butler's promotion.

Mr. E. B. Schnicker has been appointed machine foreman in the machine shop of the Chicago, Indianapolis & Louisville at Lafayette, Ind. He will act as assistant to General Foreman Frank J. Wiukels.

Mr. John E. Wootten died Dec. 16 at Philadelphia, aged 75. Mr. Wootten was born in Philadelphia Sept. 22, 1823, entered railroad service July 1, 1845, and spent all of his active life in the service of the Philadelphia & Reading Railroad, becoming general manager of that railroad January, 1877, which position he held for about ten years. Up to 1873 he was occupied almost continuously in the motive power and mechanical department, but in January of that year he became general superintendent of the road. As an engineer he made a great mark on locomotive practice, having invented and designed many things. The most important of his designs is probably the Wootten firebox, which is in wide use and which is familiar to all of our readers.—Railroad Gazette.

Mr. H. C. Woumbledorf, formerly car foreman of the St. Louis Southwestern, has been appointed foreman of car inspectors over the entire line of the Texas Pacific, with headquarters at Marshall, Tex.

On the Union Pacific, J. H. Manning, master mechanic at Omaha, Neb., has been transferred to Cheyenne, succeeding T. A. Davies, transferred. M. K. Barnum, of North Platte, Neb., succeeds Mr. Manning at Omaha, Neb. Mr. Davies will have charge of the mechanical department at Ogden, Utah. W. R. McKeen, Jr., has been appointed master mechanic, succeeding M. K. Barnum, with headquarters at North Platte, Neb.

Mr. F. M. Gilbert, lately connected with the National Electric Car Lighting Co., has been appointed engineer of tests of the Northern Pacific; he will also have charge of all the electrical work on the line.

Mr. J. R. Groves has been appointed master mechanic of the Kansas Midland division of the Kansas City, Pittsburg & Gulf, with headquarters at Wichita, Kan., vice C. A. DeHaven, promoted.

Mr. A. E. Bouldridge has been appointed master mechanic of the Southern at Louisville, Ky., vice J. B. Gannon. Mr. Bouldridge was heretofore general foreman at Atlanta.

Mr. George F. Gardner, traveling engineer of the Pittsburg Locomotive Works, and formerly master mechanic of the Columbus, Sandusky & Hocking, died Dec. 9 at Eldorado Springs, Mo., where he had gone for the benefit of his health.

Mr. George P. Hodgman, who has been in charge of the erection of locomotives at the Baldwin Locomotive Works for two years past, died in the United States of Colombia on Nov. 29, where he went in October last with a locomotive built for the Cauca Railroad. The particulars of his death are not yet known here. Mr. Hodgman was the first person to pass through Stevens Institute on the Master Mechanic scholarship, and he graduated from that school in 1894. Before entering Stevens, he spent a few years in locomotive shops, studying the details of engine design, and the best methods of handling machinery in the shop. His graduating thesis, treating of the relative merits of of electric and shaft drive, was probably one of the most complete and careful analyses of this problem, based on careful tests, that have been undertaken. His father, Mr. Samuel A. Hodgman, was formerly superintendent of motive power of the Philadelphia, Wilmington & Baltimore.—Railroad Gazette.

Mr. James Gray has been appointed foreman of the locomotive and car shops of the St. Louis, Iron Mountain & Southern at Mer Rouge, La.

Mr. Wm. Hamilton has been appointed traveling engineer of the eastern and middle divisions of the Atchison, Topeka & Santa Fe, vice W. R. Scott, promoted to be trainmaster of the Gulf, Colorado & Santa Fe at Cleburne, Tex.

Mr. J. G. McPherson has resigned as foreman of the St. Louis, Iron Mountain & Southern at De Soto, Mo.

Mr. Charles Treble has been appointed foreman of shops of the Daytou & Union.

Mr. Jackson Richards, general foreman of the Columbus, Sandusky & Hocking at Columbus, O., has resigned to engage in the sale of his boiler compound. His headquarters are now at 920 Mt. Vernon street, Philadelphia, Pa.

The New York Railroad Club has elected officers for the ensuing year as follows: President, H. H. Vreeland; first vice president, C. M. Mendenhall; second vice presideut, Samuel Higgins; third vice-president, D. B. McCoy; treasurer, C. A. Smith. Executive committee: W. W. Suow, Geo. W. West, A. E. Mitchell; Finance committee, R. M. Dixon, D. M. Brady, C. S. Henry.

Mr. LaMott Ames, for many years master mechanic of the Beech Creek Railroad, is now connected with the Brown Company, Ltd., of Rochester, N. Y., which manufactures Brown's boiler compound.

SUPPLY TRADE NOTES.

—The Falls Hollow Stay Bolt Co.'s safety hollow stay bolts have been specified for the locomotives being built for the International & Great Northern R. R. by the Rogers Locomotive Works.

—William Yerdon, manufacturer of Yerdon's improved double hose band, is gaining many new customers. These bands securely fasten the hose to the coupling. The toughness and pliability of the metal from which they are made allows of their being used many times, so that one set of bands will outwear many lengths of hose. These bands are in use by a very large number of leading railroads and rubber companies of the world.

—The Curtis & Co. Mfg. Co., of St. Louis, is furnishing the Madison, Ill., Car Wheel Works of the Missouri Car & Foundry Co. with a complete overhead trolley system to be operated by compressed air.

—The Page woven wire fence was awarded the gold medal at the Trans-Mississippi and International Exposition at Omaha.

—The J. A. Fay & Egan Co., manufacturers of woodworking machinery, of Cincinnati, Ohio, has sold its Chicago branch store to the firm of Manning, Maxwell & Moore, of New York City. The Fay & Egan Co. has represented some of the best firms in the United States at this Chicago branch, but, being exclusive manufacturers of wood work and machinery, thought it best to discontinue selling other people's products with its own, which was the special business of the Chicago store. The Fay & Egan Co. has appointed Manning, Maxwell & Moore its exclusive sales agents for Chicago territory for all of the woodworking machinery of both J. A. Fay & Co. and the Egan company departments.

—The Atchison, Topeka & Santa Fe reports the A. & M. brake shoes to have given a service of 15,000 miles without pereeptible wear on tires and to have given nearly double the braking power of cast iron shoes. These shoes were made without the hardest chills. An A. & M. shoe is reported to have given a service of 17,500 miles on a B. & O. locomotive; this shoe was made with six inserts of composition and five of hard iron. The average life of a cast iron driver shoe on this same run is, we are informed, 9500 miles, with much greater tire wear and less braking power.

—The Harrison Dust Guard Co., of Toledo, Ohio, has equipped during the past six months some 7800 new cars with its dust guards. These cars comprise parlor, mail, baggage, passenger, gondola, box, flat, and refrigerator cars. The dust guard has also been applied to locomotive tenders. The Harrison dust guards are specified on 1000 steel 100,000-lb. capacity cars being constructed by the Schoen Pressed Steel Co. During the month of December three orders were filled for the Southern Ry. Co. for 500 cars being built by the Ohio Falls Car Co. One hundred guards were also furnished for the Michigan Central R. R. Orders were also filled for the following roads: Lake Shore & Michigan Southern, Jacksonville, Tampa & Key West, Detroit & Mackinaw, Chicago, St. Louis & St. Paul, Chicago, St. Louis & Peoria, and Union Pacific, Denver & Gulf. The Harrison Dust Guard Co. is not only filling orders for 100 of the leading roads, but has also in the past six months shipped thousands of guards to 15 different car manufacturing concerns.

—Mr. T. W. Snow, who, for many years, has been connected with the U. S. Wind Engine & Pump Co., has taken charge of the Chicago branch of the Otto Gas Engine Company, and will also manage the railway department of the company and also that of the U. S. Wind Engine & Pump Company throughout the United States. Mr. Snow has the record of a successful man, and these very important interests will be in the best of hands.

—The Cleveland Twist Drill Company, Cleveland, O., is building a large addition to its plant—a three-story steel framed structure, 40 by 280 feet, in dimensions. When this building is completed much of the machinery in the present buildings will be shifted to the new one, and the whole plant will be rearranged to secure a still more economical handling of material and work. The growth of this enterprise has been steady and sound, and it is now one of the notable concerns of this country.

—"Security Lock Brackets" have recently been ordered of the Chicago Grain Door Company for the 1,000 Wisconsin Central box cars about to be built by the Michigan Peninsular Car Company.

—The Weber Rail Joint Manufacturing Company, of New York, announces that on December 15 it will remove from its old offiees in the Cotton Exchange Building to the Empire Building, No. 71 Broadway, rooms 1813-1816.

—The American Brake Shoe Co. sold over 10,000 "Diamond S" brake shoes in November, and the sales in December were over 15,000. The company's business abroad is growing rapidly, and Messrs. Taite & Carton, 63 Queen Victoria street, London, E. C., the selling agents for this shoe in Great Britain, have issued a very handsome catalogue for the foreign trade.

RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor

EDWIN N. LEWIS, Manager.

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In our January issue, we printed a communication from "Inspector" on "One of the Difficulties of Inspection." We also, in our editorial columns, made some comments on "Inspector's" communication, to which comments "Inspector" has taken some exceptions. On another page of this issue, we print "Inspector's" second communication. While it is true that "Inspector" did not use the word "convenience" in his first communication, he implied that by proper care, a very close inspection of the wheels under cars having trucks of the plate or channel type, can be made. This we think is evident. It is of course out of the question to consider the moving of cars in the inspection yard, in order to bring any part of the wheels into exposure for inspection, and this is not necessary. By simply leaning towards the wheel, getting the head under the car, so that a view can be obtained between the wheel and the truck frame, every part of the wheel can be inspected, and this care we feel is very little more than should be used in any case. We think that "Inspector" has somewhat overstated the actual conditions, when he says that a plate or channel bar truck covers at least one-half of the wheels. It is true that some forms of plate or channel bar trucks cover more of the wheels than other forms do, but it can be shown that even in the most aggravated case, the wheels are not half concealed by the truck frame, and in one well known form of plate truck, scarcely a third of the wheels are concealed. In this last form, the rim and tread of the wheels are fully exposed for more than two-thirds of their circumference, and the other third can be seen by "Inspector" by simply putting himself in a position to see over and down between the wheels and the truck frame. However, "Inspector's" first communication brings a charge against a type of truck which is rapidly growing in favor, even on the most conservative roads. There must of course be some good reasons for this growth. We think the comparison between the types of trucks must be determined on the rule of averages, that is, which of two or more types of trucks possess the greatest number of good features, and which possess the greatest number of radically objectionable features. This latter comparison we think is in line with "Inspector's" criticism of the type of trucks he names. The question is, can the actual difficulties of inspection in these types of trucks be considered radical objections to the type, sufficiently so to warrant their discontinuance? We think not. A matter which has an important though indirect bearing on "Inspector's" contention, is the growing improvement in the quality of wheels, making the presence of defects less and less numerous. Our columns are open to "Inspector" or others who may think well to further debate this important matter.

REFERENCES are made from time to time as to what is the best and cheapest method to pursue in putting titles on drawings. It is quite generally agreed that the mechanically made titles, those made with right line pen, square and compasses, belong to history, or should, and that in the absence of a better and quicker method, free hand work does very well and is really quite acceptable if well done; but unless done by one man it is not likely to be uniform. The best method will depend partly upon the kind of material on which the drawing to be titled is made; if upon bond paper probably the ordinary rubber stamp and the ink usually used with it will answer very well, but for tracing cloth, such ink will not be sufficiently opaque to give a sharp outline on the print. If the rubber type is used with printers' ink it is necessary to clean the type with gasoline or similar liquid, and these injure the rubber. It is difficult, also, to get an even impression with a rubber stamp. Stencils have been, and are, quite commonly used and with a little experience are manipulated quite rapidly.

Another method, and one which has not been generally used, is to use a printing press; a small hand press is sufficient and two or three sizes of type will be found to answer all purposes. The advantages of this method are, uniformity in the lettering, the saving in time, the even impression and, by the use of the proper ink, a very distinct title. If printers' ink is used on tracing cloth a dryer, in the form of fine absorbing powder, should be sprinkled over the freshly printed title, and then prints may be made from it immediately if care is used not to rub the ink too hard. The metal type can be easily kept clean with gasoline and a small brush. An apprentice quickly learns how to set the type and how to do the setting quickly.

THE RELATION OF POWER TO SPEED.

It is obvious that the primary limit of the power of a locomotive is the capacity of the boiler to supply steam, and, therefore, before providing methods for distributing the steam to the cylinders the steam must first be generated. Knowing, approximately, the amount of steam required, the amount of water to be evaporated is ascertained and from this the amount of coal to be consumed is known. These items fix the grate area and heating surface required, provided, of course, other limiting features may be disregarded. The necessary amount of steam being provided, it is readily conducted to the steam chest, and from this point to the tip of the nozzle the manipulation of the passages and of the apparatus used to alternately open and close the passages will determine the power developed in the cylinders if the other factors are considered constant. Given a certain engine, either mounted upon wheels, as a locomotive, or anchored on a foundation, the only two variables in the formula giving the conventional power are the number of revolutions and the average effective pressure in the cylinder.

Applying this directly to locomotives, the question now being somewhat agitated is: has the valve gear, including the valve, and the steam passages in the cylinder casting of the average locomotive of today, or of a particular build of locomotive, approached nearer to, or, indeed, reached such perfection in design that at a fixed cut off the power developed in the cylinders varies directly as the speed? It would certainly be extremely gratifying to locomotive designers were it possible to answer the latter part of the question in the affirmative; it is of great credit to them that the first part of it can be so answered and with considerable emphasis.

To assume that the power varies directly with the speed is to assume perfection in the valve motion and there are many designers who are not willing to allow their actions to be governed by such assumption. In order that the mean effective pressure may vary directly with the speed it is just as essential to get rid of the steam through the exhaust ports with the same proportionate rate for the various speeds as it is to get the steam into the cylinders in a correspondingly increasing rate. Indicator cards have been submitted as evidence that such perfection has been reached, and it must be admitted that although it might require a quite close inspection to find much difference in the steam line, a more casual observation, however, will show a marked difference in the back pressure and compression lines.

It is hardly decisive to select from two sets of cards taken at the same cut-off but at different speeds, those which would indicate the conclusion which it is desired to prove; the cards at the higher speeds may be those taken at the most favorable instant, whereas those selected from which to calculate the power at the slower speeds may be taken at a less opportune time, and the position of the main axle with reference to the frame may be such as to affect the valve motion, or other causes may affect individual cards. If such important deductions are to be named from such uncertain data, there must be such an overwhelming amount of it as to leave no question. This does not seem to be the case in so far as demonstrating that the valve gear has reached such perfection that the power will vary directly as the speed.

CHEAPEST FUEL THE MOST ECONOMICAL.

The paper presented at the December meeting of the Western Railway Club giving the results of tests conducted by Mr. Wm. Garstang and Professor W. F. M. Goss to determine the relative cost for fuels of different kinds used in locomotive service will be of great value to those who are interested in making fuel "records" or who are responsible for following such records. The paper will emphasize at once the fact that the prevailing practice of keeping coal records on the pound-ton-mile basis is no more correct than in keeping such records on the pound-car-mile basis.

The paper shows that the fuel which costs the least per ton is the cheapest fuel to use and railway managers, whether understanding this apparently proved fact or not, have certainly been acting in accordance with such facts and each succeeding year renew their efforts to purchase fuel at a lower cost per ton. The result is that each year the mechanical department is furnished with a poorer quality of fuel and then its seat is uncomfortable if the records do not show a reduction in cost on the pound-ton-mile basis. It is a question whether the price per ton cannot be reduced to such an extent as to insure fuel which, while cheapest per ton, yet will cost more finally on even the cent-ton-mile basis and it would be extremely valuable information to know just where the limit is.

Generally the coal records are kept on the basis of so many tons hauled so many miles for so many pounds of coal, but if the quality of the coal is decreasing on account of the decreasing cost per ton then it would be fair to expect an increase in the number of pounds necessary to haul a ton a mile, but it is the unfair expectation which is insisted upon. It would be entirely fair to give the mechanical department the advantage of any decrease in price by keeping the records on a cent-ton-mile basis and from year to year decrease the accounting price uniformly with the contract price.

Perhaps one of the most instructive tables of the paper is the one showing the spark losses in percentage of total fuel supplied to the firebox; the amount varies from 13.8 per cent. with heavy coal when forcing the boiler to evaporate 10 lbs. of water per foot of heating surface per hour, to 21.2 per cent in the case of the lighter coals under the same conditions of evaporation. Further, of the amount shown by spark losses only 25 per cent has been consumed. It is quite possible, however, that more ash was carried over from the light fuel and that, therefore, there was a waste of less than 75 per cent of the 21.2 per cent of apparent loss. It is extremely interesting to note that tests conducted for a similar purpose some years ago indicated, also, that the cheapest fuel is the most economical.

HELD NEGLIGENCE NOT TO ADOPT SELF-COUPLERS FOR FREIGHT CARS.

Six years ago the supreme court of North Carolina said that it thought that the time had arrived when railroad companies should be required to put on all passenger cars some improved coupler which would obviate the necessity under any circumstances of going between the ends of cars in order to fasten one to another. It also prophesied that the day would soon come when it would be negligence not to attach them to freight as well as passenger cars.

That day, the court recently held, in the case of Greenlee against the Southern Railway Company, has come. This was an action brought to recover damages for personal injuries. The plaintiff, it appears, was, through the alleged negligence of the defendant company, his employer, injured while coupling freight cars and suffered the loss of an arm. In any aspect of the case, the court holds the railway company liable, whether the plaintiff was or was not guilty of contributory negligence; for the negligence of the company in not having self-couplers, and in sending a man to couple cars at all, was a continuing negligence, which existed subsequent to the contributory negligence, if there had been any,

of the plaintiff, and was the proximate cause—the causa causans—of the injury.

In support of this radical, and apparently pioneer decision, the court calls attention to the action of Congress in requiring self-couplers and air brakes to be placed on all cars, freight as well as passenger, by January 1, 1898, and that this had been complied with as to over 60 per cent of the freight cars, besides nearly all passenger cars, operating in interstate commerce by that date. That the railroad companies had procured from the interstate commerce commission an extension, until January 1, 1900, of the time by which self-couplers should be placed upon all freight cars used in interstate service, the court says was for their accommodation, and did not and could not relieve them from legal liability incurred for injuries caused by their failure to provide "suitable appliances in general use" where the use of such would have prevented the injury. It only relieved them from the penalty provided in that act.

It also quotes figures from the eleventh annual report (1897) of the interstate commerce commission, showing that, of railroad employes (leaving out passengers altogether), 1,861 were killed and 29,969 were wounded in the year ending June 30, 1896, being greater loss than in many a battle of historic importance. But, of these casualties, it appeared that 229 were killed and 8,457 were wounded in this single particular of coupling and uncoupling cars. Now if, after the corporations, on their own motion, or under compulsion of congressional action and judicial decision, have adopted self-couplers on the passenger cars, and on over 60 per cent of the freight cars, by which many thousands of lives and bodies must have been saved, there should still nearly 9,000 men be killed or wounded in one year coupling and uncoupling the freight cars which up to June 30, 1896, still required the protection of self-couplers, this, the court considers, is the highest proof of the duty of the courts to enforce liability for failure to provide self-couplers in every case where an injury occurs from that cause. In other words, that nearly 9,000 men should still be killed and wounded in one year for failure to furnish appliances which are so widely in use, and which would entirely prevent such accidents, it thinks, points out the duty of the courts. And, it declares, the courts will be very derelict in their duty if they do not enforce justice in favor of employes as well as the public.

Nor does the court consider the fact that the plaintiff remained in the company's service knowing it did not have self-couplers was any defense. If that were a defense, it says, no railroad company would ever be liable for failure to put in life saving devices, and the need of bread would force employes to continue the annual sacrifice of thousands of men. But this, it insists, is not the doctrine of "assumption of risk." That is a more reasonable doctrine, and is merely that when a particular machine is defective or injured, and the employe knowing it continues to use it, he assumes the risk. That doctrine, the court holds, has no application where the law requires the adoption of new devices to save life or limb (as self-couplers), and the employe, either ignorant of that fact, or expecting daily compliance with the law, continues in service with the appliances formerly in use.

In conclusion, the court affirms the decision of the lower court, and says that the defendant, after notice of the act of congress, and also from the general adoption of self-couplers, that it should use them, was guilty of negligence in failing to do so. The injury to the plaintiff could not have occurred save for the failure of the defendant to comply with its duty in this regard, and the court below should have held it liable to the plaintiff upon the defendant's own evidence.

Mr. Justice Furches appends a dissenting opinion, in which Faircloth, C. J., concurs. This, he explains, was written as the opinion of the court: but, after it was written, the court having changed its opinion, he files it as his dissenting opinion. Even this opinion ends with the threat that railroads would soon have to get and use more modern and safer appliances, or answer for damages caused by the lack of them.

A suggestive communication appears elsewhere in this issue on the subject of insulating covers for locomotives. The writer directs especial attention to the advantages which may be gained by properly lagging the locomotive tank. He bases his propositions upon the results obtained by properly protecting the boiler and other parts of the locomotive, and upon the advantages known to be derived from heating the feed water in the tank. In connection with this latter feature he quotes some experiments made by Mr. J. D. Barnes on the Wabash Ry. in which a saving of six per cent in fuel has been made by heating the water in the tank from 50 to 105 degrees. The covering of locomotive tanks in the way and for the purpose suggested by our correspondent is not half a bad idea. It would, for one thing, as the writer states, relieve master mechanics from much anxiety about the blistering of paint on their tanks; and it would at the same time lead to a more general and more effective utilization of waste steam in the heating of water in the tank.

NOTES OF THE MONTH.

Recent sensational reports in the newspapers regarding injury to track caused by the hauling of a "dead" engine over the Wabash Railway at high speed led the Railway Review to make inquiry concerning the matter. That paper has from an official source the following particulars: An engine with side rods disconnected was hauled over the road in a freight train at a too high rate of speed, the result being that 772 rails were so badly surface-bent as to have to be removed, and 10 of the rails were broken. The engine which did the damage has 56-in. drivers and the train was running at a speed of from 40 to 45 miles per hour. The depressions or "kinks" were nearly all from the outside of the head of the rail, showing that the engine gave a blow diagonally downwards and inwards. The rail weighs 63 lbs. per yd., is of Edgar Thompson make, with long splices, laid in 1890. The Wabash Railway has a rule making the maximum speed on freight trains hauling "dead" or disconnected engines, 20 miles an hour but, as usual, in all cases where accidents happen, the rule was not complied with by the train men.

* * *

The first lecture of the Purdue Railway Course for the season of 1898-9 was given on November 29th by Dr. Charles B. Dudley, chief chemist of the Pennsylvania Railroad. Dr. Dudley's subject was "The Relation of Chemistry to the Railroad." The speaker first gave some interesting figures on the amounts of money spent by the railroads for various materials, which very forcibly illustrated the immense importance of the departments of chemical and physical testing and inspection. He said that the purchasing agent of the Pennsylvania Railroad spends from $17,000,000 to $20,000,000 a year, and of that amount about $5000 goes for rubber bands, $7,000 for lead pencils, $1000 for pins, $5000 for ink, $2000 for toilet soap, $1,000,000 for lumber, and $60,000 for hose, and called attention to the very interesting fact that it costs nearly as much for stationery with which to carry on the business of the road as it does for iron. The duties and responsibilities of the inspector were then described and his work illustrated by references to numerous actual cases.

* * *

Dr. Dudley took up the subject of specifications and showed how they are built up and the methods of obtaining the information from which they are compiled. As an illustration he gave in detail the Pennsylvania railroad specifications for car axles. These specifications contain not only information for the guidance of the manufacturer but as well for the purchasing agent, inspector and tester. He showed that it was the duty of the chemist not only to write specifications and test materials but to investigate special problems on a great variety of subjects, and related many instances from his own broad experience which showed the wide range of information and ingenious application of new methods which have been called into play in the solution of these various problems which have arisen from time to time. The charming personality of the speaker and his wide experience combined to make the address one of unusual interest and profit.

* * *

Considerable has been written lately about an old sign in possession of the Western Society of Engineers at Chicago. The words "Harper's Ferry," painted in black, stand out as boldly as when they were first formed by the artist's brush, while the wood around the letters, which was painted with white paint, has worn away about one-sixteenth of an inch. It is asserted by the writers that no paint manufactured nowadays is equal in durability to that which was applied on the old sign. Mr. Wm. Hooper, of Ticonderoga, N. Y., does not see anything specially remarkable in the preservation of the old sign and claims that there is just as good a paint made nowadays as then. He adds: "I have seen signs that have been painted with black paint directly on the clapboard of the building. The lettering was good after the paint on the balance of the building had disappeared, and after this the whole building was painted over, lettering and all, and the lettering obliterated; yet within ten years afterwards the old black lettering appeared again quite freshly to view. I suppose the paint for the lettering was made of linseed oil and lamp black. I believe, however, that finely ground graphite mixed with pure linseed oil, will last as long, or longer, than any other paint ever known of or used. I had a large iron casting which laid in my mill yard for over thirty years. It was painted with only one coat. The old casting was broken up and sold for old iron last month, and I noticed that the paint on the pieces of casting, even after being broken up, looked quite fresh."

* * *

"If the surface to be painted is perfectly dry when the finely ground graphite is applied," adds Mr. Hooper, "the paint will prove the most lasting paint known, because if time eliminates all of the oil, the graphite seems to adhere to the surface painted just the same as a piece of paper or wood will appear after it has been rubbed with a lead pencil or a piece of graphite. No other pigment known to me will remain on the surface painted after the oil has been thoroughly destroyed. With the experience I have had with graphite paint, I thoroughly believe that if any dry surface be covered with graphite paint and left untouched for a period of 30 years—by which time the oil will have disappeared—no doubt a letter could be written plainly on the surface by using a piece of large wire or nail after smoothing the end of the wire or nail which is to be used as a pencil. I have done all this and shown it up to others. Writing with the piece of wire polishes the graphite, which adheres to the surface, showing that it is there still."

* * *

The number of teachers and other employes of the International Correspondence School at Scrantou, Pa., is 600. The total number of professors, tutors, etc., of Harvard University is 423. This Scranton school for teaching by correspondence is one of the most successful institutions in the world and is by far the most successful one of the kind. It is in every way reputable and reliable and is helping thousands of men and women to higher positions and a broader life.

* * *

An attempt to determine the cost of stopping trains was made on the New York, Chicago & St. Louis Railway last year. The results are given in a communication recently appearing in the Railroad Gazette. It was figured that for the average traffic over the district on which the tests were made there would be effected, by omitting the stops (caused by 14 railroad crossings), an apparent money saving of $350 per month in fuel. It was further figured that the interest account and the expenses for operation and maintenance (over and above the present cost for operation) of interlocking these crossings in question would probably amount to $5,000 a year, so that on the score of dollars and cents it could not be seen that anything would be gained by interlocking the crossings. There would, however, be a saving by interlocking, of overtime on freight trains and also an important gain in the shortening up of passenger train schedules.

* * *

Some recent tests of nickel steel in Germany indicate that when the percentage of steel is increased from 0 to 8 per cent the limit of elasticity is increased from 9.21 and 27.9 tons per square in., and the tensile strength from 20.3 to 35.5 tons, while the elongation goes down from 30 to 10 per cent. Eight per cent of nickel was found to give the greatest strength. With larger proportions of nickel the conditions became very irregular. For instance, with 16 per cent nickel the tensile strength is 26 tons, while the elongation is not even 1 per cent. With 30 per cent nickel the tensile strength goes down to 6.35 tons, and the elongation is only 2 per cent.

With 60 to 98 per cent nickel the strength becomes normal again, but elongation varies greatly.

* * *

In our article on trains-parting reports in our last issue we gave the causes of trains breaking in two, as reported on the Nashville, Chattanooga and St. Louis, for a period of nine months. The reports for November are now at hand and they show causes to have been classified as follows: Slip pin key gone, 7; slip pin key broke, 2; slip pin broke, 8; link and pin drawbar broke, 1; knuckle opened, 5; coupling pin broke, 8; draft timber pulled out, 2; drawbar pulled in two, 1; coupling pin jumped out, 2; M. C. B. couplers parted, 9; link broke, 5; knuckle jerked out, 1; cast draw bar broke, 1; drawbar jerked out, 1; knuckle pin broke, 2; push bar broke, 1; drawbar yoke broke, 1.

* * *

A notable run was made on January 2 on the Burlington Route, in which the run between Council Bluffs and Chicago was made in the fastest time on record. On the date named the fast mail train was held at Council Bluffs trainsfer for the Union Pacific Railway overland mail. The regular leaving time for this train is 3:50 p. m. but on this day it did not get away until 4:52 p. m. and that hour and two minutes had to be made up, and the feat was without difficulty accomplished. The distance was 500.2 miles. The running time, including stops, was 563 minutes. The running time exclusive of stops was 523½ minutes. The last 206 miles from Burlington in, was made in 213 minutes, or in 200 minutes of actual running time. The train was made up of four postal cars. The engine that hauled it from Burlington to Chicago was a class H, with 19x 26 cylinders.

* * *

The Railway and Telegraph Employes League will hold a convention and mass meeting in Chicago February 18, to discuss measures in the interests of railway employes. Chauncey M. Depew will give an address on "Anti-Railroad Legislation and Its Effects on Salaries of Employes."

* * *

The Western Railway Club made a trip to the Niles Tool Works at Hamilton, O., on the day following the January meeting, as the guests of the company named. It was a very perfect affair in every way, and the party, made up of over 100 members, felt well repaid for the trip. Every courtesy was extended to the members of the party both while en route and while at Hamilton. The Niles company's shops are always interesting to visitors and are especially so just now because of notable work in hand, particularly that for the government in the way of mortars and gun carriages. An object of special interest was a mammoth forge lathe building for the Midvale Steel Co. This lathe will turn out work 45 feet long.

* * *

The reason for the specialist is interestingly treated of in the current issue of the Popular Science Monthly by C. L. White. In the more progressive countries, at least, he says, the breaking of the shackles in which the investigating mind had been imprisoned for so long has led not only to a greater number of scientific workers, but also to an increase in the fields of observation. The methods of investigation have likewise undergone a transformation. In place of deductive reasoning, even as late as a few decades in the past, conclusions and generalizations are now founded on lines of thought more largely inductive. Men of middle age are able to recall the time when even our leading institutions of learning required instruction in several branches of science to be given by one teacher. It was possible twenty-five years ago for a man of great ability to master the essentials of the leading sciences and to teach them, but under the present stimulus for investigation no one can hope to excel in more than one subject. It has thus come about that in place of the many-sided teacher of science we now have in our larger universities specialists in every subject.

* * *

The directors of the Philadelphia Exposition Company have decided to open the proposed exposition of American manufactures on or about September 15 next and close it on or about November 10. The price to exhibitors for space in the exposition buildings has been fixed at an average of $1 per sq. ft. Contracts will be entered into at once for the construction of the necessary buildings. Good progress is being made in procuring subscriptions toward the $50,000 which is to be added to the $250,000 obtained from the city of Philadelphia and the state of Pennsylvania. When this sum is raised an appropriation of $300,000, conditionally made by congress will become available. P. A. B. Widener has been elected president of the Expositiou company; W. W. Foulkrod, first vice president; John Birkinbine, second vice president, the latter succeeding the late Dr. William Pepper; and Sydney L. Wright treasurer. Dr. W. J. Wilson has been elected director of the Philadelphia Commercial Museums, as director general of the exposition, to succeed William Harper, who has held the office since the organization of the exposition association. Mr. Harper has been specially detailed to represent the exposition's interests abroad, and will collect samples of merchandise in demand in the various markets of the world for display in the forthcoming exposition. Mayor Warwick of Philadelphia, Hon. John Wanamaker and Theodore C. Search, president of the National Association of Manufacturers, have been elected on the Board of Directors of the exposition.

* * *

By his will the late Alfred Nobel, the Swedish dynamite manufacturer, left, as we have previously noted, almost the whole of his fortune to be converted into an international fund for the advancement of scientific research. The bequest, however, was disputed by the relatives of the deceased, and litigation ensued. It is now announced that a compromise has been reached whereby the relatives receive about $1,000,000 of the property, the balance, amounting to about $7,000,000, being used as designated by Mr. Nobel. This will give, under the terms of the will, five prizes annually of about $41,000 each to persons making the most important discoveries in physics, chemistry, physiology or medicine.

* * *

An interesting point was made recently by Mr. A. A. Stevenson of the Standard Steel Works in a discussion, presented by him, of W. R. Webster's paper, before the Mining and Metallurgical Section of the Franklin Institute, on "Specifications on Structural Steel and Rails." Mr. Steveuson says: "I think it is desirable not only to have the dimensions of the test piece and the pulling speed standard, but also important to have a record of the period elapsing between the time when the product is finished and when tests are made. That a change takes place in steel after finishing which materially affects the physical results cannot be questioned. In connection with the above the following figures may be interesting. The test pieces were all cut from tires and duplicate tests, as far as possible, from the same part of the tire, as, owing to section of a tire and to process of manufacture, tests from different parts of the same section show a variation.

Dimensions.	Elastic limit.	Ultimate strength.	Elongation. Per cent.	Reduction. Per cent.	Remarks.
2x0.500	53,490	107,460	15	19.20	Pulled within 3 days after tire was made.
2x0.500	56,037	108,700	16.30	24.30	Ten days later.
2x0.500	50,940	99,590	14	22.20	Pulled within 3 days after tire was made.
2x0.500	53,000	103,464	18	27.40	Ten days later.
2x0.500	56,037	111,050	10	12.37	Pulled within 3 days after tire was made.
2x0.500	61,130	111,410	15	21.50	Ten days later.
2x0.798	70,370	121,250	11	14.01	Pulled five days after tire was made.
2x0.798	71,980	121,970	14	17.89	Seven days later.
2x0.798	65,080	121,470	11.50	13.55	Seven days after tire was made.
2x0.798	64,400	121,160	13	16.30	Fourteen days later.

The tests were all pulled at the same speed.

* * *

The question of the porosity of thin steel plates under heavy hydraulic pressure having been raised, experiments have been carried out at the Washington navy yard with the view of settling the point in a practical way. Pieces of sheet steel of ¼, ⅛, 1-16, and 1-32 inch in thickness were subjected to a water pressure of 6000 lbs. per sq. in., and in no case was any percolation found. A ⅜-in. rivet joining two ⅛-in. plates also proved tight under the same pressure. A test was also made to determine the friction of water under high pressure, and, while it was inconclusive, there was no evidence that the friction of water under high pressure was any greater than the friction of water not under pressure.

COMMUNICATIONS.

The Value of Little Things.

Kansas City, Mo., Jan. 9, 1899.

To the Editor of the Railway Master Mechanic:

I am very much interested in the short editorial in your paper for January, in which you say Mr. J. N. Barr, of the Chicago, Milwaukee & St. Paul Railway finds both pleasure and profit in riding,—"The Hobby of Little Things."

I had early instruction in railway matters under Mr. Edmund S. Bowen, for several years connected with the Northern Central railway, Kansas Pacific railway, Erie railway, etc., and one of the lessons I learned from this good man was the importance of keeping the eye on the "little things." Of late I have changed the expression somewhat, and in talking with young men who have entered the service under my direction during the past few years, I have often called their attention the the subject in this manner:

Watch the little things in your work and in your character, because a straw will often times indicate the direction of the wind when a building like the Monadnock block, of Chicago, is absolutely undisturbed.

Another thought that I have often given to those younger than myself is this:

Men are like water; they will always cut an easy channel. Again, you might say that men are like clocks. A large percentage of them have to be wound up and set every twenty-four hours; others require winding but once a week; a lesser number are represented in the fifteen-day clocks; a still smaller company are classed with the clocks that run thirty days without winding, and occasionally you come against a self-winder.

If all young men will appreciate these homely things, watch the little things and endeavor to make themselves so useful to their employers that their employers cannot get along without them, there will be no cause for any one to criticise their employers, and they will find that the reduction in the operating expense of a railroad will be such as to justify the management in paying those salaries which all of us would like to have, and which many of us feel we ought to have.

My "Hobby of Little Things" is painted with bright red, and I do not believe there is a man on earth who has greater pleasure in riding it than your subscriber, and it is an easy thing to put fingers on economies equaling thousands of dollars each year as a direct result of "Watching little things." No one man on earth at the present time knows it all. We learn only through an intense desire to be possessed of wisdom, knowledge and understanding and by being observing of all that passes within our range.

If what is said herein shall give some young man a new incentive, I shall be very thankful that it was my privilege to dictate these few words to your paper.

In conclusion, let me say a word to employers: Do not be afraid to say good things to all persons who may be subordinate to you. Teach them to THINK and to bring vividly before them the fact that *it is a man's capacity to think and to act promptly when he has thought* that commands value in the markets of the world. There is not enough attention paid to this matter in any of our shops, in any of our offices or in any of the large manufacturing or jobbing institutions of our land.

Very truly yours,

Ira C. Hubbell.

Lagging for Locomotive Tanks.

To the Editor of the Railway Master Mechanic:

The paper on boiler laggings presented to the Western Railway Club at its January meeting by Mr. Robert Quayle, superintendent motive power of the Chicago & Northwestern railway, is quite exhaustive in its treatment of the main point in view, and it reflects light upon many correlative points, which will no doubt occur to interested railway officials and practical engineers everywhere. It is not my purpose to now review this paper, but rather to dwell upon one of the points which it suggests. The influence of speed, high steam pressure and low atmospheric temperature upon heat losses from the boiler are very fully shown to any one who will give more than a casual reading to the report. One of these points may be the use of an insufficient thickness of covering to meet the varying conditions as established in the evidence given by the boiler test.

Of equal value and importance, it seems to the writer, is a proper protection of all exposed surfaces likely to be effected under the same conditions with the boiler—such as exposed steam and water pipes, steam chests, cylinder body and heads and its cavities in the saddle, etc. These come under the list of proper items to consider if one has in view the economical operation of the locomotive.

The heat losses to feed water contained in the locomotive tank and in its passage to the boiler are perhaps the chief of the losses otside of the boiler heat radiation; and it is an easy matter to meet this loss in the same manner that we meet the loss in the boiler.

by suitable coverings for the tank and feed water pipes.

To illustrate this to a certain degree I will cite a recent report by Mr. J. D. Barnes, superintendent motive power of the Wabash system, of a test made by him to show the value of feed water heat in the regular train service. It was demonstrated during a series of regular train trips that the difference of effectiveness between feed water at the usual normal average condition of 50 degrees and when heated to 105 degrees was equal to 1 train mile more per ton of coal, or an actual saving of more than 6 per cent of fuel. A more striking illustration of the value of feed water heat could hardly be made.

Mr. E. M. Herr recently stated before a Western Railway Club meeting that he had found it practicable to handle feed water up to 124 degrees. The ratio of benefit shown in Mr. Barnes' test will give 2 per cent added value to the increase of 124 degrees, making a total of about 8 per cent difference in value of fuel as the result of an increase of feed water heat from 50 to 124 degrees.

It is not by any means new to heat feed water. One of the ways that has always been employed is to run the surplus steam while standing, and in fact also when running, back into the tank. All engineers have practiced this more or less, but it was formerly more common than at present; and it often resulted in a blistered tank when carried too far. One hundred and five degrees, however, of feed water heat in tanks is better than the average temperature of water as used daily.

Whatever will permit of maintaining a good degree of heat and provide for at times all the heat that it is possible to handle in feed water is worth while considering, when such a saving in fuel as shown by Mr. Barnes is possible. I would say, therefore, that in view of the poor results commonly had there is warrant for the covering of tanks permanently, winter and summer, with suitable materials to insure against loss. With this provided for there will be no anxiety about blistering the paint and there will be much more care taken to save the loss of steam at safety valves and at the air pump exhaust.

Mr. Quayle's paper, embodying the results of work made possible by a wise and liberal management—the fruit of the united efforts and best abilities of experienced, practical and technical officials, combined with the efforts of manufacturers represented in the test, will lead no doubt to a close general attention to the points referred to. These points have in good part been heretofore neglected because of insufficient available data, although many men have appreciated the opportunity for better practice.

George W. Cushing.

CONSOLIDATION COMPOUND LOCOMOTIVE, NORTHERN PACIFIC RAILWAY.

The Schenectady Locomotive Works recently built 14 compound consolidation locomotives for the Northern Pacific Railway and we present herewith an illustration of one of these engines. These locomotives, known as Class "Y" engines, weigh 189,200 lbs., of which 169,000 lbs. are on the drivers. They have cylinders 23 and 34 by 34 ins.; 55 in. drivers; extended wagon-top boilers 72 ins. in diameter at first ring, and designed to carry 225 lbs. working pressure; a heating surface of 2923.4 sq. ft. and a grate area of 35 sq. ft. The leading dimensions of these engines are appended.

GENERAL DIMENSIONS.

Gage	4 ft. 8½ in.
Fuel	Bituminous coal.
Weight in working order	189,200 lbs.
Weight on drivers	169,000 lbs.
Wheel base, driving	14 ft. 8 in.
Wheel base, rigid	14 ft. 8 in.
Wheel base, total	23 ft. 3 in.

CYLINDERS.

Diameter of cylinders	H. P. 23 in., L. P. 34 in.
Stroke of piston	34 in.
Horizontal thickness of piston	4¾ in. x 5¾ in.
Diameter of piston rod	3¾ in.
Kind of piston packing	Cast iron.
Kind of piston rod packing	Jerome.
Size of steam ports	H. P. 18 in. x 15/8 in., L. P. 23 in. x 2½ in.
Size of exhaust ports	H. P. 18 in. x 3 in., L. P. 23 in.
Size of bridges	1⅜ in.

VALVES.

Kind of slide valves	Allen-American.
Greatest travel of slide valves	6 in.
Outside lap of slide valves	H. P. 1⅛ in., L. P. 1 in.
Inside lap of slide valves	¼ in.
Lead of valves in full gear	1/8 in. blind.
Kind of valve stem packing	Jerome.

WHEELS, ETC.

Diameter of driving wheels outside of tire	55 in.
Material of driving wheel centers	Cast steel.
Tire held by	Shrinkage.
Driving box material	Main cast steel. I. F. & B. steeled cast iron.
Diameter and length of driving journals	Main 9 in. dia., I. F. & B. 8½ in. dia. x 10 in.
Diameter and length of main crank pin journals	Main side 7½ in. x 5¼ in., 6½ in. dia. x 6 in.
Diameter and length of side rod crank pin journals	Inter. 5½ in. x 5 in., F. & B. 5 in. dia. x 3¾ in.
Engine truck, kind	2-wheel swing bolster.
Engine truck, journals	6 in. dia. x 11 in.
Diameter of engine truck wheels	30 in.
Kind of engine truck wheels	2-wheel swing bolster.

BOILER.

Style	Extended wagon top.
Outside diameter of first ring	72 in.
Working pressure	225 lbs.
Material of barrel and outside of fire box	Carbon steel.
Thickness of plates in barrel and outside of fire box	5/8 in., 7/16 in., 13-16 in., ¾ in., 9-16 in.
Horizontal seams	Butt joint sextuple riveted, with welt strips inside and outside.
Circumferential seams	Double riveted.
Fire box, length	120 3-16 in.
Fire box, width	42 in.
Fire box, depth	F. 77 in.; B. 7.3½ in.

CONSOLIDATION COMPOUND LOCOMOTIVE—NORTHERN PACIFIC RY.

Fire box, material	Carbon steel.
Fire box plates, thickness	sides, 5-16 in.; back, 5-16 in.; crown, 3/8 in.; tube sheet, ½ in.
Fire box, water space	front, 4½ in.; sides, 3½ to 4 in.; back, 3½ to 4½ in.
Fire box, crown staying	Radial stays, 1⅛ in. dia.
Fire box, stay bolts	Ulster special iron, 1 in. dia.
Tubes, material	Charcoal iron No. 12.
Tubes, number of	330.
Tubes, diameter	2¼ in.
Tubes, length over tube sheets	14 ft.
Fire brick, supported on	2 water tubes.
Heating surface, tubes	2705.2 sq. ft.
Heating surface, F. B. tubes	15.3 sq. ft.
Heating surface, fire box	202.9 sq. ft.
Heating surface, total	2923.4 sq. ft.
Grate surface	35 sq. ft.
Grate, style	Rocking Company's Standard.
Ash pan, style	Hopper, dampers F. & B.
Exhaust pipes	Ordinary.
Exhaust nozzles	5¼ in., 5½ in. and 5¾ in. dia.
Smoke stack, inside diameter	18½ in. at top and 16 in. near bottom.
Smoke stack, top above rail	15 ft.
Boiler supplied by	One Hancock inspirator, type A, one Ohio injector, standard A.

TENDER.

Weight, empty	44,850 lbs.
Wheels, number of	8.
Wheels, diameter	33 in.
Journals, diameter and length	5 in. dia. x 9 in.
Wheel base	15 ft. 8 in.
Tender frame	10 in. steel channel.
Tender trucks	Center bearing, double I beam bolster with side bearings on back truck.
Water capacity	5500 U. S. gallons.
Coal capacity	8 tons.
Total wheel base of engine and tender	51 ft. 9½ in.

SPECIAL EQUIPMENT.

Engine equipped with 3 3 in. Ashton safety valves; McIntosh blow-off cock; Detroit cylinder lubricator; American outside equalized brake on all drivers, operated by air; Westinghouse automatic air brake on tender and for train, 9½ in. air pump; magnesia sectional lagging on boiler and cylinders; Gollmar bell ringer; Ashcroft steam gage.

RAILWAY MEN IN PUBLIC LIFE.

The election of Mr. Chauncey M. Depew to the United States senate constitutes a decided novelty in American public life. There is no good reason why the transportation interests should not have one of their members in the senate; but there has been a feeling against such a representation. General Passenger Agent Geo. H. Daniels of the New York Central, speaking at a dinner tendered to Dr. Depew at the time of his election by the New York Republican Club, referred to the broader aspects of the situation as revealed by the change in sentiment which resulted in Dr. Depew's election, in the following suggestive words:

It is to my mind peculiarly fitting that just at this time, when transportation is occupying so large a place in the public mind not only in this country but in every country on the globe, the Empire State of the Union should select as its representative in the most important legislative body in the world a man whose whole life has been spent in the closest association with the transportation interests of the country, and that, notwithstanding the prejudice which has so long existed in the minds of many otherwise fair-minded men against railroad officials as such, the representatives of his party have paid a railroad man the unprecedented compliment of a unanimous vote for the most important position within their gift.

From my boyhood I have been identified with transportation interests, and for the past 10 years I have been intimately associated with Senator Depew as chief of one of the departments in the great corporation of which he has so long been the head, and having, like thousands of others, struggled up from the very bottom round of the ladder. I think I may be qualified to speak as one of the rank and file of the great army of transportation employees on the significance of this event; and when I say that I believe it marks a new era in the history of our country, an era of better understanding and closer and more amicable relations between the great commercial, agricultural and industrial interests, and the transportation interests of the United States, I am sure I voice the sentiment of hundreds of thousands of employees of the transportation lines, citizens of this republic, who are doing everything in their power to sustain our Government and its institutions, and are assisting in making possible the continued expansion of American commerce.

The election of so prominent a representative of the transportation interests of America to one of the highest political positions in the gift of the people, comes with peculiar significance in the same week, and almost on the same day that two of the imperial governments of Europe have given to the world their indorsement of the idea that modern transportation facilities form one of the surest bases upon which to build and sustain a government. The emperor of Germany in his speech to the Prussian diet day before yesterday did not lay the greatest stress upon the necessity for increasing the army, or for the construction of additional ships for the navy, but he did impress upon his hearers the great importance of extending the railroads and the navigable canals, and in order that his people might have knowledge of the most advanced theories and practice in the construction and operation of railways, an Imperial German Commission was sent to the United States a short time ago for the purpose of examining American railways and making such recommendations as their investigation should suggest. In their report which was recently published they had nothing but commendation for American railways. The budget of the Russian Empire for 1899, made public this week, discloses the almost incredible efforts in railway extension that the Imperial government of the czar is putting forth. This year alone 109,000,000 roubles will be devoted entirely to the railways, and during the past 12 years 425,000,000 roubles have been thus expended. The immense sums which the Russians are devoting to the extension of their railways entirely overshadow the demands of both the army and the navy. The United States is not the only country that appreciates the comprehensive character of a thoroughly informed and widely experienced railroad man.

The railroad has long been recognized by thinking people as the pioneer of progress, and when I remind you that all the money in the world—gold, silver and paper—would not buy one-third of its railways and that there are on the pay-rolls of the transportation lines of the United States more than a million voters, you will appreciate their importance in this age, which is recognized as the commercial age of the world.

I can truthfully say that I have never brought before Mr. Depew a proposition for the improvement of

FRONT ELEVATION. SIDE ELEVATION.

RAILWAY Y. M. C. A. BUILDING—A., T. & S. F. RY.—AT ARGENTINE, KAN.

the service of the New York Central, or for the betterment of the facilities of our patrons, that he has not given the matter the fullest and most careful consideration, in the light of the rights of the public, as well as those of the common carrier; and I predict that the humblest citizen of this state will find in him, as the humblest employee of the New York Central has always found, a **faithful friend.**

RAILWAY Y. M. C. A. BUILDING AT ARGENTINE, KAS.

At Argentine, Kas., there is being erected a railway Y. M. C. A. building that promises to be an ideal home for railway men at that point. This building, of which we give very full illustrations, is being erected at the suggestion of the international committee of the Young Men's Christian Association. The Atchison, Topeka & Santa Fe R. R. is very substantially aiding in this work, its generous proposition being to give $3 for every $1 given in the town for the building, up to the sum of $7500 to come from the company. The company also gave the land upon which the building is located. The financial result of the proposition is that the railroad company gives $7500 and a site and the railroad men of Argentine give about $2500.

The building, as shown by the side and front elevation that we give, is of very handsome design and is three stories high and of ample dimensions. In the interior arrangement, as revealed by our floor plans, every convenience and comfort is provided for the men. In the basement space is apportioned to a large hall, double bowling alley, gymnasium room and ample lavatory and bath room accomodations. On the next floor above are a parlor, reading room, social room, temporary hospital and a class room, together with the necessary offices, etc. This class room will be a leading feature, and will play an important part in the work to be carried on within the walls of this beautiful building. On the next floor there is a large lecture hall, the remainder of the space being devoted to well arranged rest rooms. In the attic additional rest rooms will be finished off.

Great need exists in Argentine for this work for, although it is in the state of Kansas, there are a large number of saloons in the town and no place where the men can congregate under helpful surroundings.

The brick work on this structure, including the foundations, is completed and the building will be ready for occupancy this month. Mr. Thomas Prout has been placed upon the payroll of the company as secretary beginning January 1, and he is now at Argentine to organize the association and secure furniture for the rooms.

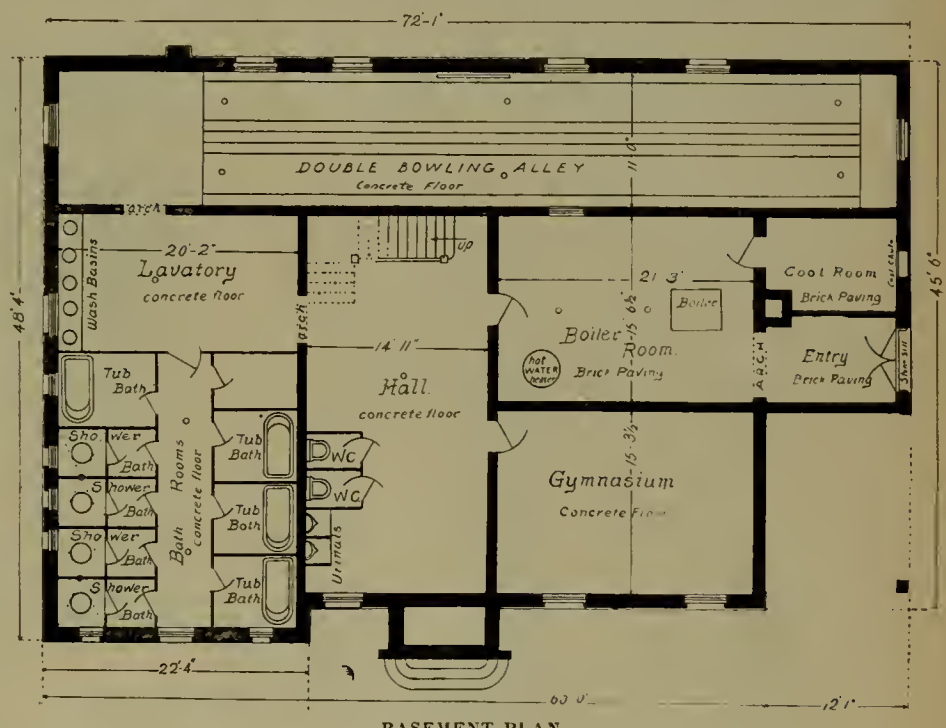
Money for similar buildings at Temple and Cleburn, Texas, has been raised. For these, the proposition from the Atchison, Topeka & Santa Fe Company, on whose lines these towns are located, is on about the same basis as the Argentine plan, and the building at Temple is already under way

TESTING LOCOMOTIVE MATERIALS AT THE LOCOMOTIVE WORKS OF THE MIDLAND RAILWAY, DERBY.

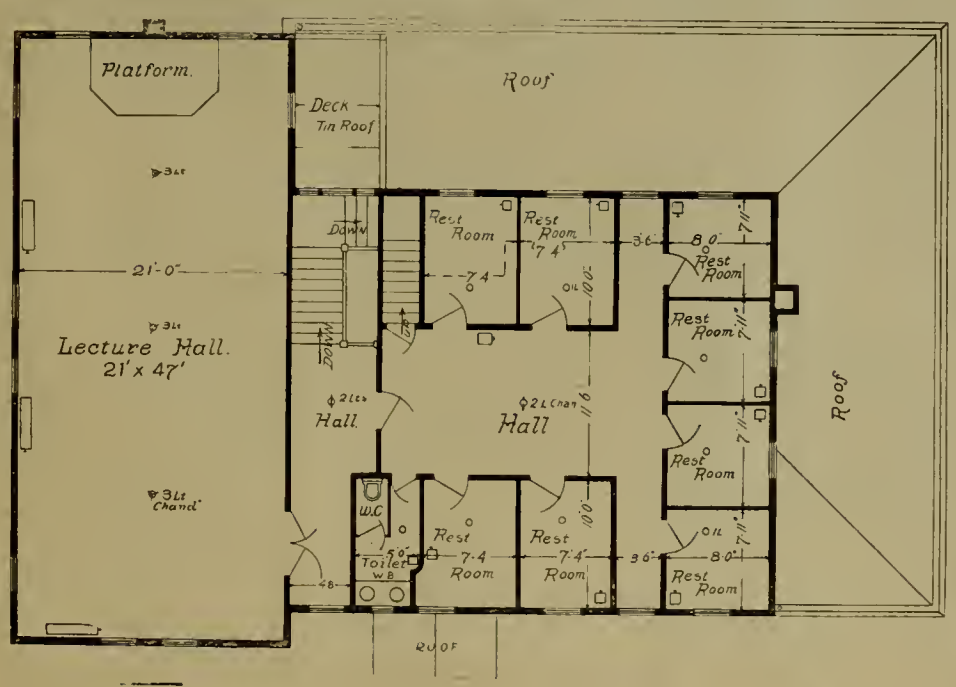
By W. Gadsby Peet, Chief of the Locomotive Testing Department.

(Concluded from page 171. Vol. XXI.)

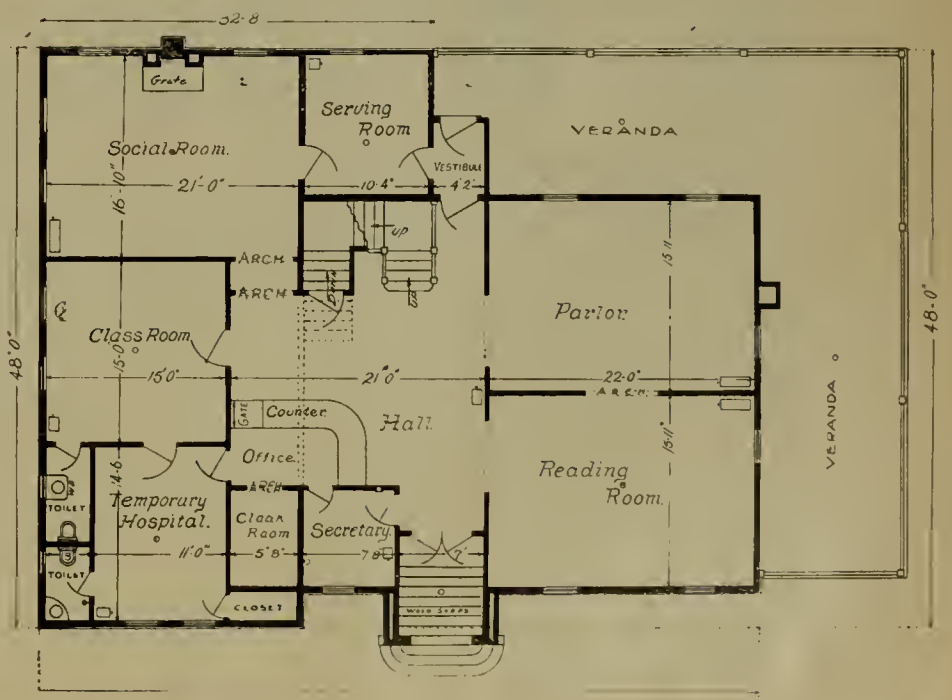
Deeley Torsion Machine.—The machine used for making torsion tests is the invention of Mr. R. M. Deeley, and is shown in Figs. 20, 21, 22a, and 22b. Fig. 20 is



BASEMENT PLAN.



SECOND-FLOOR PLAN.

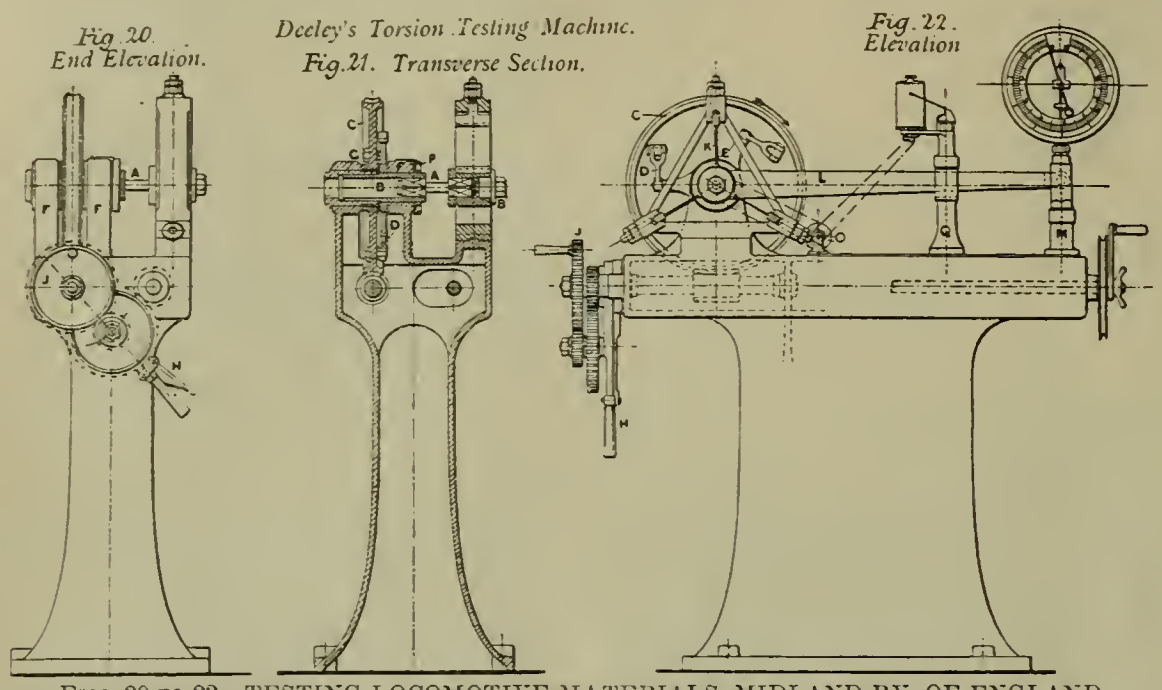


FIRST-FLOOR PLAN

RAILWAY Y. M. C. A. BUILDING.—A., T. & S. F. RY.—ARGENTINE, KAN.

an end elevation, Fig. 21 a transverse sectiou. and Fig. 22 a side elevation.

The test bar A has square euds. and is held in hollow centres BB'. The centre B is rotated by meaus of a worm wheel C through the links D, and the three-armed lever E. which is keyed on the centre B. This worm-wheel revolves in a bush secured to the bracket F and liner G. Clearance is left between the lever and the boss of the worm-wheel, so that, as the bar lengthens under the strain. the socket which forms the hollow

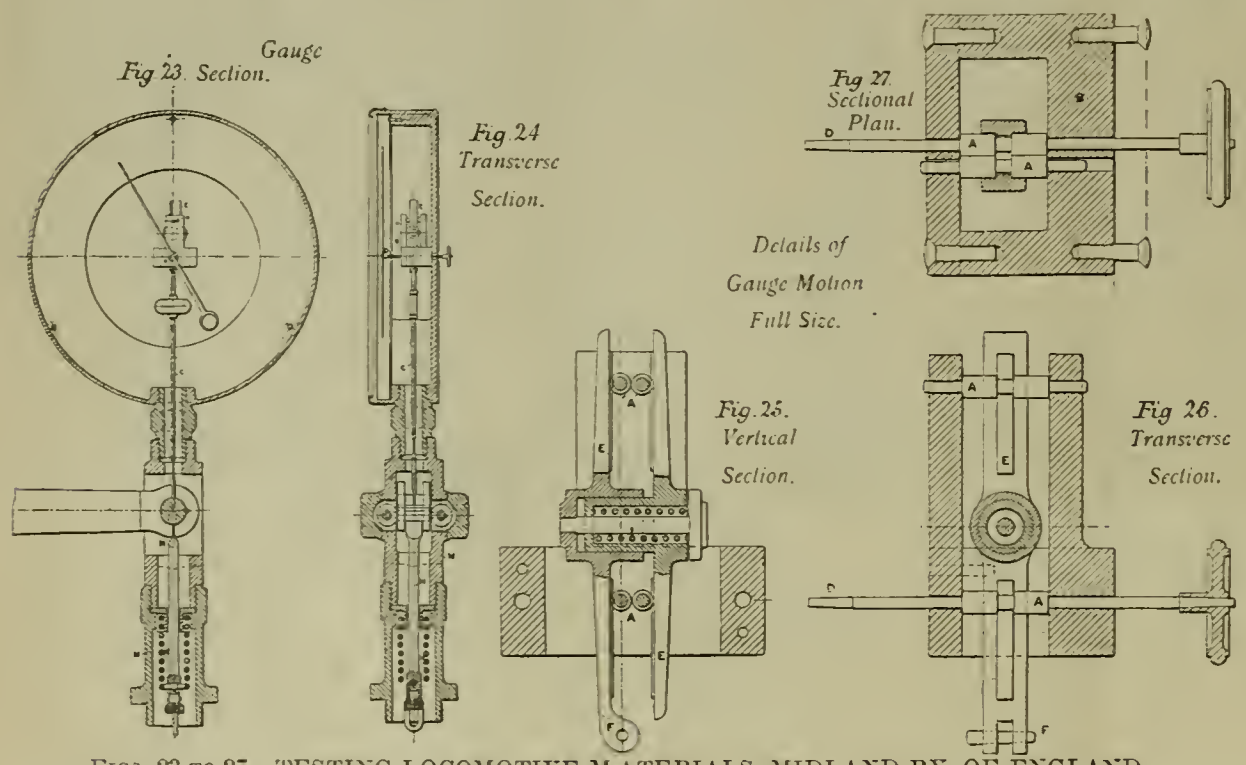


FIGS. 20 TO 22.—TESTING LOCOMOTIVE MATERIALS, MIDLAND RY. OF ENGLAND.

ceutre B. may slide longitudinally iu the liner G and the bracket F; and as there is a rotary motion of all the friction surfaces of the centre B. these surfaces slide lougitudinally, and the test bar has perfect freedom to lengthen. The machine is driven by a light rope from the shop shafting through a train of wheels. seen in Fig. 22, which may be thrown out of gear by

a lever L. Fig. 22. the other end of which is counected to a flexible rod N, Fig. 23. carried by a double helical spring H; this is contained in a pillar M. which is secured to the bedplate and surmounted by a gauge, on which is measured the extension of the spring. or the twisting moment on the lever L, Fig. 22, resulting from the strain put upon the test bar A. The gauge is graduated to give the strain in tons at a leverage equal to the radius of the test bar, 0.399 iu., which by a simple calculation may be converted into pounds at a leverage of 12 in., or iuto auy other terms desired. But for comparing a number of results, the readings from the gauge as here described are in a convenient form.

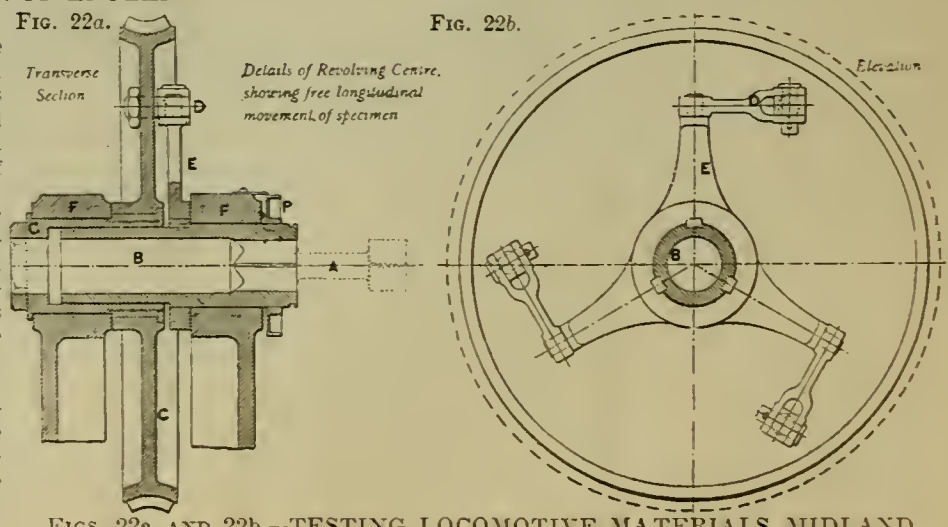
The gauge motion. which is shown in Figs. 23 and 24. presents some novel features. Two pairs of small rollers A. seeu also iu the enlarged views. Figs. 25, 26, and 27. arc carried in a frame B. secured to the gauge



FIGS. 23 TO 27.—TESTING LOCOMOTIVE MATERIALS, MIDLAND RY. OF ENGLAND.

the trigger and lever H. The centres are brought into position for inserting the test bar by means of a handle on the wheel J, Fig. 20, which is also used to work the machine and read off the stress and angle of rotation at the point of elastic limit. After this the speed of rotatiou is increased by throwing the train of gearing into action. The angle of rotation is read from an adjustable graduated disc P, Fig. 21, fixed on the centre B. while the finger is on the bracket F. The other end of the test bar is carried by the hollow centre B', by means of which the twisting moment is measured. This centre is suspended by three thin steel plates K, Fig. 22. from the corners of a triangular frame, which is bolted to the bedplate in such a maner that the centre B' may rotate throngh a very small angle, while rigidly held in every other direction. This forms an almost frictionless elastic support; and as the angle through which it moves is exceediugly small, even with the maximum load on the bar, there is no possibility of the steel plates being overstrained. The centre B', which is adjusted conceutrically with the centre B by the screwed ends and nuts of the flexible plates, forms the boss of

casing. The bearings of oue of them are extended, and on the projecting end D is placed the gauge finger; and on the other end, which passes through the back of the gauge casing. is a milled head for adjusting the finger after the slack of the machine has been taken up and before the test is commenced. A pair of steel arms E is firmly clasped on the rollers by means of a spring. and any vertical movement of the arms causes the rollers to rotate, including the one carrying the gauge finger. The lower end E of one of these arms is connected to the flexible rod G, Fig. 23. which in turn is screwed



FIGS. 22a AND 22b.—TESTING LOCOMOTIVE MATERIALS, MIDLAND RY. OF ENGLAND.

iuto the end of the lever L, Fig. 22. It follows, therefore, that every movement of the lever and corresponding extension of the spring H, Figs. 23 and 24, will be transmitted to the gauge finger. In the event of the sudden fracture of the test bar the rollers slip on their faces. and so preveut any shock from coming upon the gauge motion. The gauge was graduated by fixing a balanced lever on the elastic centre, loading it to give the stresses required, and carefully marking out the results on the gauge.

Autographic Recording Apparatus.—An apparatus for taking autographic diagrams is attached to the pillar Q, Fig. 22, which is secured to the machine. The top of the pillar contains a small weight resting lightly on the lever L, and connected at the top to the parallel motion of a Crosby indicator. The depression of the lever. which is proportioned to the strain on the speci-

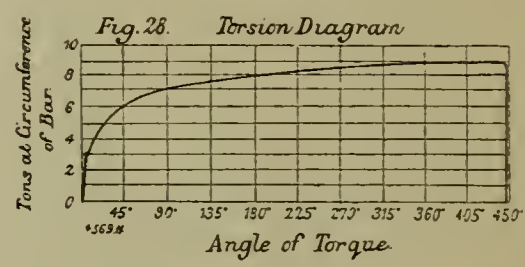
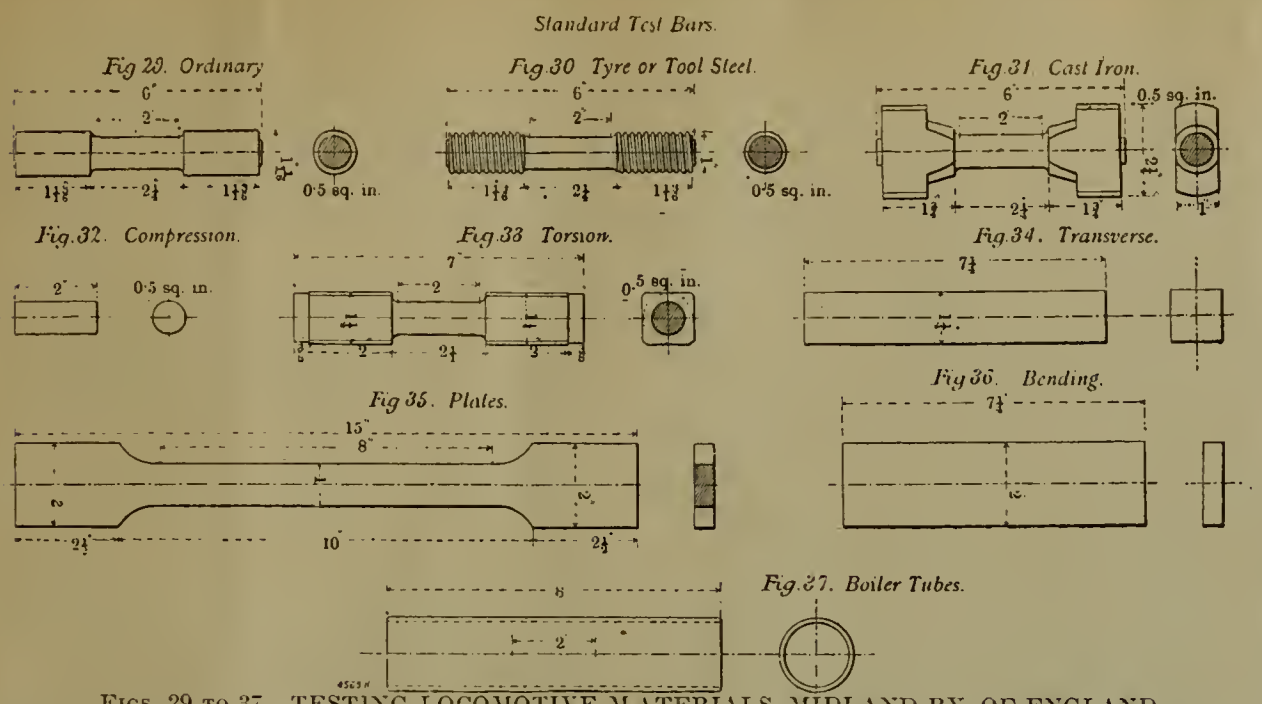


FIG. 28.

men. gives a vertical movement to the pencil; and the drum is rotated by a cord driven throngh the countershaft O by a grooved pulley fixed on the revolving centre B. A specimen diagram taken from a test upon a steel crank-axle torsion-bar is shown in Fig. 28.

Details of Test Specimens.—Figs. 29 to 37 show the standard forms and sizes of test bars used. Fig. 29 is the ordinary tensile test piece, which is adopted. where the section of metal will allow. for all classes of material except cast irou and very hard steel, such as tire or tool steel; for the latter the form shown in Fig. 30 is used. which has the ends screwed with a special rounded thread, six to the inch. Fig. 31 represents the tensile test piece for cast iron. All the above bars are 0.798 in. in diameter. or 0.5 square inch area; the centers dots. 2 in. apart, are marked en before testing. and the elongation may be measured either between these centres, or over the entire length of the bar; in the latter case it is stated as a percentage of the central portion 2 in. long. but there is then an error due to a certain amount of elongation having taken place in the cuds which is included in the measurement, making the percentage of elongation of the bar appear abont one-fifth more than it really is. Fig. 32 is the compression bar. which, like the tensile, is 0.798 in. in diameter and 2 in. long. This is tested by applying a load of 25 tons. wheu the bar is taken out and the amount of compression measured; the load is calculated on the enlarged area at the center of bar. The load is then increased to 50 tons. and the calculations are repeated. Such specimens as will not stand the full load of 50 tons are tested to destruction. Fig. 33 is the torsion bar, 0.798 in. in diameter by 2 in. centres. Fig. 34 is the standard bar for transverse tests; it is 1¼ in. square by 6 in. centres. being 3.91 times, or nearly four times as strong as a bar 1 in. square by 12 in. centers. so that a comparison between bars of these sizes can be readily made when necessary. Fig. 35 is the plate tensile bar, 1 in. wide by 8 in. centres. The bending bar for plates is shown in Fig. 36, and is 2 in. wide by 6 in. centres. Fig. 37 is the tensile test piece for boiler tubes. the elongation being measured on a length of 2 in. Pieces of tubes 4 in. in length are also tested by drifting.

Great care is taken in the preparation of the test



FIGS. 29 TO 37.—TESTING LOCOMOTIVE MATERIALS, MIDLAND RY. OF ENGLAND.

bars; the turned specimens are finished strictly to gage, and all scratches are eliminated by polishing with emery and oil. The square bending bars are slotted to gage, finished by filing and polishing; and the plate-bending bars are slotted, finished with the file, and all the tool marks taken out. The corners of all bending bars are left sharp. Plate tensile bars after shearing are milled in a Buckton machine, and the form of bar adopted insures ½ in. being cut on each side, so that the shearing does not effect the part tested; these bars are also finished with the file, and the tool marks taken out.

Every crank axle, also every steel and copper boiler-plate, is tested; besides which a large and varied selection is made for testing purposes from all the important parts of the locomotive, such as tires, straight axles, frame plates, connecting and coupling rods, boiler tubes, etc. Tires are subjected whole to a deflection test in the hydraulic press. Straight axles are doubled up in the same machine, and cast-steel wheel centres are broken up under a falling weight to test the soundness of the castings. A complete test of any material includes four tensile tests (two each in different directions), four compression, one bending, and one torsion test; although for most purposes tensile and bending tests only are made.

A photograph of several flaws in steel crank and straight axles is given in Fig. 38. These flaws were discovered on examination, and the axles were broken up in an hydraulic press. All of them showed fine crystalline fractures. The steel in each case is of excellent quality, and the mileage of the axles is as follows:

A—Crank axle .....329,863 miles.
D—Crank axle .....265,269 miles.
E—Crank axle .....521,769 miles.
B—Straight axle .....558,779 miles.
C—Straight axle .....652,000 miles.

C is an interesting example of what appears to be an internal flaw; it was found in the wheel seat of a straight axle when the wheel was taken off, and the whole section is fractured, except a very small part round the keyway and other small piece on the outer edge, seen on the lower-left-hand side in photograph. The central portion, about 6¾ in. in diameter, is evidently the original flaw, as it has a crystalline appearance, and does not show any signs of having rubbed against its fellow half, except on the lines radiating from the centre, which stand up from the flat surface of the fracture and are rubbed bright to within 1-16 in. of their base. The outer ring, about 1 in. wide, has worked bright, and appears to have started at the edge of the internal flaw and made its way outwards, the lines of its progress being quite clear.

In all cases where an axle or other part breaks very suddenly at a flaw, the ruptured surface is more or less crystalline. This seems to have led many to regard a crystalline fracture as an indication of a defective or brittle material; but, as a matter of fact, a test bar out of a fractured axle generally has the usual silky appearance. When a special form of tensile bar is used, having a groove turned round the centre with a sharp V-tool, and is broken suddenly, a sharp, clean fracture results, which is invariably crystalline. Best Yorkshire iron is also shown to be crystalline when broken in a similar way. It is only those steels that are wanting in ductility which show a crystalline fracture when broken in the ordinary way of testing. In the more ductile specimens the crystals are sheared in the process of drawing out under a tensile strain, and thus give the silky appearance which is characteristic of good steel, such as should be used for axles. It is thus seen that the crystalline appearance of the fractures shown in Fig. 38, does not necessarily denote a want of ductility in the material.

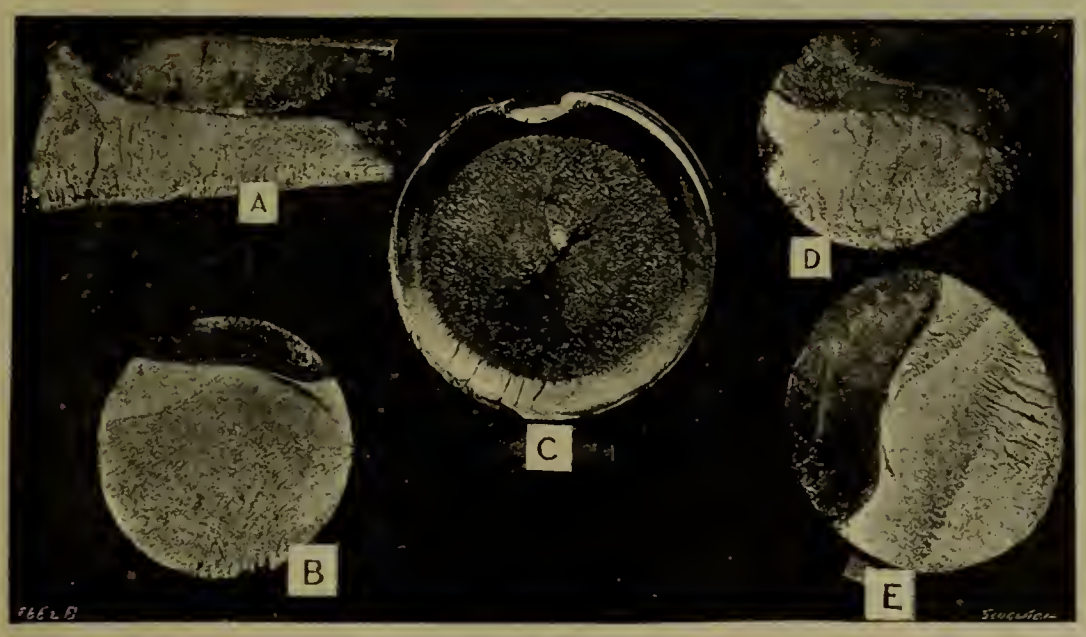


FIG. 38.—TESTING LOCOMOTIVE MATERIALS, MIDLAND RY. OF ENGLAND.

BEST FLOORS FOR SHOPS AND ROUND HOUSES.

From a carefully prepared and quite lengthy report on this topic presented at the last convention of the Association of Railway Superintendents of Bridges and Buildings, we make the following brief extracts:

In round house floors, we find among those in general use: brick, concrete, granolithic concrete, cinder, disintegrated granite, cedar block, timber and plank. Of these, the four most commonly used are probably brick, concrete, plank and cinder.

This committee believes that good vitrified brick, properly laid, will give the best satisfaction in all round houses which are used for anything more than storage purposes. In this we have a floor that is smooth, firm, hard and practically indestructible. It is absolutely unaffected by water, heat, oils, acids or grease, and is easily cleaned, while one important advantage is in the ease with which it can be repaired, since any part may be taken up and replaced by common labor without the slightest injury to the floor as a whole.

The following method of laying brick floors conforms to the generally accepted practice: Assuming the soil to be firm and well drained, excavate the ground to an even surface 8 inches below grade of desired floor. Tamp well with heavy rammers to secure a firm foundation, then fill in with good clean sand or gravel to within 3½ inches of grade, making a crown of about 2 inches between pits for drainage; wet this down well, tamp with rammers, and trim off with straight edge, taking care to get good even surface. Lay brick on edge close to each other and breaking joints so that tops come one half inch above grade. After laying, roll bricks with 2,000-pound or 3,000 pound roller, cover the surface with 1 inch fine sand and broom it well into cracks, or fill cracks with cement grout. A concrete foundation is recommended by some, but, except in cases where the natural ground is not firm, or where the floor is to be subject to extremely heavy loads, it is not considered necessary.

For blacksmith shops or foundries the natural earth frequently forms a very suitable as well as substantial floor. In localities where the soil is too soft in its natural state, the addition of cinders or clay will solve the problem cheaply and satisfactorily.

In machine shops the conditions are different, and here we find the recommendations almost as varied as are those for round house floors. A brick floor in a machine shop answers many of the requirements, but there is good evidence in support of the objection that men cannot stand all day on such a floor or upon a surface of concrete or asphalt without feeling the bad effects of cold upon the feet. This difficulty is overcome to a large extent by the use of slatted floor racks or platforms at the machines where operatives stand. When machines are set upon a brick floor there should be special provision made for foundation. But this can hardly be urged as an objection, as it is necessarily the case with heavy machines under almost any circumstances.

A bedded plank floor has recently been laid in an extensive shop plant of the Boston & Maine road. The earth is well compacted and brought to the proper surface and a bed of coal-tar concrete put down in three courses. This bed is 4 ins. thick when finished. The specifications are that the stones of the lower course shall be not less than 1 in. in diameter and those of the second course not more than 1 in. in diameter. Stones of each course to be well covered with tar before laying and thoroughly rolled afterward. The finishing course to be composed of good clean sharp sand well dried, then heated hot and mixed with pitch and tar and brought to a true level to fit a straight edge. Roller to weigh not less than 700 lbs. on a length not exceeding 22 ins. On this finished surface of the foundation there is spread a coating ¼-in. thick of best roofing pitch put on hot, into which the lower course of plank is laid before it cools. Care must be taken to have the plank thoroughly bedded in the pitch and after laying, the joints must be filled with pitch. If vacant places occur under plank they should be bored and filled. The finishing flooring is laid across the lower and thoroughly nailed.

For the lower course 2½-in. spruce plank s. l. s. is used, and for the upper 1½-in. s. l. s. spruce plank. It is also noted that the lumber for lower course should be fairly seasoned and that of the upper course well seasoned before using. The cost of such a floor is given at 18c per sq. ft., using spruce lumber.

For paint shops and car shops a brick floor has been found very satisfactory. The committee believes that a brick floor, generally speaking, is the most economical, durable and satisfactory floor for shops as well as for round houses.

TESTS OF COAL FOR LOCOMOTIVES.

At the December meeting of the Western Railway Club, Mr. Wm. Garstang, Supt. of Motive Power of the Cleveland, Cincinnati, Chicago & St. Louis Ry., presented a paper on tests of coal for locomotives. This was based on tests made on his road and at Purdue University. The bulk of the paper was taken up by the report made by Prof. Goss at the University. This we now give, and hope to present the results of the road test work and the substance of the club discussion in a later issue:

While interest in the tests centers in the evaporation obtained, observations were also made to show the behavior of the fuel with reference to spark losses, the amount of refuse lodging in the ash pan, the draft necessary to maintain a given rate of combustion, the relative amount of smoke produced, the ease with which it may be fired, and such other minor facts as would necessarily suggest themselves; the purpose being to determine as completely as possible the relative behavior of the several samples submitted.

Five samples were submitted which, in the correspondence between your office and this, have been designated as A, B, C, D, and E. Each sample made up a car load lot, the cars were switched to the laboratory, and the coal was, in every case, delivered from the car to the fireman as needed, and at a single handling.

Evaporation.—Locomotive boilers in service are worked within such limits of power that each hour an amount of water is evaporated for each foot of heating surface, which falls between the limits of 4 and 11 lbs. For example, a boiler having 2000 ft. of heating surface may evaporate 10,000 lbs. of water per hour, in which case the rate of evaporation is said to be 5, since this is the number of pounds of water evaporated for each foot of heating surface per hour. Again if the same boiler is called upon to deliver 18,000 lbs. of steam per hour, the rate of evaporation becomes 9. Other things being equal, the amount of water evaporated per pound of coal depends upon the rate of evapo-

ration and is greatest when the rate of evaporation is least.

A comparison of the evaporative efficiency of the several samples, first, when the rate of evaporation per foot of heating surface per hour is 5 lbs., and, second, when it is 10 lbs. of water, respectively, is given in Table I.

Designation of samples.	Pounds of water evaporated per pound of coal.		Relative value of sample, calling the value of sample E, one hundred.	
	When the rate of evaporation is 5.	When the rate of evaporation is 10.	For use under light power.	For use under heavy power.
I.	II.	III.	IV.	V.
E.	8 61	6 61	100	100.
A.	8 00	6 11	93	93
B.	7.40	5.87	87	89.
D.	6 81	5 40	79	82
C	6 60	5 37	77	81.

TABLE I.—ACTUAL EVAPORATION.

Before these tests were taken it was thought likely that the character of the exhaust action would have a material influence on the evaporative efficiency of the boiler. It was for this reason that in the series of tests, as outlined, provision was made for running at a comparatively slow speed with a heavy exhaust, and also at a high speed with a lighter exhaust. The results show that for two of the samples the slow heavy exhaust gave an evaporation which relatively was slightly higher than that given by the quick lighter exhaust action, while in the tests of the remaining three samples, the conditions are reversed. In all cases the differences are so small as to make it quite likely that they arise from causes quite apart from the exhaust action

The conclusion is, that within the limits of the conditions chosen, there is no measurable difference in evaporative efficiency due to the character of the exhaust blast. If, in each case, the boiler is forced to the same power, the same degree of efficiency results.

Equivalent Evaporation.—In reporting data for tests similar to those under consideration, it is customary to reduce the water actually evaporated per pound of coal, to an equivalent weight which would have resulted had the temperature of the feed been constant at 212 degrees F and the pressure of steam been that of the atmosphere. The "equivalent evaporation" constitutes a logical basis from which to compare the performance of all boilers, even though the steam pressure, or feed-water temperature, or both of these, may vary greatly in different tests. In order that the result of the tests herein described may be readily compared with the results of other boiler tests, the actual evaporation has been reduced to the equivalent evaporation, with the results which are shown in Fig. 1.

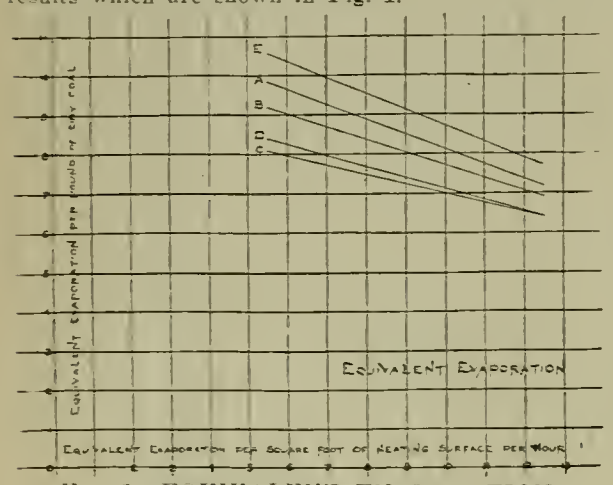


FIG. 1.—EQUIVALENT EVAPORATION.

Sparks.—For every test, a record of the weight of cinders entrapped in the front end was determined. Observations were also made to determine the weight of sparks passing out of the stack, but as it was impossible to entrap the entire stream issuing from the stack at any given instant, values obtained in this part of the work should be considered approximately only. The sum of the sparks caught in the front end and of those estimated to have passed out of the stack are, in the following paragraphs, considered together as constituting the spark losses. Values of the spark losses for each of the several samples of coal tested, expressed as a percentage of the weight of coal fired, are presented in Columns 2 and 3 of Table II.

Designation of sample.	Percentage of weight of coal fired accounted for as sparks entrapped in front end and passing out of the stack.		Relative weight of sparks produced by each of the several samples in generating the same weight of steam, assuming the weight of sparks resulting from sample E to equal one hundred.	
	When the rate of evaporation is 5.	When the rate of evaporation is 10.	When the rate of evaporation is 5.	When the rate of evaporation is 10
I.	II.	III.	IV.	V.
E	6 6	21 2	100	100
A	6.2	15 6	101	79
B	4 8	16 4	84	87
D.	5.7	17 4	109	100
C.	3 3	13.8	65	80

TABLE II.—SPARK LOSSES.

The extent of the spark losses disclosed by the preceding table cannot fail to surprise one who has not followed the work previously done at Purdue. It is significant that under conditions of running, common to practical service, that from 14 to 21 per cent of the coal fired disappeared in the form of sparks. (Col. III.) It is true, however, that the fuel lost is not so great as this, since the sparks represent fuel which has been partially consumed. The sparks resulting from samples under consideration have not been analyzed, but investigations already made at Purdue indicate that they have from 60 to 75 per cent of the fuel value of the coal. It will be safe, therefore, to reduce the values given in Cols. II and III by about 25 per cent in making an estimate of the fuel losses resulting from the passage of sparks through the tubes.

It is significant that, with one exception, those samples giving the highest evaporation also give the larger spark losses. Two conditions probably account for this fact. First, the purer coals have a lighter specific gravity, and hence, respond to the draft action more easily than coals intermixed with non-combustible matter; secondly, in general, the purer the coal the lighter the ash, a large percentage of which, instead of falling through the grate, passes out with the sparks and adds its mass to their weight.

It may be urged as an objection to these coals giving high efficiency, that their use is attended by a large spark loss. The argument, while good, is not true to the extent indicated by the values in Cols. II and III. For example, Col. III shows the percentage of the coal fired, accounted for as sparks, but a pound of sample C, producing 0.138 pounds of sparks did not make as much steam as a pound of sample E, producing 0.212 pounds of sparks. The relative spark producing qualities of the several samples, based upon the weight of steam generated, are given in Cols. IV and V. These values, therefore, serve as a logical basis from which to determine the relative spark producing qualities of the several samples

Refuse Caught in Ash-Pan.—Table III shows the percentage of the weight of coal fired which is accounted for as refuse in the ash-pan.

Designation of sample.	Percentage of weight of coal fired, accounted for as refuse in ash-pan.		Relative weight of ash resulting from different samples when the same weight of steam is generated, calling the weight resulting from sample E, one hundred.	
	When the rate of evaporation is 5.	When the rate of evaporation is 10.	When the rate of evaporation is 5.	When the rate of evaporation is 10.
I.	II.	III.	IV.	V.
E.	11.0	4.9	100	100
A.	10.7	9.2	105	203
B.	13.9	11.6	146	267
D.	14.8	10.3	170	257
C.	14.4	11.0	171	276

TABLE III.—REFUSE IN ASH PAN.

It is important in this connection to note that the refuse caught in the ash-pan of a locomotive does not represent the entire non-combustible portion of the fuel, for under the heavy draft of a locomotive much non-combustible material passes out through the tubes. Such portions of the non-combustible, mix with the sparks, and are, in the present work, accounted for as such.

The amount of refuse caught in the ash-pan, however, constitutes a factor of some importance in any consideration of the relative merits of the different fuels, since all such materials must be carried over the road and handled at terminals, or, if its amount becomes excessive, it must be handled at intermediate points.

By reference to the table it will be seen that when the engine is run at light power, the five samples give very nearly the same amount of refuse in the ash-pan. When the rate of evaporation is 10, however, sample C gives nearly three times as much deposit in the ash-pan as sample E. In general, it may be said that the better the fuel the less deposit there will be in the ash-pan.

It is clear, from the statements already made, that a very intimate relation exists between the amount of coal accounted for as refuse in the ash-pan and that accounted for in the form of sparks. If, for example, the values of Col. II, Table II, be added to those in Col. II, Table III, the result is practically the same for each of the several samples of coal, and if the values of Col. III of the same tables be added, they also become nearly a constant for all of the several samples of coal. The conclusion is that as the character of the coal changes with reference to refuse, an inverse change results with reference to spark losses. Such a result is logical and is quite in accord with the explanation given with refereuce to conditions affecting spark losses.

It is evident that the percentage of refuse caught in the ash-pan, given in Cols. II and III of Table III, do not represent the relative amount of ash for the different samples when the same work is to be done, for the reason that a pound of sample C will not yield the same amount of steam as a pound of sample E. The refuse which will result from each of the samples in producing the same amount of steam, as compared with that resulting from sample E, is given in Cols. III and IV. These columns, especially Col. IV, emphasizes the ash producing qualities of the poorer coals.

Draft.—The draft which promotes combustion in a locomotive is produced at the expense of back pressure on the engine. For this reason, a free burning coal will, other things being equal, contribute to the efficiency of the locomotive as a whole, since by its use the cylinders are allowed to do their work under conditions more favorable to economy.

A comparison of the draft necessary to maintain the combustion of the several samples tested is given in Table V.

Designation of sample.	Draft in inches of water.	
	Necessary to secure the evaporation of 5 pounds of water per foot of heating surface per hour.	Necessary to secure the evaporation of 10 pounds of water per foot of heating surface per hour.
I.	II.	III.
E.	2 02	5 58
A	2 12	6 08
B	2.26	6.02
D.	2 30	6.26
C	2.12	5 96

TABLE V.—DRAFT.

The results show that the samples A, B, and C require substantially the same draft for their combustion; that sample D requires a slightly greater draft than the three first mentioned, and that sample E requires a draft which is lower by about 10 per cent. The degree of uniformity disclosed by these results is really quite remarkable and the general conclusion to be derived from them is that, except in the case of E which has some slight advantage, all stand practically upon the same footing.

Smoke.—Coals A and E are the only coals that show any unusual smoke effects. The smoke produced by coal A is very black and does not clear between fires when the rate of combustion is as great as in the 30 or 50 mile tests. The coal E, on the other hand, does

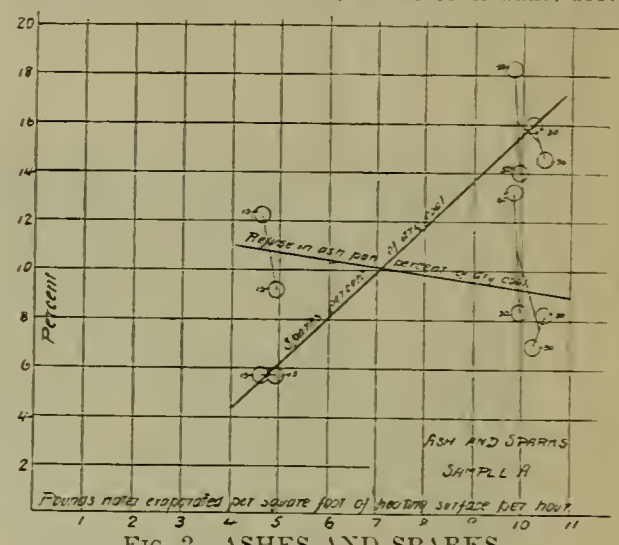


FIG. 2.—ASHES AND SPARKS.

not produce sufficient smoke to color the exhaust for an interval of more than five seconds after it is shoveled into the furnace; when the fireman is putting in the fire there is a single puff of smoke each time the door is opened, and immediately after the exhaust clears. Coals B, C, and D are nearly equal in their smoke-producing properties. They will make enough brown smoke to color the exhaust continuously on a hard run, but when the firing is light the exhaust will clear between fires.

Ease in Firing.—The labor of firing is, in general increased by conditions requiring the use of the hook.

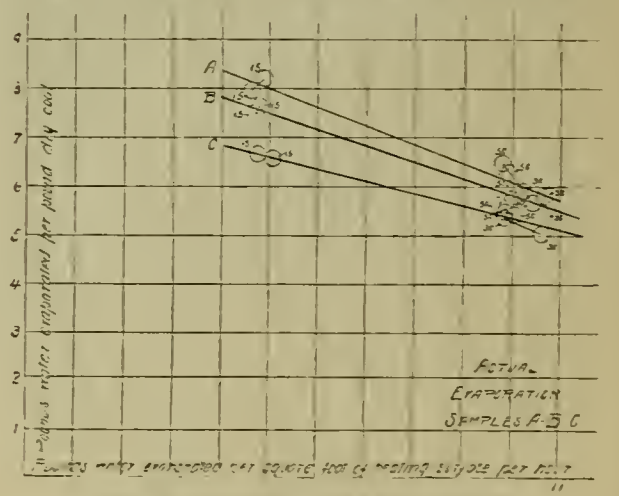


FIG. 3.—ACTUAL EVAPORATION.

The necessity for this arises when a coal cokes readily or when it clinkers.

Sample E, which gives the highest evaporative efficiency, the least ash, and requires the least draft for its combustion, cokes as soon as fired, and for this reason it is handled at the expense of more labor than either of the other samples. It is possible that in service on the road the tendency to shirk this labor may lead to unevenness in firing which will necessarily result in a lower efficiency for this coal than has been at-

tained in the laboratory, where careful attention was at all times given to the firing. None of the coals tested gave so much clinker as to require the frequent use of the hook.

No final conclusions should be drawn which do not

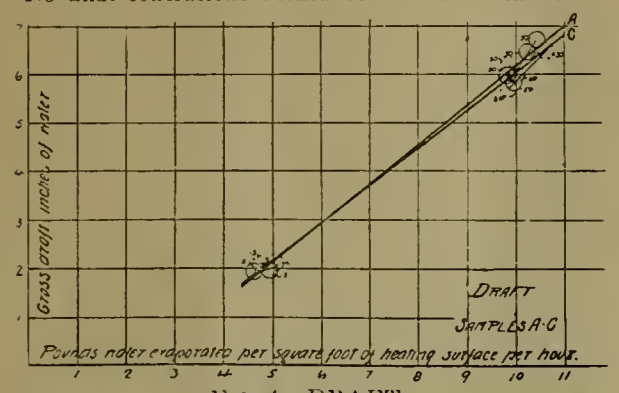


FIG. 4.—DRAFT.

take into account the relative cost of the several samples, a factor which is unknown to the writer. It is evident, however, that no one sample can be said to be the best in every respect. For example, the relative desirability of the several samples, with reference to evaporation, freedom from spark losses, absence of objectionbale accumulation in ash-pan and the lightness of draft necessary to promote its combustion is given in Table VI.

Designation of sample.	Evaporation.	Freedom from spark losses.	Absence of accumulation in ash-pan.	Lightness of draft.
E.	1st	4th	1st.	1st
A	2nd	1st.	2nd	4th.
B	3d.	3d	4th.	3d
D.	4th	4th	3d	5th
C	5th	2nd	5th	2nd

TABLE VI.—RECAPITULATION.

The four factors by which it is sought, in the preceding tabulation, to judge the value of the several samples do not stand on an equality. It is evident that a high evaporation is more to be desired than lightness of draft, but the facts disclosed are instructive nevertheless. They show that sample E which excels in evaporation, shares with D the doubtful honor of being the largest spark producer. Also, that sample C, which gives the lowest evaporative efficiency, is second in its freedom from sparks and in lightness of draft.

Reviewing the data with reference to D and C, it will be seen that while D gives an evaporation which is slightly higher than that given by C, in all other respects the latter excels, and doubtless for most purposes C is a more desirable coal than D. But the significance of all the factors, excepting evaporation, will doubtless need to be considered in connection with the demands for a given service.

DOUBLE-END SUBURBAN LOCOMOTIVE, NIPPON RAILWAY OF JAPAN.

The Schenectady Locomotive Works have recently completed 26 double-end narrow gauge suburban locomotives for the Nippon Railway of Japan, and we present herewith a view of one of these engines. This engine weighs 86,700 lbs., of which 51,700 lbs. is on the drivers. Its cylinders are 14 by 22 ins. The engine has 56-in. drivers; a straight boiler 46 ins. in diameter, designed to carry 180 lbs.; a heating surface of 836.8 sq. ft. and a grate area of 18.2 sq. ft. The leading dimensions of this engine are as follows:

GENERAL DIMENSIONS.

Gage .....3 ft. 6 in.
Fuel ..... Japanese bituminous coal.
Weight in working order .....86,700 lbs.
Weight on drivers .....51,700 lbs.
Wheel base, driving .....5 ft. 6 in.
Wheel base, rigid .....5 ft. 6 in.
Wheel base, total .....21 ft.

CYLINDERS.

Diameter of cylinders .....14 in.
Stroke of piston .....22 in.
Horizontal thickness of piston.....4¾ in.
Diameter of piston rod .....2¼ in.
Kind of piston packing .....Cast iron
Kind of piston rod packing .....Jerome metallic
Size of steam ports .....12 in. x 1⅛ in.
Size of exhaust ports .....12 in. x 2¼ in.
Size of bridges .....⅞ in.

VALVES.

Kind of slide valves .....American balanced.
Greatest travel of slide valves .....5 in.
Outside lap of slide valves .....⅞ in.
Inside lap of slide valves .....0 in.
Lead of valves in full gear.....
..... Line and line, front and back.
Kind of valve stem packing.....Jerome metallic.

WHEELS, ETC.

Diameter of driving wheels outside of tire.....56 in.
Material of driving wheel centers.....Cast steel.
Tire held by .....Shrinkage.
Driving box material .....Steeled cast iron.
Diameter and length of driving journals.....
.....7 in. dia. x 8 in.
Diameter and length of main crank pin journals.
.....4½ in. dia. x 5 in.
Diameter and length of side rod crank pin journals..Front 3½ in. x 3¾ in.; back 5¼ in. dia. x 4¾ in.
Engine truck, kind.....Two wheel swing bolster.
Engine truck, journals.....5 in. dia. x 8 in.
Diameter of engine truck wheels.....33 in.
Kind of engine truck wheels.....
.....Steel tired wrought iron spoke center.

BOILER.

Style ..... Straight.
Outside diameter of first ring.....46 in.
Working pressure .....180 lbs.
Material of barrel and outside of fire box.....
..... Carnegie steel.
Thickness of plates in barrel and outside of fire box ..... 7-16 in., ½ in. and 9-16 in.
Horizontal seams ..... Butt joint sextuple riveted, with welt strip inside and outside.
Circumferential seams .....Double riveted.
Fire box, length .....48 3-16 in.
Fire box, width .....54⅜ in.
Fire box, depth .....46½ in.
Fire box, material .....Carnegie steel.
Fire box plates, thickness.....Sides 5-16 in., back 5-16 in., crown ⅜ in., tube sheet ½ in.
Fire box, water space .....
.....Front 4 in., sides 3 in., back 3 in. to 4 in.
Fire box, crown staying.....Radial stay, 1 in. dia.
Fire box, stay bolts .....⅞ in. to 1 in. dia.
Tubes, material .....Charcoal iron.
Tubes, number of 159
Tubes, diameter .....1¾ in.
Tubes, length over tube sheets.....10 ft. 8 in.
Heating surface, tubes .....771 sq. ft.
Heating surface, fire box .....65.8 sq. ft.
Heating surface, total .....836.8 sq. ft.
Grate, surface .....18.2 sq. ft.
Grate, style .....Rocking.
Ash pan .....Plain, dampers front and back
Exhaust pipes .....Single
Exhaust nozzles .....3¼ in., 3⅜ in., 3½ in.
Smoke stack, inside diameter .....12 in.
Smoke stack, top above rail.....12 ft. ½ in.
Boilers supplied by .....
.....Two No. 6 New Nathan non-lifting injectors.

TRAILING TRUCK AND BACK OF ENGINE.

Kind of truck .....
.....Two-wheel swing bolster, with radius bar
Wheels, number of 2
Wheels, diameter .....33 in.
Journals, diameter and length.....5½ in. dia. x 8 in.
Water capacity (twin tanks, one on each side of boiler) ..... .1200 U. S. gallons.
Coal capacity (coal bunker back of cab).....4500 lbs.

SPECIAL EQUIPMENT.

Engine equipped with two Coales 2½-in. encased safety valves; two water gages; Smith automatic vacuum brake, outside equalized; magnesia sectional lagging on boiler and cylinders; three headlights with 8-in. bull's eye lens; two whistles, 1-3 in. and ¼ in., Crosby No. 3 chime.

DOUBLE-END SUBURBAN LOCOMOTIVE, NIPPON RY., JAPAN.

AIR BRAKE DRAIN CUP AND STRAINER.

A very serviceable drain cup and strainer for use on air brakes has been devised by Mr. Thomas B. Hunt, general foreman Pennsylvania Company, at Chicago. We illustrate the device giving in Fig. 1 a sketch showing its location with reference to the train pipe and the triple, and in Fig. 3 a sectional view in detail of the cup and strainer. Its construction will be readily understood by reference to the cuts, A being the coupling to the branch pipe, B a cap which is removed to remove the strainer D, C a washer to make tight joint, E the top rest for the strainer, and F and G the upper and lower chambers respectively of the drain cup. Fig. 2 shows a form of double strainer that can be used if desired instead of the single form.

In referring to his device Mr. Hunt says in substance: "By using this device we leave the main pipe entirely unobstructed and get entirely away from the undesirable practice of breaking or taking apart the main air pipe in order to clean the drain cup and strainer. The drain cup is provided with a removable strainer to be removed by simply taking off the bottom cap B and taking hold of the ring or inside band of the strainer with the finger or some hooked implement. This band or inner ring of the strainer serves a two-fold purpose—to keep the strainer from collapsing, also that we may take hold of it to pull it out. The strainer may be used singly or doubly as desired, as one fits inside the other. I do not think the double strainer is at all necessary. The small basket strainer at the union to

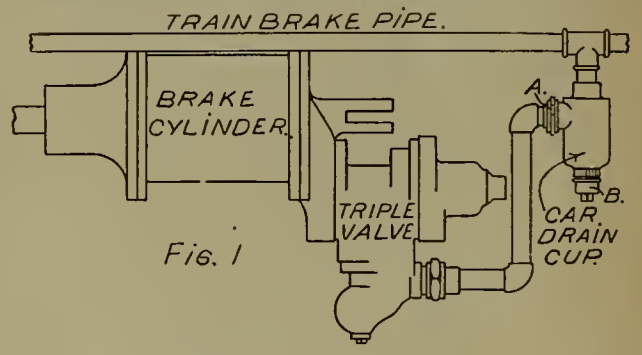


Fig. 1

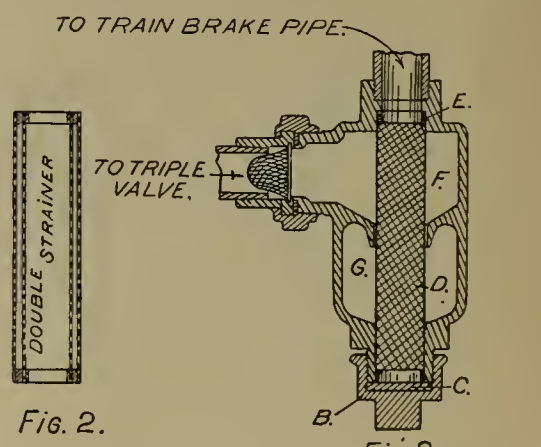


Fig. 3.

Fig. 2.

AIR BRAKE DRAIN CUP AND STRAINER.

triple valve need not be used, and I do not think should be used. It is entirely unnecessary. This arrangement can be very readily looked after and cleaned. We believe that a passenger train of ten cars fitted up with this device could be drained and have the strainers brushed off in from twenty to twenty-five minutes and this, too, without interfering with the main pipe, while with the present device now in use the time consumed in doing this work would be about an hour and if you would have a little bad luck or the pipe break on you in taking it down it would possibly be two hours, as the drain cup would have to be removed from the main air pipe, the strainer unsoldered and cleaned and then soldered on again and drain cup put in position

again in main air pipe. We believe that the application of a drain cup of this pattern to cars would be very little more in first cost than the present cup and strainer. If this drain cup was applied to freight cars we could then exact of our people to clean the drain cups and strainers every time cars would be on the repair track for the reason that it would take so little work to accomplish this as it would take very little time and labor to go over all the cars on the track; hence, we could insure better working of the brakes. With this device there will not nearly so much dirt and water pass through the triples as now. The strainer as now constructed clogs up with dirt, filling the meshes of same except that part of it which comes immediately in contact with the branch pipe, and oftentimes this portion is almost clogged up. With this device there is no danger of collapsing strainer partly filling up and obstructing the main pipe, as it is entirely away from the main pipe; with this device such an occurrence would only affect the brakes on the car on which it would be placed. With this drain cup we are able to use a strainer with very fine perforations for the reason that we have so much strainer surface."

THE PURPOSE OF PATENTS.

Section 8, clause 8, of the constitution grants power to congress to promote science and the useful arts by securing to inventors the exclusive use of their discoveries for limited terms. Congress therefore has power to grant patents or to decline to grant them. It may fix the term and the fee, but it cannot attach conditions to the grant. The right must be exclusive, for there is no power to grant any other than an exclusive right. To make the patent dependent upon the payment of an annuity would be a condition repugnant at once to the constitution and to good policy, because the basis of patents here is different from the basis everywhere else. In all other countries it is a personal grant and it is not unfair to say it may be forfeited if not used. In this country it is not a grant at all, but a contract between a man who has a valuable invention and a public who desires to purchase it. The public says if you will disclose your invention, we will guarantee you the exclusive use of it in public for seventeen years. That is a fair bargain. If the inventor thinks he can make more out of a seventeen-year monopoly in public than he can by a secret use, so long as he can keep it secret, he will accept; otherwise he will not.

It must be noted that under our law and constitution the invention belongs exclusively to the inventor for seventeen years. After that, for all time, it belongs to the people. Therefore the people have no rights in it for seventeen years, and no right to complain if the inventor's interests impel him to lock the invention up. A great deal is said about dead and unused patents which are worthless and yet stand in the way of more recent and more meritorious inventions. Where are these dead and worthless patents? If they are dead and worthless how can they stand in any one's way? If they do stand in the way, then they are not dead or worthless. But where are they? In the vaults of manufacturers who hold them, not for use, but for protection. It is sure, if this protection is valued, the annuities will not clear them away, and it is equally sure that many a good invention will be cleared away because the struggling inventor has reached his last cent before the annuity becomes due.

The only basis for patents is in the constitution, and the sole reason is, the promotion of science and the useful arts. If patents promote science and the useful arts, it is reasonable to conclude the more patents the more promotion. Every patent represents an advance in useful knowledge and that is promotion. If progress is a good thing, then progress should be promoted by smoothing the way and removing discouragements—not by roughening the way and imposing burdens. The surplus revenue of the patent office now amounts to over $5,000,000 which rests in the treasury idle. It is not revenue of the government and cannot be used except for the purposes of the patent office. It is accumulating more than $100,000 a year. The fees and costs of obtaining a patent ought to be reduced or the facilities of that office ought to be increased. In either event science and the useful arts would be promoted by further encouraging the production of inventions.—R. D. O. Smith, in American Trade.

PNEUMATIC STEAM JOINT GRINDER.

A valuable utilization of the Boyer piston air drill has been effected by providing a chuck attached to the drill for holding rings in grinding steam joints. The chuck is made with three legs or arms, which are expanded by the use of nuts on the threaded spindle in the center, as shown in our engravings. Our two views show this machine in actual operation on a joint in a cylinder saddle and on a steam pipe. This tool is a money-saver on new as well as repair work; and for hurry-up jobs on leaky steam pipe joints in roundhouse work it is very valuable in doing work quickly and helping to get the engine out for service without delay. This device will be

GRINDING STEAM PIPE JOINT IN CYLINDER SADDLE.

readily appreciated by all mechanics who have done this sort of work by hand, when they compare the amount of time required with that necessary in doing the same work by hand. The time required for this tool in grinding ordinary joints is only about 15 minutes, but of course this depends largely upon the condition of the work to be done. The Boyer piston air drill with which this device is operated is too well known among the shops throughout this country to require further explanation. This device is offered by the Chicago Pneumatic Tool Co., of Chicago.

BOOK NOTES.

RAILWAY ECONOMICS, by H. T. Newcomb, LL.M., Chief of the Section of Freight Rates in the Division of Statistics of the United States Department of Agriculture, and Instructor in Statistics and Transportation in Columbian University. Philadelphia: Railway World Publishing Co., 1898.

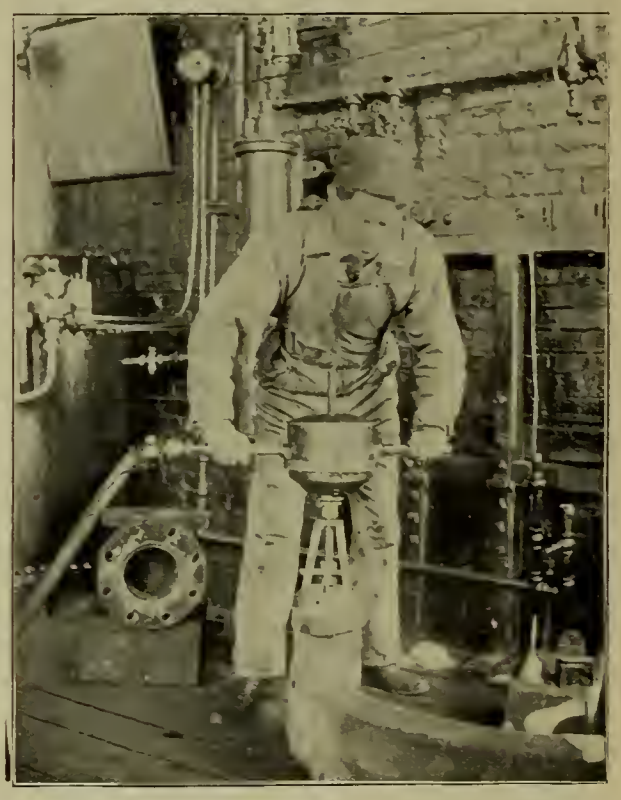
This work was originally prepared for serial publication in the Railway World, and was intended to present the principal facts which establish the position of railway transportation in the present organization of industry in the United States, with only so much of comment and discussion as seemed absolutely necessary. The author does not attempt an ambitious and exhaustive treatment of the very important topic that he has before him but simply attempts to present a concise and untechnical statement covering the leading divisions of his subject. A few of the chapter headings of this book will serve to give an idea of the author's scope. Some of them are as follows: "Capitalization," "Income and Expenditure," "The Decline in Charges," "Rates and Prices," "Competition Among Railways and the Decline in Charges," "Competition Among Producers and the Decline in Charges," "Should the Business of Railway Transportation Be Remunerative?" "Relatively Reasonable Rates," "Unjust Discrimination in General," "Charges for Long and Short Hauls," "Pooling Prior to 1887," "Pooling Under Federal Supervision," "Pooling, Consolidation or Unjust Discrimination." Mr. Newcomb has been, and is, in an exceptionally favorable position from which to study the subjects of which he treats, and he has quite thoroughly covered his topics considering the limitation of space which he sets. He writes in a simple, straight-forward style and has produced a book which should find a place in every railway man's library.

THE DESIGNING OF DRAW-SPANS. By Charles H. Wright, M. Am. Soc. C. E. First edition, first thousand, 1898. Published by John Wiley & Sons, New York, and Chapman & Hall, London. Cloth, 6x9 ins., 317 pages; price $3.50.

This book is in two parts, the first part dealing with "Plate Girder Draws," and the second part with "Riveted-Truss and Pin-Connected Longspan Draws." The author's aim was to collect in this volume all the material necessary for the complete designing of the common types of draw-spans, and to arrange it in form for practical use; and he seems to have succeeded. A valuable feature of the book is the very large amount of illustrations, by way of figures incorporated with the text and numerous folders showing details of existing structures. After going into the theory and formulas applying to moments, reactions, stresses and deflections, several pages are devoted to the design of machinery for turning the span, operating wedges, etc. There is a very good list of illustrations showing the machinery in use on for operating existing structures. End-lifting and turning machinery are each taken up separately and discussed with reference to the forces to be overcome and proper principles of design. The different systems of operating draw-spans by steam, electricity, etc., are considered fully, both theoretically and by illustration of practical applications. A very interesting feature of the work also is contained in 60 pages devoted to descriptions of various existing bridges. Among the bridges shown and described we notice several examples of structures in Chicago, New York, Cleveland, Duluth, Milwaukee, Omaha, Buffalo, and other places. Among these we notice a mention of the famous "8-track railroad drawbridge" over the Chicago drainage canal in Chicago, which is evidence that the author is strictly up to date. There are specifications of parts of drawbridges and devices used in connection therewith and 12 folding plates, giving drawings of several noted railroad single and double-track through draw-spans.

"What to Eat," an authority on foods, cooking, service, table decorations and furnishings opened its new year with a particularly attractive issue, comprising nearly 20 articles written on the lines indicated. This magazine is published monthly at Minneapolis, Minn., at $1 a year, and to those interested in its distinctive line of topics is worth far more than its price.

The National Railroad Master Blacksmiths' Association has just published in pamphlet form the proceedings of its sixth annual convention, held at Boston, Mass., last September. These proceedings comprise a large amount of exceedingly valuable matter. The Master Blacksmiths' Association, which has been in existence since 1893, has taken high rank amongst our railway associations and is doing most excellent work. Its proceedings merit very wide circulation. The secre-



GRINDING FLAT JOINT ON STEAM PIPE.

tary, Mr. A. L. Woodworth, of Lima, Ohio, is to be commended for the excellent manner in which he has edited these proceedings, and for presenting them in such tasteful typographical form.

The American Steel Casting Company, of Thurlow, Pa., has issued a catalogue which in typographical excellence, beauty and interest of illustration, and in effectiveness of presentation of its subject matter, has rarely been equaled by the books which come to our table from time to time. The illustrations cover chiefly its remarkably large and complicated steel castings for special purposes. Heavy gun carriage castings, Bessemer converter trunnions, locomotive driver centers, locomotive frames, engine bed plates, stern posts, rudders, propellers, crank shafts, form the leading subjects of illustration

The Builders Iron Foundry of Providence, R. I., has issued a very complete little catalogue illustrating its full line of grinding and polishing machinery.

The Safety Appliance Company, of Boston, Mass., issues a neat catalogue in which are illustrated and described the specialties of that company, including

the brake equalizer, the draw bar adjuster, the spring suspension, and the dead lever take up, which this company now offers. The pamphlet contains much suggestive and valuable information.

The San Francisco Bridge Company and New York Dredging Company send us a beautiful pamphlet illustrating the various engineering works which they have constructed. It contains many interesting stories of some of the remarkable engineering undertakings of the companies named, and the illustrations are rarely beautiful.

The New Britain Machine Company, of New Britain, Conn., has published a handsome catalogue of the large line of engines which it manufactures. The pamphlet is very tastefully prepared and the text gives a thoroughly adequate idea of the principles of the company's high speed engines for small powers. The same company also publishes a similarly attractive catalogue decribing its line of chain saw mortisers. The peculiarity of this mortiser is that the mortise is made by a steel chain, each link of which has a sharpened tooth so formed as to carry out its own chip. This chain travels approximately 1500 ft. a minute, during which period 40,000 teeth are presented to the work, and while one tooth removes but a small amount of material, the collective cut of all the teeth greatly exceeds anything possible by other mechanisms.

The leading article in Appleton's Popular Science Monthly for February discusses the very important question of Vegetation in Cities in its relation to healthfulness. Dr. Smith, the author, has been one of the leading physicians of New York city for the past 25 years, and is hence well qualified to speak authoritatively on the subject. Mivart's Grounduork of Science, by W. K. Brooks, of Johns Hopkins University, calls attention to some of the weak points in Dr. Mivart's philosophy, and points out the evil effects which such attempts at compromise always produce. Mr. C. L. Whittle contributes an extremely important article on The Science of Observation. He first calls attention to the necessity of knowing how to observe intelligently, and then takes the reader to a number of places, by means of photographs, where Nature's methods are strikingly illustrated, and shows how, by a study of such common features as railroad cuts, ledges of rock, and washouts, some of the most powerful forces in Nature can he demonstrated and the present features of the landscape explained by their past action. The Labor Problem in the Tropics, by W. Alleyne Ireland, gives the results of a study of this question during a residence of many years in tropical colonies; points out how essentially different a problem it is from that of labor in a temperate climate, and comes to the conclusion that in a large part of the tropical islands contract labor is an absolute necessity, if any commercial success is to be achieved.

The history of French philosophy, which Prof. L. Levy-Bruhl, of Paris, is writing for the Open Court has reached the middle of the 18th century. The subject for the February number is Voltaire, and the article is accompanied by a portrait of this great thinker. The March number, which will treat of the Encyclopaedists, will be richly illustrated. Rationalism in the Nursery is the title of a second article appearing in the Open Court for February by Dr. Paul Carus on the treatment and education of children. This series, which is of high importance to parents and educators, will be continued in the following numbers. The same magazine is also publishing a number of very interesting articles on the History and Evolution of General Ideas, by Prof. Th. Ribot, of Paris. The February number treats of the intelligence of animals.

"Graphite" is the title of a handsome little four-page monthly issued by the Joseph Dixon Crucible Co., of Jersey City, N. J. It is issued in the interests of Dixon's graphite productions, and for the purpose of establishing a better understanding in regard to the different forms of graphite and their respective uses. This publication has certainly a very interesting field and fills it in a very instructive as well as attractive manner. As is said in one of the articles appearing in the current issue, few even of the well informed dream how indispensable graphite is to modern civilization. We quote further from the article referred to: "Not a single iron casting is taken from its sand mould without the sand being first faced by graphite; not a gun projectile is cast but the steel is melted in a graphite crucible; not a tool, not a saw is made but from graphite crucible steel. Every pound of nickel, of copper, of composition metal, of brass, is cast in some way, the metal being reduced in a graphite crucible. Every printing house, for the perfection of its electrotypes, is absolutely dependent on graphite. Every electrician and every department of electrical work comes under the same tribute. Graphite lubricates friction ways, it is notably the most enduring paint pigment, and the bulk of the writing done on the globe to-day is done with a graphite pencil. In brief, not a factor which today contributes to civilization but is helped by graphite. The electric light would shine much less easy but for graphite, and the production of steel rails is equally dependent. The beautiful mineral has peculiar charms and characteristics. Heat and cold, and the highest and lowest extremes of both, cannot touch it. It can bathe in acid as does a pebble in cold water."

THE CRANDALL BELL RINGER.

Mr. E. M. Crandall, foreman machine shops of the Kansas City, St. Joseph & Council Bluffs Ry., at St. Joseph, Mo., has devised an automatic bell ringer that has proved its worth in daily service for nearly a year. We illustrate this bell ringer in quite complete detail. Fig. 1 gives it in elevation as applied, and Fig. 2 shows its internal structure, the piston being shown in its varying positions.

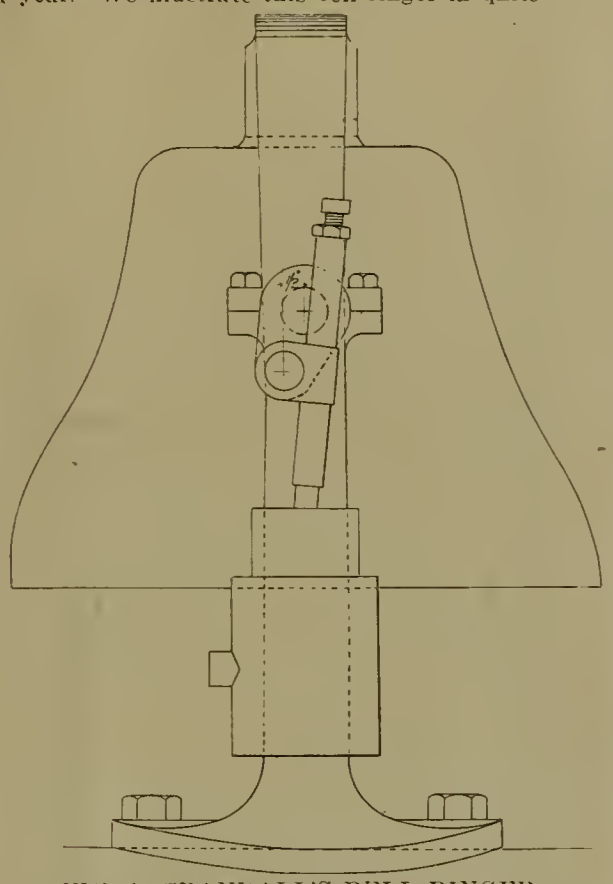


FIG. 1—CRANDALL'S BELL RINGER.

In Fig. 2 A shows the piston at the bottom of the stroke with the inlet part wide open, as shown at section b, b. The set screw is at the top of the groove, and as the piston rises it will follow the line of the groove marked a, a, as shown on E, giving the piston a spiral motion, and also cutting off the air and bringing the exhaust port open when the piston is at the top of the stroke, as shown in section a, a. B shows the piston at the top of the stroke with the exhaust port open, as shown at section a, a. Here it will be seen that the set screw is at bottom of the groove. In operation the weight of the bell will bring the piston down. The ringer is made entirely of cast iron.

The ringer may be operated by either steam or air, but air is much preferred by Mr. Crandall. These ringers are in use at St. Joseph, and also at Burlington and at Aurora on the Chicago, Burlington & Quincy.

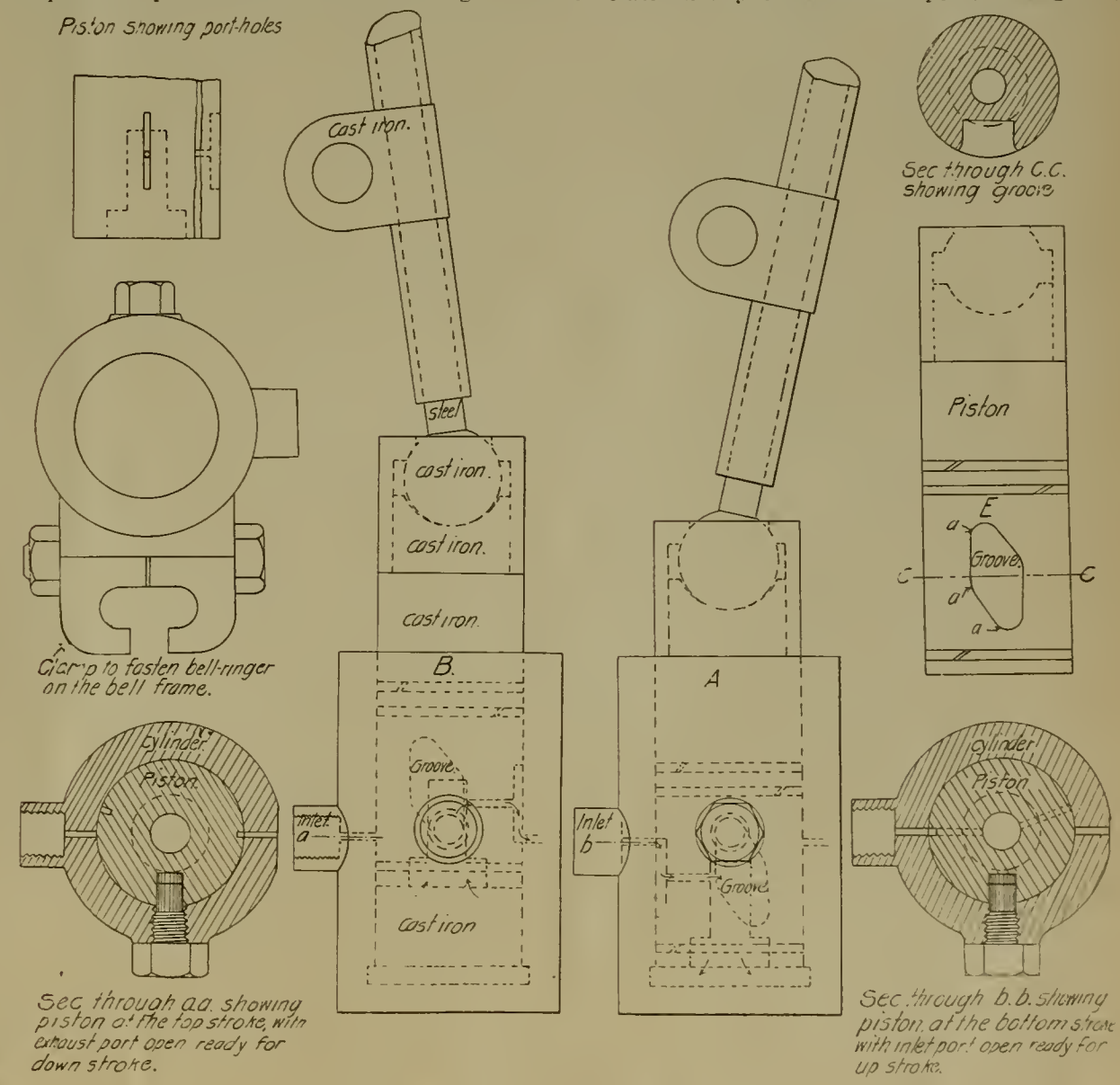


FIG 2 CRANDALL'S BELL RINGER.

CONCERNING ARTIFICIAL LEATHER, MOROCCOLINE, ETC.

The first patents granted in this country and Europe for artificial leather and the method of producing it were issued to Mr. Walter N. Dole and associates 20 years ago. Mr. Dole is not only the pioneer in this business but has been a chief factor in its development from the beginning. He is the manager of the Boston Artificial Leather Company of Boston. A detailed history of the development of artificial leather from its first crude inception to the present perfected article would show that it called for all the energy, pluck and patience which even the typical New England man can supply. The road which led to the present position of success and importance was by no means an easy one. In view of all the facts it would seem that Mr. Dole is justified in claiming to be the originator of artificial leather and all others are imitators.

The product which the company is now selling is called Moroccoline. It is of interest to railroad men because it has proved highly satisfactory as a covering for car seats in smoking cars; for dining car and smoking room chairs and similar uses. It is furnished with embossed surfaces of any selected design and the dies used to reprodnce the design are precisely the same as those used for real leather It is also furnished in any desired color or shade.

Its cost is about one-third that of the hand-buffed upholstery leather which it so closely resembles, and to which for steady and hard service it is much preferable.

As to its durability the manufacturers assert with great positiveness that it will wear as long as the best upholstery leather; that it will not grow hard or crack in any climate or temperature and that

stains of oil or grease can be easily removed and will leave no stain or mark. They also assert that it differs from all other imitations of leather in that it will not show scratches. In fact the experience of a number of railroads, extending over several years, proves that the durability of this article is all that can be asked.

Years ago two pieces of drill or duck were pasted together and the outer surfaces were then coated with the artificial leather. This is the method usually pursued by those who are now in the business. But it was found that the two pieces of cloth would often separate and thus by producing blisters, ruin the fabric after a short term of service. The manufacturers of Moroccoline therefore use a single heavy sheet of duck and thus avoid blistering and separation.

The slight odor apparent when these goods are first unrolled disappears in the process of upholstering.

The surface of Moroccoline is impervious to dust and can be wiped or washed as often as desired. It is therefore, for sanitary reasons, an ideal substance for the uses above suggested and for many other similar ones.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.

JANUARY MEETING.

The regular meeting of the Car Foremen's Association of Chicago was held at the Great Northern Hotel, Chicago, January 12. President Morris called the meeting to order at 8 p. m. Among those present were:

Alderson, A. S.	Kramer, Wm.
Ashcroft, Norman.	Keebler, C. F.
Anderson, A.	La Rue, H.
Bates, B.	McOmber, A. H.
Blohm, Theo.	Miller, M. M.
Bohan, W. J.	Martin, J. F.
Callahan, J. P.	Miller, Wm.
Cook, W. C.	Morris, T. R.
Depue, Jas.	Nelson, John.
Etten, L.	Nordquist, Chas.
Fritz, Chas.	Northam, F. R.
Frenk, Wm.	Olsen, Louis.
Frank, M.	Penn, O. A.
Ford, George.	Rieckhoff, Chas.
Godfrey, J.	Showers, G. W.
Groobey, Geo.	Stuckie, E. J.
Green, C. E.	Stocks, James.
Grieb, J. C.	Schutt, W. F.
Gradl, M.	Spohnholtz, Chas.
Guthenberg, O.	Shannon, S.
Goches, Wm. H.	Smith, R. G.
Guthenberg, B.	Stagg, C. S.
Gruhlke, E.	Schultz, Aug.
Hunt, T. B.	Schultz, F. C.
Holtz, Christ.	Saum, Geo.
Hansen, A. P.	Smith, E. B.
Husband, E.	Thiverge, J.
Hennessey, J. J.	Thrall, Jno.
Jones, R. R.	Van Vliet, J.
Jones, A. A.	Wensley, W. H.
Johannes, A.	Wentsel, Geo.
Johnson, A. F.	Weschler, Henry.
Kehm, H. C.	Williams, Thos.
Krump, M.	Warren, W. G.
Kamen, Fred.	Wagener, A. M.
Kroff, F. C.	Wharton, R.

President Morris: The minutes of the previous meeting have been published in the Railway Master Mechanic and if there are no objections they will stand approved as published.

Secretary Cook: The following names have been submitted to the executive committee and approved, and the gentlemen will be enrolled as members:

J. C. Thiverge, C. & W. I. & Belt Ry.; C. F. Keebler, P. F. W. & C.; D. Murray, P. C. C. & St. L.; A. M. Waitt, L. S. & M. S.; J. Horrigan, E. J. & E.; Geo. Rosar, M. P. Schmidt, F. H. Longfellow and Chas. Fritz, C. M. & St. P.; F. B. Parmelee and Norman Ashcroft, P. D. D.; Robt. P. Lamont, Simplex Ry. Appliance Co.; A. C. McCord, McCord & Co.; S. J. Kidder, Westinghouse A. B. Co.; H. McCrudden, M. C. Ry.; Morris E. Ward, Chicago-Cleveland Car Roofing Co.; W. H. Miner, C. F. T. Co.; H. C. Buhonn, McConway & Torley Co.; H. H. Vaughan and J. K. Lencke, Q. & C. Co.; C. A. Herriman, Railroad Supply Co.; Wm. D. Sargent, The Sargent Co.; Fred J. Green, McGuire Mfg. Co.

President Morris: The secretary has been corresponding with similar associations at Indianapolis and Cincinnati, and I think it will result in considerable good to all concerned. The secretary will please state what has been done in this connection.

Secretary Cook: The matter was taken up by one of the members of the advisory committee, Mr. Grieb, who had some correspondence with the Big Four road, which resulted in our getting into communication with the Car Foremen's Associations located at Cincinnati and Indianapolis. We have written the secretaries of the two clubs, giving them a history of our club and information on different points of our work, and have asked them to give us a similar report on their organization. The matter was only taken up a few days ago and we have not had time to receive a reply yet, but no doubt will have full information before our next meeting.

Pres. Morris: The subject of the parting of trains is one that is of a good deal of interest just now. It has been taken up by all the clubs in the country, and it seems to me that the Car Foremen's Association ought to put itself on record on this question. I think it would be a good plan to have a committee appointed to investigate and report.

Mr. Groobey moved that a committee be appointed to investigate the parting of trains, and offer any remedies that may suggest themselves to the committee, and the motion prevailed. President Morris appointed on the committee Mr. Geo. Groobey and Mr. R. W. Burnett. Secretary Cook reported that he had a communication from Mr. E. B. Smith on the subject of parting of trains, referring to cases that had come to his notice of trains parting without knuckles opening. This communication was referred to the committee.

Pres. Morris: We will now take up the question in interchange, which reads as follows:

"A" delivered to "B" a loaded flat car belonging to "C." Six days later "B" returned the car to "A" empty, with drawbar, draft spring, followers and pocket in good condition on top of car, also pieces of two draft timbers and head block. End sill at this end was so damaged on account of the drawbar in next car striking it that it had to be removed. "A" requested a defect card from "B" for the broken end sill, the other defects being owner's. "B" replied that he received car from "A" with one draw lug, one draw lug bolt, one head block, four draft timbers and one head block bolt broken, old defects. "B" also says that on the day following receipt of the car, as a result of these defects, the drawbar was pulled out and the other damage followed. "B" refused to issue card for the reason that he received car from "A" in bad order. "A" claims that "B" could have made all repairs to the car at owner's expense and that failure to do so made "B" responsible.

Mr. Jones: In the first place, as I understand it, A delivered B a car with four draft timbers broken, and bolts and lug casting, etc. Now they claim that if car had been repaired it would have saved this damage; and the question is, could car be repaired? Was car loaded, and if so, was it loaded over the draft timbers so you could not put bolts in? The end sill was broken by the drawbar in the other car. I do not think that would not form a combination. Still, we had a case similar to this some time ago, and I would not like to say a great deal on it at this time.

Mr. Wentsel: There is not much chance for argument, according to my way of looking at it. B accepted this car from A in that condition, and if he does not make repairs he certainly becomes responsible. He could have made repairs to the car and billed owners. If he did not, he became responsible for the breakage.

Mr. Hunt: If the car was in a damaged condition when A delivered it to B, B had a right to repair it. Whether he could repair it or not hardly enters into the case. You might say that he could not repair it, but could have transferred the freight. At any rate, B damaged the car further. Now when B gets through it forms a combination of defects. I do not think he had any right to give car back to A in that dilapidated condition. It seems to me that the proper thing for B to do at that time was to avoid damaging the car further and communicate with the owner. Now there were defects that did not occur simultaneously; in fact, there appears a report that the car was simply damaged when given to B, but that it was further damaged by B. Now, of course, that was not simultaneous damage. The car was then damaged to break into a combination, and it seems to me that B should have held that car and communicated with the owner. At least, it was B's case after he had taken car and damaged it further.

Mr. Callahan: When they pulled this timber off they could have made repairs and billed owners, but after end sill is damaged, there is a ruling of the arbitration committee (I cannot call to memory the case) to the effect that the company is responsible for consequential damage. In this case the consequential damage to that car made it a combination of defects when they delivered car back to A, and it clearly shows that B is responsible. I think it would be advisable to look into when this damage was done to the car. Was the car in the yard or going out on the road? The car must be handled if received by B and he marked it for repair track.

A Member: To make these repairs they are liable to pull the draft timbers out before they get it to the repair track. He cannot be responsible in case like this. That is going back to the old-time way of holding loads on the repair track and not letting them go forward. I should think in this case B should not be responsible.

President Morris: This drawbar was pulled out the day after it was received. The case specifies that. Car was received one day and the drawbar was pulled out the following day.

Mr. Stuckie: In my opinion, what is an owner's defect is always an owner's defect; and if you have a right to make repairs and charge to owners, you have a right to deliver car back in that condition, and let them make their own repairs. Now it seems to me that there was not much wrong with car when draftbolt was broken, the other being in good condition on top of car. The end sill was not broken at the same time these draft timbers were pulled off; therefore it could not be a combination. Of course if they had made repairs it would have saved the end sill; but seems to me as though the damage must be done at the same time to make it a combination.

Mr. Grieb: I must take exception to the remarks made by the last speaker to the effect that an owner's defect will always remain an owner's defect. It seems to me that there are limitations to an owner's responsibility, and that if B accepted this car in such condition that it was not safe for transit, he must protect the owner's interests and make the repairs necessary to put it in safe condition before this additional damage is done. It is not a question of whether damage occurred in the yard or on the road. There is a decision by the arbitration committee that very clearly applies to the point at issue here. This case (526) resolves itself into a combination of defects where the claim is made that the defects were not brought into existence simultaneously, and the ruling is that such matters must have some limitations. (Onotes): "If an employe of a railway company wilfully destroys a couple of draft timbers, it is not believed that the railroad company could escape responsibility under cover of Sec. 29 of Rule 3; nor does it seem equitable that a railroad company whose employes chain up a car, which chaining subsequently damages the draft timbers, should escape responsibility." If we substitute an end sill in place of the draft timbers, as it occurs in that particular decision, it seems we have a ruling from the highest tribunal in car matters, which applies to the present instance very nicely, and places the responsibility for damages on B.

Mr Smith: I agree with the last gentleman. I think that B is responsible for the end sill. I do not think this is any case at all.

Mr. Stagg: The rules are that a company should make repairs to a foreign car as they would their own. Apparently B made no effort to repair this car. If it had been a car of his own, there is no doubt that he would have made repairs to the car. But he apparently made no effort to repair this car; let it go until it became damaged and end sill broken. A great deal of that is being done, and it strikes me that the responsibility for the damage ought to be placed on B.

Mr. Stocks: I do not look at it that way. It seems to me, as B received that car, being a load, he thought it would run to destination in that condition, and when he took hold of it, it did not do so. The draft timbers pulled off. Of course then he could not make repairs, the car being loaded, so he put the car on a chain and hauled it back to his place. I will receive a car from any road that gives it; and I believe that is what the M. C. B. rules are for—to move freight. If we try to make a road responsible for a case like this, it will so become, after a while, that we cannot get a car handled at all—a road won't take a car when it is damaged.

Mr. La Rue: I think that the loaded car question has a great deal to do with it. I have had a case of bonded goods in transit. It was impossible to get inside of the car to put the draft timber bolts in. In hauling car to destination the draft timbers were damaged by drawbar in the other car. The M. C. B. rules, as I understand them, are to facilitate the movement of freight, not to hinder or stop it on technicalities. If A delivered that car to B, under those conditions, to help move the freight, I think that there ought to be a division of the cost, when car comes to be delivered back to A.

Mr. Kroff: I would like to know whether it was a transfer load or whether it was through freight.

President Morris: Does that make any difference?

Mr. Kroff: Yes. The gentleman said that he could not get in a car loaded with bonded goods. He can always get a bonded man to open the car. I think that B is responsible for it. I do not think there is any argument at all there. B should have made repairs.

Mr. Smith: We give foreign cars the same attention that we give our own. B failed to do this.

Mr. Stuckie: Is A the owner of the car?

President Morris: C is the owner of the car.

Mr. Stuckie: I think that the load has a great deal to do with it. For instance, you have a car loaded with bridge iron, heavy girders, stone, or any other commodity, and the load is right over the draft timbers. This is pretty near a daily occurrence, and many a road has not the facilities for transferring the load immediately. I know we haven't. We have cars in our yard three or four days before we can get one transferred, just because we cannot make repairs while it is under load, and I think there should be something to show what this car was loaded with, or whether B could make repairs consistently.

Mr. Wentsel: It states that car went back empty. After car was transferred it was B's place to make repairs before turning it over.

Mr. Stuckie: Were these draft timbers pulled off under load or when empty?

President Morris: There is nothing here to show that. I do not think that enters into the argument.

Mr. Hennessey: It seems to me that the question is this: When B accepted car, he accepted it because he considered it safe to run. He was the judge whether car was safe to be handled or not. He considered that

it was safe by accepting it. Now he broke the car. The draft timbers pulled out, and he made additional damage—he broke the end sill. There is no question but that B is responsible for all the damage.

Mr. Jones: In the first place the draft timber was pulled out and draw-bar broken at the same time. The end sill was not broken at the same time. Would that form a combination? I do not think it is right that a road should jump on another because it could not make repairs. If a car is loaded with 60-foot rails, it is impossible to make repairs under it. In regard to draft timbers, you might tighten up the bolts and make it safe to go, and car get damaged in transfer—pull out the drawbar and draft timbers after end sill was broken. Before this car was sent home, end sill might have been broken in transfer. If I were to get such a car I would return it to delivering line to make repairs. I think this is done in many cases.

Mr. Kehm: I would like to ask Mr. Grieb if he considers B responsible for the end sill and draft timbers?

Mr. Grieb: Yes; for all the damage done.

Mr. Kehm: I hardly think I agree with you, Mr. Grieb, for the simple reason that the arbitration committee in decision 531 has decided that the owner is responsible for the delivering record. I agree with you so far as the end sill is concerned—that B should be responsible for it—but the owners should be held for the draft timbers and head blocks.

Mr. Grieb: I must acknowledge that the point made by the gentleman that spoke last is well taken, and is supported by the decision—531—of the arbitration committee as it exists. But I think we may expect another decision from the arbitration committee, which will controvert the decision in case 531. I do not wish to speak authoritatively in the matter, but I have good reason to warrant this supposition on my part. I cannot see any reason why B should not be held responsible for the entire damage. I fail to see wherein B has served the interests of the owner by moving this car, or wherein, by such action, he has expedited the movement of freight. We have heard a good deal this evening about delaying freight by going back to the old practice of tying up cars for just such defects; but it seems to me that the best interests of the owner and the movement of freight will be expedited by putting cars in such condition that they will go through to destination without being liable to such heavy damage as was inflicted in this case.

Mr. Hunt: In answer to Mr. Kehm I must say that I do not know why a man should be held responsible for breaking an end sill. It is a combination, and as I understand it there was a combination when car was delivered to B. Suppose that car was strong enough to take the load to destination, in view of the fact that it had these defects. It appears that there was a record that it had these broken draft timbers. Now, all that B broke was the end sill. Why should B be held for that end sill, or why should he be held for defects which he did not make, and made at different times. The rules say that defects must be simultaneously created. It appears that none of these defects were simultaneous. I may be wrong, but it appears to me, in the first place, B had good right to turn car back to A in that condition—that he thought he was not in for these defects. He should have communicated with the owner. If I received a car with two broken draft timbers and I considered it safe to go to destination and I subsequently broke an end sill, now it might strike me that they were all owner's defects. It certainly was not simultaneous damage, and you are not in for consequential damage if it does not reach a combination. You may break a part of a car and it is an owner's defect. On account of breaking that part you may break another part, but still it does not reach a combination, and they are both owner's defect. You charge them both to owner, because he should pay for them. This, it seems to me, is in the same line. I do not know why a man should pay for defects which he did not make, and defects which are not made simultaneously. If you are in for all consequential damage, then you must say that if you damage a car for a man in some condition, and he is responsible, for this damage, and you afterwards damage it further on account of this damage, but you still do not reach a combination, you must say, then, you should stand repairs for this car. It would seem it was owner's defect; that you had not reached a combination.

President Norris: You think that argument good, Mr. Hunt, notwithstanding decision 526?

Mr. Hunt: Yes; I believe it is right. I do not know whether I clearly understand that decision or not. Will the gentleman please read it again—in regard to 526?

(Mr. Grieb gave a short synopsis of the case.)

Mr. Grieb: In this case we have one similar to that under discussion this evening. Damage existed before the car was received by B, and further damage resulted by reason of the defective condition of the car. In following up Mr. Hunt's line of argument, we would be justified in destroying anybody's car entirely if we did it piecemeal, that is, did just enough at a time not to form any combination. To commence with, we damage certain pieces that in themselves do not form a combination, and eventually we could bill for the whole car. In this case, the damage to draft timbers, in connection with that to the end sill, which occurred on the day following, does not form a combination; therefore, if the day afterwards two sills in the car were broken they in themselves would not constitute a combination, because the damage that existed prior cut no figure in the particular case. And so on, this line of argument could be made to extend almost to the entire car. It seems to me that such a line of argument is absurd, and that the party handling the car owes so much for the safe handling of the owner's car that he must make those repairs that are necessary in time to save any additional or consequential damage by reason of defects existing.

Mr. Kehm: I hardly agree with Mr. Grieb on that subject, for the reason that a great many roads running west and south out of Chicago have a great many cross-lines where interchange is light; where it does not pay a road to keep an inspector. They have not the facilities for putting in draft timbers, and sills and repairs of that kind, and they have got to haul car to the nearest shop. I would like to ask if, in his judgment, the receiving road would be responsible for broken draft timbers that the owner damaged himself, or another road damaged. I hardly think he will decide that way, or that he would like to accept car in that condition and assume responsibility. I believe that the arbitration committee in case 531 decided the point conscientiously and right. I think that Mr. Hunt is correct in his assertions, so far as the receiving road should not be held responsible for consequential damage, if they do not break a combination. The arbitration committee, I think, has ruled against that; but I think he is right in the position he took.

Mr. Hunt. Suppose when a man gives his car to another road the draft timbers are damaged. The other man says, "I guess that will stand, I will take the car to destination;" but in doing so breaks an end sill. One man ought to have the same right as another. Do you think the owner should hold that man and make him pay for the whole thing?

Mr. Stagg: It says here: "B replied that he received car from A with one draw lug, one draw lug bolt, one head block, four draft timbers and one head block bolt broken." Does that mean four draft timbers, or four draft timber bolts? I understand that as meaning four draft timber bolts, not four draft timbers.

President Morris: I will say that I am in possession of information that enables me to assert that this is right—four broken draft timbers.

Mr. Stagg: That places a new light on it; I read it four draft timber bolts.

A Member: I think in view of what Mr. Hunt said if that meant bolts it would have read "timber" in place of "timbers."

A Member: If I took a car with four broken draft timbers and car is returned with a broken end sill—car delivered to me loaded for the purpose of being unloaded, the delivering line not being able to transfer the load, and they refused to receive the car back—I certainly would not receive another load from them.

Mr. Smith: That is not the question before the house. B was not obliged to receive the car, and in doing so he made himself responsible.

President Morris: What is the pleasure of the meeting on the question?

Mr. Callahan: I move that it is the sense of this meeting that B is responsible for this end sill, as requested by A.

Seconded.

Mr. Hunt:. Is that the question? It is who is responsible for the damage to this car.

Mr. Callahan: I will say that A only requested a card for the end sill.

A rising vote was called for which resulted: Ayes, 29; Nayes, 23.

The second question submitted for discussion reads as follows:

"The Chief Joint Car Inspectors at their meeting held in St. Louis in September, '98, decided that under sections 35 to 45 of M. C. B. rule No. 3, the owner of a car is responsible for two draft timbers broken at one end of car, the other end having a combination of defects for which owner is not responsible. It is understood that the damage to both ends apparently occurred at the same time. Is this correct?"

Mr. Stocks: My opinion is that the company breaking car in that shape would be responsible for the whole business, because they are all broken together and showing that he handled the car unfair.

Mr. Showers: I cannot see anything to be discussed. The matter is covered very plainly by the rules, just ahead of section 35. I will admit that between sections 35 to 43 there is nothing that would prevent us handling car in this way and still avoid responsibility; but the note prior to that lays the matter low—combinations of defects that denote unfair usage. Now if the combination is broken at the other end, it is certainly unfair usage.

Mr. Hennessey: A good many remarks have been made this evening that I do not agree with. Now the intention of the rules, as I understand them, was, first, that if a combination existed, when damage occurred at one and the same time, there could be no question at all. Now breaking a draft timber on the other end of the car simply aggravates the case. They admit that the damage occurred at the same time. It seems to me that that was a very peculiar decision for the Chief Joint Car Inspectors at St. Louis to make. I think the spirit of the rules was this: That there would be no question if a combination existed at one end of a car. If there were draft timbers broken at one end and two sills at the other, it would form a combination. I cannot understand why you should have to break the car up.

Mr. Hunt: As I understand this case, this damage was all done at one and the same time. If so, I think the party that did the damage is responsible for the whole thing; because, as I view this thing, the party breaking the combination is responsible for everything that is done at that time. If you break a combination at one end of a car, I think you would be in for the damage at the other end, if done at the same time. The combination of defects simply outlines an unlawful act. In other words, it is unlawful to damage a car to the extent of a combination and for any damage occurring at that time, the party making the damage, is responsible, I think. I take it that it is the same as a wreck. If you wreck a car you are responsible for what you do to that car, whether it breaks a combination or not. If you derail a car you are responsible for the damage to that car, whether it forms a combination or not, and anything, be it ever so little, you are responsible for, because it is an unlawful condition. If you damage a car to the extent of a combination you are responsible for it, and you are responsible for any other damage done at the same time, if it is only a nail, and the party wants to hold you to it.

Mr. Wharton: I agree with Mr. Hunt, exactly.

Mr. La Rue: I agree with Mr. Hunt.

Mr. Grieb: It seems to me, according to the remarks made, that we are unanimous in the opinion that the decision of the chief car inspectors in this particular does not meet our views. I would make a motion to that effect.

President Morris: It is moved that the sense of this meeting is that the construction that the chief joint car inspectors of St. Louis put on the case referred to, under sections 35 to 43, does not meet with the approbation of the association.

The motion was seconded and carried unanimously.

After a recess the following point was taken up for discussion:

"The Joint Inspectors also decided that when a car is delivered in interchange with two sills broken and comes back with two additional sills broken, all defects should be considered as belonging to owners. Does the association agree with this?"

Mr. Miller: I believe the position is correct. It is the general practice on most roads. If a car is received back home with four sills broken, two old and two new, there is no question. I have passed many cars back myself.

Mr. Stuckie: I agree with the gentleman that owners are responsible if car has two sills broken and two broken in addition. Car is weakened by having the two sills broken.

Mr. Shannon: I do not agree with the members who have spoken. I believe that car should not be delivered in interchange with four broken sills. That car is unfit for service. The question is not whether you are delivering car to owner or not. If you stand by this decision you have to treat all cars alike. I think a car with four sills broken should not be delivered in interchange, unless arrangement is made with owners to accept car home.

Mr. Stocks: I would like to ask the last gentleman if he would not protect the record of another road. Suppose now, that a car is delivered to another road with two sills broken. I would like to ask him if you are protecting that man's record.

Mr. Shannon: That record would be all right, providing I was the owner of the car. The car on your line is rendered unfit for service. It is your business to take it up with the owners and get disposition. Remember we are accepting that car to run; it is not my car, it is a foreign car.

Mr. Stocks: Yes; but I got the car from you with two sills broken, that is all there is broken in the car. Now, then, you will not protect my record? Of course I must get a defect card from you to show sills were broken.

Mr. Wentsel: Are these sills all on one end, or at opposite ends?

President Morris: Nothing is said about that.

Mr. Wentsel: If car did not get too heavy a load it might be safe to run.

Mr. Hunt. We have got to stick to the rules. The rules say simultaneous damage. Two sills broken does not make a combination, and two more two weeks from now does not make a combination. They are owner's defects, but I am afraid if you undertake to make repairs and send bill in to owner he would be very apt to disapprove the bill. I think the proper action in the case would be to take it up with the owner, as Mr. Shannon says, for disposition of the car. This very case came up shortly after the combination of defects were made up. Suppose you break two sills on the car and two weeks afterwards you break two more. What are you going to do with the car? The best opinion of the parties present was that you should communicate with the owner and get disposition of the car. They then did not think that the party breaking the sills was responsible at all, but that the owner was still responsible; but you should still communicate with him. It is not a combination; that is they were not broken simultaneously, hence no combination. This is purely a ques-

tion of rules, and the combinations mean just what they say.

Mr. Kehm: I am inclined to believe that Mr. Hunt is correct, so far as seeking disposition for the car from the owner. We had a case something similar to that a short time ago and the owner told us to go to the delivering road and get protection. Now while we realized that he was respousible, still I believe the same question was up in the Western Railway Club about a year ago, possibly longer than that, and they decided that the party damaging the two sills, the second two sills, should make these repairs and deliver the car back to the other road on his receiving record. That, I believe, was the decision arrived at.

Mr. Huut: May I ask who is to pay for those sills?

A Member: The owner, of course. He delivers car back, the two sills on his record.

A Member: I should he in favor of handling it in that way, so far as I am concerned.

Mr. Joues: I am in favor of what Mr. Shannon said. It is admitted that we got two sills in car. Car has four sills broken, and is unfit for service. Ask owners for disposition and place home card ou it and send it home, if he will receive it.

A Member: In case owner will not receive it in this condition, what is to be done then? Who is going to he responsible?

Mr. LaRue: It seems to me that when the man received that car with two brokeu sills he had the privilege of making the repairs, so that the other two sills would not breuk. He could have charged them to the owner, aud then it would have stopped.

Mr. Wentsel: I have a car that I am holding with two broken draft timbers. I would like to see this thing settled I cannot get rid of the car; no one will take it. Car had two broken sills, and after receiving it two more were broken. I have tried to get rid of it but I get it back right along; no one will receive it.

Mr. Callahan: I thiuk these are owner's defects. He received the car with two sills broken, and broke two afterwards. They are owner's defects, aud they could uot offer that car in interchauge afterwards. The only thing to do would he to take it up with the owners and get home routc car and send it home.

A Member: Suppose owner would not give him a home route card—four sills broken?

Mr. Kroff: The car was delivered with two sills brokeu and two sills were afterwards broken. Each railroad coupany should put in two sills and charge it to the owner. It is an owner's defect, aud I thiuk it is properly handled in that way.

Mr. Hennessey: This is a somewhat complicated case: but it seems to me that the car was delivered with two center sills brokeu. And after the car was received it had two additional sills broken. Now it seems to me if we carry that a little further, we might break, in additiou, two side sills, aud still call it owner's defect, the damage not being done simultaneously. When you received the car with two center sills hroken you ackuowledged that you cousidered the car safe to run; if not, you had the option of returning the car. Because you cousidered the car safe to run you accepted it. Now you broke two more sills. It don't seem to me that the owner could be held respousible for anything more than the two original sills.

Mr. Grieh: If you take a car with two defective sills and run it and do additional damage, you are uot protecting the owner's interest in haudling the car in that condition, and if you elect to do so, you have got to abide by the consequences. You serve the owner's interest hest by making such repairs as will keep the car in shape for service.

Mr. Kehm: I would like to ask what a person is going to do on a transfer where you have no inspector or no facilities for making repairs. Are you goiug to put car on a transfer and leave it there, or are you going to accept car in defective condition and run it to the nearest point where you can make repairs.

Mr. Hunt: Some of the gentlemen who have talked on this subject have dwelt on the fact of hreaking so many sills in a car. You can break all the sills in a car, but you can't break them all at once. You can break two to-day, and you can repair them; next week you can break and repair two more, and keep on until you get the whole bottom broken; and the owner pays for them. That is nothing new. It must he all right; the rules say it is.

President Morris: In order to get the sense of the meeting will some one make a motion in regard to how this question should he settled; whether the Chief Joint Inspectors decided properly or not, according to the sense of the meeting.

Mr. Grieb: This is a serious case and is uot very apt to occur in every-day practice. We have not got definite facts in the case which makes it all the more difficult to arrive at a proper understanding, and frame an idea as to what the circumstances in the case warrant. In order to get a little more light on the subject I would be in favor of holding this question over until the next meeting.

Upou motion it was decided to hold the question over.

President Morris: We will now take up the fourth question: "To what extent can we work compressed air on repair tracks to advantage?"

Mr. Hunt: Compressed air can he used to a great advantage on repair tracks a good deal more than it is. If for no other purpose, I would have it for testing air brakes. That is something that I do not believe is followed up to-day as closely as it ought to he. Air brakes have become one of the most vital points of car construction to-day and I believe from observation that they do not receive the attention they ought to. No railroad company could put air to better use than in testing air brakes. If we do not do anything else but test air hrakes we have done a great good. Aside from that, of course, as we all know, there are many other uses that air can he put to—for jacking up empty cars, lifting different classes of materials, etc. But above everything, I think the first use that it should be put to on a repair track would he on the brakes. We, on our road, try to do a good deal as regards air hrakes. We have four men in Chicago doing nothing else hut testing freight hrakes and repairiug them, and I believe to-day we have the air hrakes in fairly good condition. We ought to have; we put a lot of money into it, and we believe it is money well spent, and I believe we are getting results.

Mr. Shannon: We have no repair jacks, hut we have a lift for loading trucks and wheels. We use air mostly for testing air brakes.

Mr. Hennessey: We have not carried the use of air as far as a great mauy other companies have. But I agree with Mr. Hunt that the most important place to use air at the present time is on the air brakes. All repair tracks should be equipped with it. There is an impression that air don't cost money. It does. You get air so as to use it to advantage and it costs money. Possibly there is where the line should be drawn. I think that it could be used to good advantage in loading trucks, wheels, and in shops, for jacks, where there are heavy engine repairs, if they are in good condition.

Mr. Ford: We are using considerable air—cleaning coaches, lifting cars, boring holes in end sills aud draft timbers, cleauing benches and other material around the shop. We are not so large as some roads, but we have two men engaged who do nothing else. We have air at the freight yard and test all the air brakes before they leave the yard.

Mr. LaRue: We have our shop piped for air, also our repair track. We have two tracks that I run six cars apiece on. We jack all cars up and run the trucks out. I was hoping that I could find some way that we could use air economically and quickly, and still with an appliance that would be light to handle, through a shop where there was lots of rubbish. I think it was in '90 or '91 that I first commenced to use air jacks to lift cars on repair track. But the jack was nccessarily a very heavy and cumbersome affair, and in takiug it over the yard it was necessary to have two strong meu. Since that time I have taken the cylinder part off an air cyliuder and used that for putting up draft timbers. I found that to be a very good tool in some instances, because the expansion of the air would follow the draft timhers right up and be quicker than some jacks

Mr. Stocks: On the Northern Pacific nearly every shop and repair track is equipped with air. They use it for testing air, putting up draft timbers, spraying paint and also for pulling down sills in a car. In fact, they successfully use air for nearly everything they do in the yard.

Mr. Stuckie: We use it mostly for testing. We have air plants at different parts of the yard where we receive cars from connecting roads. We place them on a track where we can test them, and we find a great many cut out. We find the difficulty with the air aud fix it, so as to get the air cars on the line and have the use of the hrakes, and we aim to put them in position so that they are in working order when going west ou the linc. We do this with all foreign cars. At the coach yard they use air for cleaning the coaches, and also for liftiug wheels We also have a plant where we make up road trains, and we have the train already charged when the road engine hooks on, so it is ready to test the air. We travel the length of the train, discover the leakage, and repair it, and the train moves out with dispatch, instead of in the old way, of getting engine on and pumping and perhaps burning her pumps out before she gets her train crew. It is much easier on the pumps of the engine.

Mr. La Rue hrought up the question of M. C. B. couplers with ends of shanks having but one hole for attaching pocket, and asked whether such patterns should he considered strictly M. C. B. standard or not. A short discussion followed and it was decided to hold the question over to the February meeting.

The meeting then adjourned.

The next meeting will he held in the parlors of the Briggs House, corner Randolph street and Fifth avenue, Chicago, February 9, 1899, at 8 p. m. The program will be as follows:

(1) Topic No. 3 of the January meeting, relating to responsibility for auy number of sills heing broken on a car following the hreakiug of the original two, was not completed and will be again taken up.

(2) Postponed discussion on the subject hrought up at Jauuary meeting, "Is it a deviation from M. C. B. standards for an M. C. B. coupler to have but one hole for bolt to secure pocket to shanks. How should such couplers he credited if removed?"

(3) In case of slid wheels should the company doing the damage be responsible for both wheels on an axle, provided one wheel is slid 2½ inches or over and the other ⅛ iuch or ¼ inch less the limit.

(4) What is the customary practice on railroads in protecting car inspectors or repairers while they are looking over trains or repairing cars at inspection points?

COMMENT BY CAR FOREMEN.

This column is edited by the Publication Committee of the Car Foremen's Association, and the Railway Master Mechanic is not responsible for any of the views expressed therein. Commnnications and items of interest to car men are solicited T. R. Morris, chairman.

Change in Meeting Place.

The attention of tne members of the Car Foremen's Association is called to a change that has heen made in the meeting place. The meetings have hitherto, for a long while, been held in the Great Northern Hotel, but for various reasons it has heen decided that other quarters should be secured. The managers of the Briggs House have kindly offered accommodations and they have heen accepted as a temporary arrangement. The Briggs House is centrally located in Chicago, at the corner of Fifth avenue and Randolph street.

Hot Boxes.

If there was any one particular thing hrought out hy the discussion of hot hoxes at the Decemher meeting of the Car Foremen's Association, it was that of the great number of causes that led to the car becoming afflicted with this serious trouble.

It was interesting to listen to the various reasons assigned for the heating of journals. Among them were: Hard spots in hrass, gravel and sand in boxes, general inattentiou, cold weather causing packing to bunch up at front of hox, journals improperly prepared when new wheels are applied, trucks out of square, brasses too long, waste hetween journal and brass, radius of hrass greater than that of journal, hrass bearing against collar, poor quality of packiug, hard and dry packing in hack of hox, etc.

There is uo question hut that to each one of the above mentioned causes can be attrihuted a great many cases of hot boxes, and it was very appareut that each member was largely influenced hy his own experiences in charging up to some one particular cause all the trouble be had with hot boxes.

This certainly is very wrong and results in bliudiug oue to the real condition of affairs.

While it may be, and undouhtedly is, true tiat local conditions in some instances may cause a number of hot boxes, even perhaps a majority, to arise from one cause, it does not follow that they cannot arise from other causes. It is a fact that prohahly will not be disputed that the causes of hot boxes on one road are the same in a greater or lesser degree as on other roads. It must be so in these days of through cars and interchange. If A has brasses in his cars that have hard spots in them, B will prohahly have hot boxes on his liue when A's cars are run there. Carelessness on B's part in not squaring up his trucks will cause trouble for A when B's cars are ou the former's line, and so on.

The questiou of the virtue of a cooling compound for hot boxes on the line was not discussed as thoroughly as it should have heen. To get a clear idea of the results of the use of compound it would have heen a good idea to have had a train man of intelligence and experience present.

Owner's Rights and User's Responsibilities.

It is a difficult matter to convince some inspectors that they cannot, after their road has pulled out a draw har from a foreign car, broken the draft timbers, end sill, and perhaps other parts, send the car home to the owner with switch chain attached and say they are not responsihle, because they received the car originally with hroken draft timber holts. The M. C. B. rules now in force put a great many defects that occur as the result of handling cars, under the head of "owners." It seems that the arbitration committee has done perfectly right in deciding that any railway company that fails to take advantage of the rules and make such repairs as the owner has agreed he will pay for, must be responsible for the defects that occur as a result of his neglect.

It must he acknowledged that there are conditions that make it impossihle for repairs to he made as a preventive of further damage. Take, for instance, a loaded car with certain owner's defects which cannot he repaired on accouut of the lading. The company in whose possession the car is, may wish to make repairs, but is unable to do so. The result is that in subsequent handling the car is damaged in such a way that a prohibited combination is formed and the defects must be repaired at the expeuse of the party doing the damage. This undoubtedly is a hardship, hut if the master car builders were to try to provide for each contingency that in their judgmeut might arise, our book of rules would necessarily he as bulky as the statutes of the United States. The broad principle involved is this: each railway company gives to every other railway company the privilege of repairing any of his cars that have defects which the M. C. B. rules say owners are responsible for. Bills for such work will be promptly paid. The owner has a right to

say that with such discretionary power in their hands the representatives of foreign lines must keep his cars in good condition. Failure to do so makes, not the owner, but the party failing to protect the owner, responsible for defects that as a consequence of existing defects, form a combination which the rules say the company doing the damage shall be held for.

COMMUNICATIONS.

Inspection of Pressed Steel Trucks.

To the Editor: I see that you noticed my short article on the above subject in the last Railway Master Mechanic. I don't like the way you wound it up. I did not intend to say, and I can't see anything in my article where I admit, that wheels can always be inspected in these trucks. I did not say anything about its being a matter of convenience. Under certain conditions we can see the whole circumference of the wheels, but the only way I know of is to inspect one part of it and then move the car up and look over the rest of it. This is so altogether impossible in a railroad yard that it cannot be considered for a moment. No, Mr. Editor, I know of no way in which we can get a close inspection of the wheels in a pressed steel truck, convenient or otherwise. If you do, I shou'd like to hear of it and I would be much obliged for the information. Inspector.

[Some comment on the above is made in our editorial columns.—Ed.]

The Establishment of a Standard Air Brake.

In a recent issue of Engineering News is printed a communication on the establishment of a standard air brake, as follows:

We have in the United States about 200,000 miles of railway, nearly enough to belt the globe eight times. Most of this mileage has been built since the air brake was invented, at a cost of over $11,950,000,000. A large portion of the greater sum invested in the rolling stock was involved in the cost of freight cars, the successful operation of which can only be secured by the uniformity of the construction and operation of the air brakes. It follows, therefore, that as the number of freight cars increases, the argument for the establishment of a standard brake becomes more forcible.

The difficulties in operating brakes of different designs are a well-known source of great inconvenience to all roads. They result from one road having to carry cars with a different style of brake, or from a road using an inferior brake at the start and afterwards adopting a high-class equipment.

The use of the air brake to-day is a matter of legalized necessity, and the adoption of one design will be a matter of common usage. Although the first results of this will be to increase the prestige of one company, it is the only final and satisfactory solution of the one great difficulty experienced in freight traffic. The objections sometimes urged against leaving the business in the hands of one company are secondary to the logical necessity for the establishment of a standard.

The absorption of the patents and business of the Boyden Brake Co. by the Westinghouse Air Brake Co. only partially solved the difficulty, as there still remain two brakes. The claim of Westinghouse to the sole right to manufacture the "Quick Action" brake is now being contested by the New York Air Brake Co. Although the New York company was compelled to abandon three forms of brakes as being infringements on Westinghouse rights, they now have a fourth design on the market, the validity of which has been sustained by the lower court. This case was taken to the Court of Appeals on petition of Westinghouse and is still to be argued before that tribunal.

The time that will be involved in settling the present suit, together with the trying of three other cases brought by the Westinghouse company against the New York company, makes the much-desired solution of the air brake situation even more remote than ever. And, until it can be legally shown that all air brakes now in use are but variations and modifications of one, the matter must rest largely with the individual road, who can either work toward a common uniformity, or, by adopting different designs, increase the present complications.

PERSONAL.

Mr. J. L. Bickford has resigned as purchasing agent of the El Paso & Northeastern.

Mar. A. Carroll has been apointed master mechanic of the Crow's Nest Pass Line of the Canadian Pacific.

Mr. G. H. Goodell, mechanical engineer of the Erie, has resigned to accept a similar position on the Northern Pacific.

Mr. Edward Worman has been appointed master mechanic of the Louisville, Evansville & St. Louis shops at Princeton, Ind.

Mr. James Donough, an engineer on the Gulf, Colorado & Santa Fe, has been appointed road foreman of engines of that road.

Mr. William T. Moore, formerly for many years master mechanic of the Pittsburg division of the Pennsylvania Railroad, is dead.

Mr. Ralph Ramawell has been appointed foreman of the Chicago Great Western shops at South Park, Minn., vice T. H. Yorke.

Mr. C. H. Hudson, who has just resigned as chief engineer of the Southern Railway, was also mechanical engineer of that road.

Mr. H. R. Linn has been appointed chief draughtsman of the car department of the Lake Shore & Michigan Southern at Cleveland, O.

Mr. H. B. Gregg was recently appointed engineer of tests of the Santa Fe Pacific, reporting to Geo. W. Smith, superintendent of machinery.

Mr. T. E. Harwell, general foreman of the Mobile & Birmingham at Mobile, has been appointed master mechanic, with headquarters at Mobile, Ala.

Mr. Edward D. Seitz has been appointed secretary and purchasing agent of the Louisville, Evansville & St. Louis, with headquarters at Louisville, Ky.

Mr. Arthur Crandall, formerly well known in railway supply circles in Chicago, died at the Presbyterian Hospital, Chicago, Jan. 28, of cirrhosis of the liver.

Mr. John R. Wagner, superintendent of motive power of the Delaware, Susquehanna & Schuylkill, died at his home in Drifton, Pa., Jan. 21, after a short illness.

Mr. A. F. Seltzer has been appointed master mechanic of the Michoacan & Pacific, with headquarters at Zitacuaro, Mexico, vice Mr. E. W. Knapp, resigned.

Mr. P. D. Plank has been appointed master mechanic of the Louisville, Henderson & St. Louis, vice D. Vanalstine, resigned to go to the Chicago Great Western.

Mr. J. H. McClure has been appointed road foreman of engines on the Wabash for the Eastern Division from Detroit to Buffalo. His headquarters will be in Detroit, Mich.

Mr. O. Antz, heretofore general foreman of the Cleveland car shops of the Lake Shore & Michigan Southern, has been appointed general foreman of the Buffalo shops of that road.

Mr. Clinton B. Conger, for many years road foreman of engines on the Chicago & West Michigan, has resigned to become associate editor of Locomotive Engineering.

Mr. John McManis, traveling engineer of the Oregon Short Line, has been appointed superintendent of the Montana division, vice C. A. Boies, and his old office has been abolished.

Mr. A. W. Davis has been appointed locomotive foreman of the Grand Trunk and Wabash shops at St. Thomas, Ont., vice James Armitage, who goes to the Pamerston, Ont., Division.

Mr. E. von Schlegell has been appointed superintendent of the St. Cloud shops of the Great Northern, vice A. C. Deverell, transferred. Mr. Deverell's new position has not been announced.

Mr. F. L. Hunter has been appointed chief storekeeper of the Denver & Rio Grande at Denver, Colo. Mr. Hunter had been in the stores department of the Union Pacific for many years.

Mr. J. D. Clark, heretofore superintendent, purchasing agent and car accountant of the Mobile & Birmingham, with headquarters at Mobile, Ala., has been appointed general superintendent.

Mr. S. F. McLeod has been appointed purchasing agent of the Duluth, Missabe & Northern, and will perform the duties of that office under the direction of First Vice-President W. J. Olcott.

Mr. J. L. Stark has been appointed foreman of motive power and car departments, and superintendent of docks at East Toledo, O., on the Cincinnati, Hamilton & Dayton, vice J. Stokes, resigned.

Mr. R. W. Knowlton, one of the oldest locomotive engineers on the Northern Pacific and for some time master mechanic of that road at Fargo, N. D., and Brainerd, Minn., died at Fargo, January 6.

Mr. David Van Alstine, master mechanic of the Louisville, Henderson & St. Louis, at Cloverport, Ky., has resigned to become assistant master mechanic of the Chicago Great Western, at St. Paul, Minn.

Mr. J. E. Muhlfield, general foreman of the Wabash at St. Thomas, Ont., shops, has resigned to go to the Grand Trunk as master mechanic at Fort Gratiot. F. F. Whitney succeeds Mr. Muhlfield at St. Thomas.

Mr. O. H. Reynolds, associate editor of Locomotive Engineering, has left that journal, and will, we understand, re-enter railway service. Mr. Reynolds was formerly mechanical engineer of the Northern Pacific.

Mr. John Nowers, for several years assistant chief clerk in the office of the general manager of the Atchison, Topeka & Santa Fe, has been appointed chief clerk in the office of the general storekeeper of that road.

Mr. Milan C. Bullock, president of the M. C. Bullock Manufacturing Company, of Chicago, and prominent as an inventor and manufacturer of diamond drills, died last month at his home in Chicago of pneumonia.

Mr. L. A. Larson has been appointed chief clerk to Master Mechanic Tracy Lyon, of the Chicago Great Western, vice Mr. J. H. Goodyear, who, as previously noted, resigned to enter the service of the Buffalo & Susquehanna.

Mr. L. D. Pollock has been appointed storekeeper and general claim agent for the Hutchinson & Southern Railway Company, with headquarters at Hutchinson, Kan. He will have charge of material and supplies and all claims.

Mr. William H. Schultz, at one time master mechanic of the Philadelphia, Germantown & Norristown, and afterward for many years master mechanic and general superintendent of the Camden & Atlantic, died at Wilmington, Del., January 3, aged 93 years.

Mr. Calvin W. Parsons, a well-known mechanical engineer, died at Scranton, Pa., from paralysis, on December 27. Prior to 1894, when he entered business for himself as a consulting engineer, he had been connected with the Dickson Manufacturing Company, the Lackawanna Iron & Steel Company and other concerns.

Mr. A. W. Kirkwood, of Pana, Ill., aged 65, the oldest engineer on the Springfield division of the Ohio & Mississippi, now the Baltimore & Ohio Southwestern Railroad, having in 1870 run the first engine over the tracks, dropped dead on his engine at Altamont, January 12. Kirkwood had accumulated quite a fortune during his long railroad service. He was a prominent mason, and was head of the Brotherhood of Locomotive Engineers of the Springfield district.

Mr. E. B. Thompson has resigned as mechanical engineer of the Northern Pacific, and has been succeeded by Mr. G. H. Goodell, hitherto mechanical engineer of the Erie. Mr. Thompson's future movements are not announced. He is now cast attending his father who is ill. Mr. Thompson is best known through his long and efficient discharge of the duties of chief draftsman and mechanical engineer on the Chicago & Northwestern, which road he left a year or more ago to go to the Northern Pacific with Mr. E. M. Herr.

On the Grand Trunk changes in the mechanical department have been made as follows: Mr. R. Patterson, hitherto master mechanic of the lines west of the river, at Fort Gratiot, has been appointed master mechanic at Stratford of the lines east of the river, vice J. Davis Barnett resigned: J. E. Muhlfield, hitherto general foreman of the Wabash at St. Thomas, succeeds Mr. Patterson as master mechanic at Fort Gratiot: J. Hodgson is appointed master car builder, at Fort Gratiot: F. Sutherland is appointed master car builder at Montreal and S. King, master car builder at London.

Mr. Clement F. Street, who has for several years been prominently connected with the Railway and Engineering Review, is now on the staff of Mr. Schenck, the president and manager of the Dayton Malleable Iron Works. In his new position Mr. Street will have full scope for his well-known abilities as a mechanical engineer and also for the profitable use of his wide acquaintance with railway men and manufacturing concerns. He is to be congratulated on the connection which he has formed—one that will give abundant opportunity for the ability and tireless energy with which he is gifted.

Mr. James Oborne, assistant to the vice-president of the Canadian Pacific, has been appointed general superintendent of the western division of the company's system, with headquarters at Winnipeg. Mr. Oborne comes from the mechanical department. His connection with railways dates from October, 1874, when he entered the mechanical department of the Grand Trunk at Point St. Charles. He remained with the Grand Trunk nine years and then joined the Canadian Pacific Railroad as chief clerk to the mechanical superintendent. Subsequently he entered the operating department and worked his way up to his present important post.

On the Colorado & Southern, formerly the Union Pacific, Denver & Gulf, the mechanical department has been reorganized. Mr. J. S. Turner is now the superintendent of motive power and Mr. W. E. Fowler master car builder. Mr. Turner announces the following appointments: "Mr. J. J. Cavenaugh is appointed division master mechanic, in charge of Denver shops and Pueblo, Clear Creek, Fort Collins and Wyoming districts, with headquarters at Denver, Colo. Mr. D. Leonard is appointed division master mechanic, in charge of Como shops and Platte Canon, Leadville and Gunnison districts, with headquarters at Como, Colo. Mr. T. M. Gibb is appointed division master mechanic, in charge of Trinidad and Gulf Junction shops, and Trinidad and New Mexico districts, with headquarters at Trinidad, Colo. All motive power employes of the respective districts will report to and receive their instructions from the division master mechanic."

On the Erie system important changes in the mechanical department have been made, as follows: Mr. Washington Lavery, hitherto assistant superintendent of motive power at Cleveland of the Nypano division

of the Erie and assistant superintendent of motive power of the Chicago & Erie, is made assistant superintendent of motive power of the Erie, with headquarters at New York; Mr. George Donahue, hitherto division master mechanic of the Nypano division of the Erie at Meadville, Pa., takes Mr. Lavery's former place and title as assistaut superinteudent of motive power, with headquarters at Cleveland; Mr. Willard Kells, hitherto master mechanic of the Chicago & Erie, with office at Huntington, Ind., has been appointed master mechanic of the Meadville division of the Erie, vice Geo. Donahue, promoted. Mr. J. G. McLaren, general foreman locomotive and car department of the Chicago & Erie, at Chicago, succeeds Mr. Kells as master mechanic of the Chicago & Erie, at Huntington, and Mr. M. Mercatoris has been appointed general foreman of the Chicago & Erie, at Chicago, vice J. G. McLaren, promoted.

Mr. Frederick A. Delano, superintendent of freight terminals of the Chicago, Burlington & Quincy, at Chicago, has been appointed superintendent of motive power of that road, in charge of locomotive and car departments, vice Mr. G. W. Rhodes, promoted to be assistant general superintendent of the Burlington & Missouri River in Nebraska. Mr. Delano comes to his new duties with admirable qualities therefor, gained through long training in various lines of railway work. He entered railway service in 1885 with the Chicago, Burlington & Quincy, as machinist's apprentice in the erecting shops of that road at Aurora, Ill. He remained at Aurora in that capacity until July, 1887, when he was given charge of the bureau of steel rail inspection tests and records of the same road. Continuing in this work until 1889, he was in April of that year made assistant to the second vice-president. He held this position until July, 1890, when he was made superintendent of freight terminals of the same road, with headquarters at Chicago, which position he filled until called to his new post as head of the mechanical department. His headquarters will be in Chicago and not in Aurora, where previous superinteudents of motive power of the Burlington have been located. Mr. Delano during his long term of service in the operating department did not lose sight of mechanical matters, but, on the contrary, kept in close touch with them, and actively engaged in the work of the Western Railway Club, of which he was for a time vice-president and, during the year 1897-8, president. He is now chairman of the committee of that club which is engaged upon the important work of investigating M. C. B. couplers and knuckles with a view to the possible standardizing of the principal dimensions, etc.

Mr. Godfrey W. Rhodes, who has been for many years superintendent of motive power of the Chicago, Burlington & Quincy, has been promoted to be assistant general superintendent of the Burlington & Missouri River Railroad in Nebraska. Mr. Rhodes has been such a prominent and active figure in the railway mechanical world that the news of his withdrawal to enter the operating department comes with something of a shock. He had in early life done work of recognized value in the mechanical department of the Pennsylvania Railroad at Altoona and was later superintendent of motive power of the Northern Central and still later superintendent of motive power of the Pennsylvania Lines at Columbus. It may, perhaps, be said, however, that it is since he has been at the head of the mechanical department of the Chicago, Burlington & Quincy that he has taken his present leading position among the railway mechanical officials of the country. Perhaps his most widely noted work was that connected with the famous Burlington brake tests, but he has also been closely and prominently identified with the development of the M. C. B. car coupler, and these with his assiduous labors on the arbitration committee of the Master Car Builders' Association, his general work in committee and on the floor at the conventions of that body and his active participation in the work of the Western Railway Club have brought him into a favorable prominence enjoyed by but few of his coworkers. It is a matter of congratulation that his departure into the operating field of railway work will result in only a partial breaking off from the old ties and pursuits of so many years standing, for he will in his new position give especial attention to the motive power affairs of his road and he will also, we understand, retain, as far as possible, his connection with the Master Car Builders' Association and continue as chairman of the arbitration committee.

SUPPLY TRADE NOTES.

—There has been a change in the officers of the Allen-Morrison Brake Shoe Co., Mr. F. R. Spear being elected president to succeed Mr. J. F. Morrison.

—On or about March 1 the officers of the Steel Tired Wheel Company, now located at 115 Broadway, New York, will be moved to the Empire building, No. 71 Broadway.

—Henry L. Leach, of North Cambridge, Mass., in summing up his orders for 1898 for the well known Leach locomotive sanders, finds that the total of orders was 2188 sets, of which 75 per cent were of the new type "D."

—The Cleveland Twist Drill Company announces that Mr. E. G. Buckwell has been engaged to take charge of its sales department. Mr. Buckwell has had long experience as a traveling salesman, and later on as a business manager, and the firm feels that he will greatly increase the efficiency of its office force.

—The Falls Hollow Staybolt Co., of Cuyahoga Falls, Ohio, is, owing to the high quality and safety of its hollow staybolt iron, daily securing new customers from railway companies, locomotive and marine boiler manufacturers, etc. The company is just now in receipt of a half carload order from the Pacific coast, also several large orders from leading railway companies and ship builders.

—The Chicago rabbeted grain door was specified on the 2000 Big Four box cars recently let to the Pullman Company, and also on the 500 Denver & Rio Grande box cars to be built by the Ohio Falls Car Co., and the 700 box cars recently let by the Chicago Great Western to the Michigan-Peninsular Car Co. Security lock brackets, manufactured by the Chicago Grain Door Co., will also be used on the Denver & Rio Grande cars.

—The well-known builders of high grade woodworking machinery of all kinds, J. A. Fay & Co., Cincinnati, Ohio, have just sent us a large illustrated poster, printed in two colors, red and green, on fine white paper, about 25 ins. by 38 ins., and showing over 100 of their new machines for working wood, which have been designed on new and the most advanced principles. The company will send one of these posters, free, postpaid, to those who request it.

—The Safety Car Heating and Lighting Co., New York City, reports that it equipped 1,724 cars with the Pintsch light during the year just closed That is not only a good record for a year in which the railroads were still practising extreme economy, but it is also good news for all who travel. Putting the Pintsch light into a passenger car means that the car is made far more comfortable and desirable to travel in than it was before. The public will be glad to know of the prosperity of a company which does so much to make long railway trips enjoyable. The company also equipped 902 cars with its heating apparatus.

—The Cambria Steel Co., having leased the Cambria Iron Co.'s works, has consolidated its New York office (heretofore at 100 Broadway and 33 Wall street) at the new Empire building, No. 71 Broadway, rooms 1705 and 1706. The company has appointed Mr. H. L. Waterman as general sales agent for New York City and vicinity, but he will give special attention to the sale of structural steel, steel blooms, billets and slabs. Mr. W. A. Washburne will given attention to negotiations for steel rails and railway track fastenings. Mr. L. R. Pomeroy will give attention to steel axles and other forging specialties. Mr. Thos. F. Russell, 102 Chambers street, New York, will sell, as heretofore, the special product of the company's Gautier department.

—Dolese & Shephard have placed an order, through T. W. Harvey, Jr., Monadnock building, Chicago, with the Georgia Car Co., of Savannah, Ga., for 25 80,000 lbs. capacity stone cars. These cars will be equipped with Harvey trucks and bolsters, Southern couplers, and Merrill turn buckles. The cars will have 5 by 9 axles. The Georgia Car Co. has secured an order, through Mr. Harvey, for 50 cars from the Brownell Implement Co. These cars will be in all respects the same as those for Dolese & Shephard. The Georgia Car Co. has also received an order through Mr. Harvey for one sample car from the Caswell Car & Improvement Co. This car will be equipped with Harvey trucks and bolsters, the Southern coupler and the Ronemus draft gear.

—The Harrison Dust Guard Co., of Toledo, Ohio, is now getting out equipment for 1000 large steel cars being constructed by the Schoen Pressed Steel Co. for the Lake Shore & Michigan Southern, also for the Pittsburg & Lake Erie. The company has just received orders to equip the 80,000-lb. steel cars being constructed by the Elmira Bridge Co. for the Goodwin Car Co It also received orders recently for the 1000 stock cars being built by the Illinois Car & Equipment Co. for the Rio Grande Western Railroad. The company has received orders this week for dust guards for the Lake Shore & Michigan Southern, St. Louis & San Francisco, Seaboard Air Line, Chicago Great Western, Chicago & West Michigan, Ogdensburg & Lake Champlain, and Detroit, Grand Rapids and Western railways.

—The Schoen Pressed Steel Company and the Fox Pressed Steel Company have consolidated. The new company is styled the Pressed Steel Company. It has a capital stock of $25,000,000, of which $12,500,000 will be 7 per cent non-cumulative preferred stock and the remainder common stock. The officers are: Chas. T. Schoen, president; E. M. Dickerson, first vice-president and treasurer; Henry W. Oliver, second vice-president; Wm. H. Schoen, third vice-president; Edward A. Schoen, manager of works; W. O. Jacquette, secretary, and J. B. Brady, general sales agent. It is understood that J. T. Milner will be western sales agent. Regarding the Fox Company, W. O. Jacquette, their treasurer, makes the following statement: "The Fox Pressed Steel Equipment Company, whose works are located at Joliet, Ill., and Pittsburg, have been manufacturing the Fox pressed steel trucks and other steel equipment for railway cars for several years. The orders for 1898 included over 35,000 pressed steel trucks and 28,000 bolsters. The net earnings of the company on these orders will approximate $646,000. With the new orders now on file it is estimated that the earnings for 1899 will exceed $900,000. The present actual capacity of the works in important products is 120,000 trucks and 105,000 bolsters yearly. Under the consolidation and by additional facilities now arranged for in the Pittsburg works the capacity will be about double, or will be increased from 200 to 400 trucks daily. The various products of the plant are covered by 73 patents issued and more applied for." Charles T. Schoen, president of the Schoen Pressed Steel Company, makes this statement: "The Schoen plant is located on Preble avenue, Allegheny, and manufactures pressed steel freight cars and the various appliances, which are protected by over 70 patents issued and others pending. For the last half of 1898 the works were turning out from 15 to 20 cars daily, together with other car equipments. The Schoen Company now have on hand orders from the following railroads: Pennsylvania, Baltimore & Ohio, Lake Shore & Michigan Southern, Pittsburg & Lake Erie, Oregon Short Line, Baltimore & Ohio Southwestern, Pittsburg, Bessemer & Lake Erie, and other railways. These contracts aggregate over $4,000,000. The company also have on hand negotiations which will be promptly closed and which will yield upward of $4,000,000 worth of contracts for additional freight cars. The enlarged capacity of the works will enable the company to produce annually 12,000 cars, 180,000 bolsters, 30,000 truck frames, together with innumerable center plates, stake pockets and corner bands." In this connection we may note that the patents issued to Mr. William T. Schoen form a volume of considerable size and are the foundation records of the development of one of the great industries of this country. The first patent issued to Mr. Schoen related to springs for cars, bears date March 24, 1874, and is numbered 148,991. The last one issued up to the date of this writing is dated May 31, 1898, is numbered 604,794, and covers claims for an improvement in railway car bolsters. The patents issued to this inventor between these dates number about seventy and several applications are now pending. Naturally the most of the earlier patents relate to car springs—as Mr. Schoen was then in the car spring business, but in the list for that period we find portable heaters, ash-pit for furnaces; a furnace grate; two or three patents for hydrocarbon superheaters and burners; one on a joint for umbrella ribs and stretchers; one on a ventilated car door, etc. The patents relating to pressed steel shapes and the means for forming them are, of course, numerous and mark the wonderful progress which has been made along lines in which Mr. Schoen is the pioneer. The earlier patents in this field cover such things as centerplates, stake-pockets, etc. In July, 1890, a patent for a metallic car was allowed; in April, 1895, one for a pressed steel holster, and in July of that year one for a pressed steel truck frame. Every railroad man knows what immense industries have grown out of these and other Schoen patents in the same field. Many of these inventions are covered by patents in foreign countries. Among the pressed steel inventions which have not been developed to any extent are a pressed steel rail joint, a pressed steel brake shoe, and others.

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A study of shop design is always in season, bnt just now it is especially so in view of the fact that our railway companies are finding themselves in rather easier funds and are becoming somewhat inclined to expend money more generonsly in the way of improvements. Accordingly Mr. Forsyth's article on locomotive repair shop design, given in this issue, will be read with rather more interest than it might have been a year ago, when anything in the natnre of a new shop or a remodeled shop was only thought of hopelessly by master mechanics in general. We cannot give Mr. Forsyth's article in full but we give a portion wherein special attention is given to the advantages of housing under one roof the boiler shop, the erecting shop and the machine shop. Mr. Forsyth's suggestions will repay careful stndy.

An employe in the performance of his duties is bound to exercise ordinary care for his own safety, or that degree of care which prudent persons usually exercise under similar circumstances; and, if he is injured by failure to exercise such care, his employer is not liable. If, in the performance of his duties, the employe has no instructions to pursne a particular method, and two or more methods are open to him, he necessarily chooses between them; and, the supreme court of Florida holds, in the case of the Florida Central & Peninsular Railroad Company against Mooney, he cannot be said to have been negligent if he in good faith adopts that method which is more hazardous than another, if the one adopted be one which reasonable and prudent persons would adopt under like circnmstances. The reason given for this, is that any other rule would reqnire the employe to be measured by the standard of very prndent persons, because only extremely cautions persons ordinarily adopt the least hazardous course where both are considered safe and appropriate. In actions for negligence, further says the court, any evidence, tending to prove knowledge on the part of the person alleged to have been negligent of those circnmstances and surroundings which enter into the question as to whether snch person has failed to exercise proper care, is admissible. The court also holds that, in actions for negligence, where there is no evidence tending to show negligence of so gross and flagrant a character as to evince a reckless disregard of hnman life, or of the safety of those exposed to its dangerous effects, or that entire want of care which would raise the presumption of a conscious indifference to consequences, or to show wantonness and recklessness, or reckless indifference to the rights of others equivalent to an intentional violation of them, exemplary damages cannot be awarded.

An argument is made against the M. C. B. coupler by Mr. John Hickey, snperintendent of motive power of the Rio Grande Western, in a letter recently submitted by him to the snperintendent of his company. Mr. Hickey approaches his snbject earnestly and honestly but we do not believe that his conclusions will be generally accepted. He calls attention to some acknowledged tronbles with the M. C. B. type of coupler, such as the constantly-met-with variations in contonr lines, imperfect locking devices, etc. His criticism on these points will donbtless result as other similar criticism, published and nnpnblished, has done, namely, tend towards a rectification of the evils complained of. He contends that the M. C. B. coupler is too expensive to maintain, bnt we believe that this contention is not snpported by the data kept by most railways. His conclusion is that he cannot recommend this type of coupler for application to the rolling stock of his road. We do not believe, as we have often expressed ourselves, that at this late day it is worth while to seriously consider the M. C. B. coupler as a back number. It has been very widely introduced into service and its use is being rapidly extended. Experience with this type has developed some serious defects in its design, it is true, but these have in part been rectified. We do not by any means concede that it is a determined fact that the proportions of this coupler cannot be increased to meet the reqnirements of modern service, which are so mnch heavier than those prevailing at the time the type was introdnced. Mr. Hickey has always been a progressive man and we honestly believe that in due time he will hold different views as to the ntility, effectiveness, safety and expense of maintenance of th M. C. B. coupler. There is every reason to believe, we may add, that the coming report of the Western Railway Club's committee on couplers, due now in March, we understand, will throw much valuable light npon the whole subject and clear the way for still fnrther elimination of present troubles of the coupler situation.

THE FUTURE OF THE MACHINE TOOL BUSINESS.

Some weeks ago an eastern trade paper made an ill-considered and gratuitous attack on a very prominent railway snpply house located in New York city because of a report that this house had secured the sales agency of a considerable number of machine tool manufactnrers, to buy their ontpnt and put it on the market; they being actnal purchasers and taking the whole risk of selling. The paper referred to took the gronnd that the arrangement would be very unsatisfactory; that it had not been made, and that many of the concerns reported to have entered into it had not done so bnt would continne to do business in the good, old fashioned way.

While we have reason to believe that the attitude of the concerns referred to was misrepresented in the article in qnestion it is not our pnrpose to dispnte its assertions but simply to inqnire whether such an arrangement might not be beneficial to all parties concerned and also be a step forward in the path of commercial progress in this line.

In most of the great industries and in a multitude of the smaller ones the mannfacturer disposes of his output in quantities to those who buy to sell to the local dealer or the consumer. Why shonld not this method be applied to the disposal of machine tools?

Manufacturing, and selling what is mannfactnred, are two entirely distinct matters and the kinds of ability and methods of organization which they require are very different and distinct. Usnally the man who is well fitted to manage a manufacturing establishment has little ability to hold his own when it comes to selling his machines on the battlefield of competition. There must be another man, or another department, for making sales. It is true that a few strong companies are able to thoronghly eqnip the sales department of the business with strength enough to watch and meet all the varying conditions of home and foreign demand, but a great many smaller mannfacturers are nnable to do this, and the burden of selling their machines is a very heavy one. The proportionate cost of selling is so great that they mnst keep prices up to a high figure, and yet their net profits are less than they should be. Surely a scheme by which they could dispose of all they make to a strong, independent, selling company and be left free to devote all their energies to the improvement of their product and the lessening of its cost—snrely snch a scheme deserves serious consideration instead of attack and ridicnle!

But the important qnestion is, not whether snch a method would benefit the manufacturer, bnt whether it would give to the purchasing public advantages which the present system does not offer. That mnst be the snpreme test. What the public wants it will have, sooner or later, and it will snstain the agencies which give it what it wants. No matter how original and ingenious a method may be, if it does not meet and satisfy an existing want it soon perishes. What would the plan nnder discussion do for the purchaser?

It would tend to cheapen the price of machine tools, because the disproportionate expense of selling would cease to be a factor in the cost of the machines.

It would result in great exhibit collections of machines at central points. These exhibits would include competing machines; there would be lathes, shapers, boring mills, milling machines, etc., of different makes and the purchaser could compare them and decide which design would be best adapted to his special reqnirements. That this is an advantage much appreciated by purchasers is shown by the way in which competing machines at world's fairs and other large exhibitions are studied and compared by those who are interested in such things?

The time and expense of travel would be saved and the traveling salesman, with his catalogues and cuts, could give the purchaser his choice among a number of machines of whatever kind he might be in the market for. And each manufacturer, spurred by the competition of all the others in the same line, would naturally keep up his output to the standard and also endeavor to improve it.

And would not this method be a step forward along those lines in which commercial progress is marching at the present time? Who knows that the methods which have prevailed for the last thirty years are not to be improved upon and changed? The businesses of manufacturing and selling are already differentiated, but who shall say that the irresistible law of differentiation has worked out its final results in this matter? The tendency toward differentiation in our industries is general. So, also, is that of the combination of like but independent industries in one single organization. These tendencies are deplored and resisted by many, but they are irresistible and any organization, commercial or political, which attempts to stay them will be no more successful than was Mother Partington in sweeping back with her broom the incoming Atlantic tide. Combinations of trade interests are to be the feature of the early years of the twentieth centnry and the movement, with all that is in it of good and bad, must work itself out. Wise legislation may guide it, bnt no legislation, no opposition, can stop it. And if the method of selling machine tools which seems to be so distastefnl to our contemporary is, as it is quite possible it is, along the same lines it will be developed and perfected in spite of all opposition, and will prevail and maintain itself until some still better way is evolved out of the desires and necessities of men.

TRAIN RESISTANCE.

There will be fonnd in another colnmn of this issue a formula, together with explanations of the same, from which to calculate train resistances, and which has been proposed by Mr. John Lundie. It is not claimed that the formula offered will give the resistances for freight trains. It has been fonnd, in fact, that the formula will not check results found by actual tests in this kind of service; and we are inclined to donbt its accurate application to passenger trains, although it must be acknowledged that it gives very closely the results fonnd by experimenters and as given by the D. K. Clark formula.

The basis of Mr. Lnndie's formula is a series of observations made with "coasting" trains of different "units of transportation," 21 and 82 tons, plotting the data, drawing mean lines through the points and finding an equation which shall be that of a curve approximating as nearly as possible the constructed one. It is presumed that the formnla applies to trains running on a level, tangent track, and disregards entirely the resistance dne to movement of the atmosphere either in severity or direction relative to the movement of the train.

Even with these assumptions we are not inclined to accept, without fnrther proof, the formula as being within what may be termed the reasonably permissable error of such unsatisfactory formnlae. Professor W. F. M. Goss has pointed out, in a paper read before the Western Railway Club in April, 1898, that the first unit in a train is acted upon by an atmospheric force which may be calculated, and

which is ten times as great as the force acting upon any other unit except the second and last units. From this it will be seen that the atmospheric resistance, in an atmosphere otherwise perfectly quiet, will vary with the number of cars in the train, and, therefore, an exact formula should provide for the number of cars in the train. Again, the relative sizes of wheels and axles will affect the resistance, because it is well known that the larger the wheel the easier it will roll.

It may be well to call attention to what appears to be a discrepancy in the formula. Mr. Lundie uses the expression, "unit of transportation," and this includes, it is presumed, the locomotive. Assuming this and making further assumptions which are entirely within the possibilities of practice, then the resistance of the locomotive will be less than 1½ pounds per ton more than the resistance of the train; if the locomotive is not included in the "unit of transportation," then it will be found that a light train will offer about ¾ lb. greater resistance per ton than a heavy train, the difference depending upon the difference in the extremes taken. The diagram in another column shows this, and if an electric motor were used this may possibly account for the small increase in pounds per ton resistance for the motor, and the fact should be stated so that a correction may be made for steam locomotives. It is believed that if the motive power were produced by a steam locomotive the minimum possible train resistance would be greater than the 4 pounds given by Mr. Lundie. If 4 pounds is too small for steam motors then the direction of the curves would be changed and at the higher speeds at which the formula and observed resistances are compared the two would more nearly agree. An error has probably been made in assuming that the resistance per ton of a steam motor is practically the same as that for an electric motor.

If the formula is supposed to give results which shall check with observed data obtained from trains moving in other than a quiet atmosphere we are not surprised that it will not check with the results obtained in freight train service.

TESTS OF LOCOMOTIVE BOILER COVERINGS.

Undoubtedly the most important tests ever made of locomotive boiler coverings were those made last August on the Chicago & Northwestern Railway, and which were reported in a paper presented at the January, 1899, meeting of the Western Railway Club by Mr. Robert Quayle. It is believed that these are the only tests ever made which give any approximation of the amount of the heat losses by radiation from the boiler and other radiating surfaces of a locomotive in service, and it is probable that the results obtained will be considered conclusive and used as a basis of calculations for some time. It is quite probable that the tests were just as much of a revelation to the manufacturers of boiler coverings as to the railroad officials, and certain it is that several of the manufacturers have changed their method of manufacture, or made additions to their previously regular line of coverings, as a result of these tests.

The arrangements made for the tests were very elaborate and the generosity of the Chicago & Northwestern in making the tests possible is worthy of much commendation. The paper, an abstract of which we give in this issue, went only so far as to present facts, explaining the arrangements made and giving the results with very few deductions; and for this latter feature it has been endeavored to criticise it, but the effort has been mostly on the part of those who either hoped to have some particular covering favored or did not appreciate the very slight difference in the insulating value of the various coverings tested.

Since the paper was published it has come out that there was only one of the manufacturers represented in the tests who really appreciated that with the thickness of the coverings tested (about 1¼ to 1½ inches), there would be only slight differences in the amount of condensation found. This manufacturer was so firm in his belief before the tests that he was not particularly careful in applying his covering for test, while others were extremely careful to have the covering perfectly applied.

Taking this into consideration, together with the facts that the tests extended over eight or ten days with the varying conditions of weather that are certain to occur in that length of time (though they were not extreme even for the season during which the tests were made), the small differences between the various coverings are certainly quite surprising, and it is opportune to question what causes the uniformity in the results. It is believed to be the general opinion that the thickness of covering used had so much greater effect on the results than did the particular properties of each make of covering, that upon the former the results depended almost entirely, and that the results being practically uniform for all the coverings and of such an amount that small differences had only little effect, there resulted a showing of practically equal efficiency of the various coverings.

The general results of the tests will be to cheapen boiler coverings, provided conditions do not arise which will make it desirable to use thinner coverings. If such conditions do arise then the question of the insulating efficiency must receive attention; in the meantime a little addition in thickness may increase the commercial efficiency of an otherwise cheap covering. This is now appreciated by the manufacturers and they are at work on coverings which shall be cheaper in first cost or which shall be cheaper to apply.

Many mechanical officers will wish to make deductions from the results of the tests which shall guide them in selecting coverings, or will serve to emphasize the necessity of covering as many of the parts as possible, and these will find much assistance in the table which accompanies the discussion of the paper by Mr. W. H. Marshall. The deductions there given of the losses, in dollars and cents, through covered and uncovered surfaces will be found quite surprising, and even the figures given in this table are not large enough to represent the losses from the larger boilers carrying a steam pressure of 200 pounds or more, which are now quite common; nor will they include the greater losses which must occur in the more northern climates in winter.

The table to which the above reference is made, and the whole report, will demonstrate the necessity of covering every square inch of radiating surface possible. It will not do, however, to go at the matter blindly and think that because a surface is covered it is, necessarily, insulated. There is much radiating surface which is now commonly left unprotected which can be covered with good results, but there are other surfaces which can be covered, but to do so in a satisfactory manner will require some scheming. Of the former are the various steam pipes in the cab, and elsewhere, and parts of the cylinder casting; of the latter are the flat surfaces of the firebox, and particularly difficult will this be to handle where the ends of the staybolts are to be left exposed to view.

It will not be found satisfactory, we may add, to just fasten the covering in proximity to the surface; it must be so applied as to prevent the circulation of air between the covering and the surface covered, or between parts of the covering.

NOTES OF THE MONTH.

A record of a belt that had run continuously for 41 years is given by the Age of Steel. It was a leather belt of double thickness and 24 inches wide. This belt, which gave its service in Texas, showed when removed only a few worn spots.

* * *

In our last issue we gave an account of a remarkable fast run made by the Chicago, Burlington & Quincy in its mail service east-bound between Omaha and Chicago. On February 15 a west-bound train between the same points and in the same service beat the record first made. The train weighed 125 tons and was hauled from Chicago to Creston by class "H" mogul engines, having 19x24 inch cylinders and 62 inch drivers. The remainder of the distance the train was hauled by the 18x24 class "M" locomotives with 62 inch drivers. The distance of 500.2 miles was made in 554 minutes, including stops, and 524 minutes excluding stops.

* * *

The Atchison, Topeka & Santa Fe road has created the office of lamp inspector, whose duties are to travel over the road continually, inspecting all signal lamps, including semaphore, switch, train marker, and engine classification lamps. All these lamps are now in charge of the signal department, and this inspector reports direct to the signal engineer. The inspector visits Topeka, where the main shops of the Santa Fe System are located, once a month to inspect and test all new and repaired lamps, and no lamps of any description are issued by the store keeper without the stamp of the inspector.

* * *

In the Wisconsin legislature an effort is being made to pass a bill providing that railroad companies shall be responsible for damages where fire is caused directly or indirectly by sparks from the locomotive; a provision being made, however, that the railway companies may, if they wish, place insurance for their own benefit on the property along their line.

* * *

We have before referred to the marked improvements made on the Baltimore & Ohio in the way of removing curves. Further improvement in this report has recently been made at a point about half way between Cumberland and Martinsburg on the second division of the Baltimore & Ohio Railroad, at a picturesque spot known as Doe Gully. There is quite a little hill at this point that the road goes through and the approaches to this tunnel include several reverse curves. The company has been engaged for the past two months in removing these curves and reducing the grades. The chief engineer says that the improvement will do away with one of the most objectionable pieces of track on the second division since Seven Curves were eliminated, and will remove four reverse curves. It will not only make a much better riding track for fast trains but materially assist the west-bound freights in climbing this grade.

* * *

John Buddle & Son were identified, says the Age of Steel, with the introduction of cast iron rails in the collieries of the north of England. In a publication of long ago, known as the "Pitman's Pay," the following lines, in strong Northumberland dialect, express in an original fashion the gratitude of the miners of those days to the inventor of the cast-iron rail:

"But heavy puttin's now forgotten,
Sic, as we had i' former days;
Ower holey thill* an' dyels† a splittin',
Trams now a-run on metal ways.

"God bless the man wi' peace and plenty
That first inveuted metal plates,
Draw out his years te five times twenty,
Then slide him through the heevenly gates.

"For if the human frame te spare,
Frae toil an' pain ayont conceevin',
Hae aught te de wi' gettin' there,
Aw think he mun gan' strite te heeven."

*The sill or floor of the mine. †Deal boards.

* * *

"The wonderful growth of the telegraph business is shown," says Popular Science News, "in the fact that 30 years ago there were only 3,000 telegraph offices and little more than 75,000 miles of wire strung throughout the length and breadth of the land. At the present time there are about 25,000 offices and over 1,000,000 miles of wire. The annual number of messages handled 30 years ago was 5,879,282; to-day it is 80,000,000. The average cost to the sender 30 years ago was $1.047; the average cost to-day is 30.9 cents. At the start the cost to the company was more than twice what it is to-day to the sender."

* * *

A practical demonstration of the workings of an electrical machine is told of by the Criterion: "A certain physician," says that paper, "had a large Toepler-Holtz machine which gave a spark like a young streak of lightning. His wife was much interested in it and watched the doctor manipulate it until she fancied herself master of the apparatus. One day a party of friends called when the doctor was out, and the good wife seized the opportunity of paralyzing them with her knowledge of science. She was a very dignified woman of portly presence, and after leading them into the office, she began her explanation with all the impressiveness of a lecturer. She spoke briefly of the preliminary manipulation of the machine. 'And then,' she said, laying her hand upon one connection, 'the electricity goes from here to there,' whereupon an angry white spark leaped out from the brass ball indicated, with a report like a horse-pistol, and smote her upon the extended finger, causing her to sit upon the floor with a violence that shook the window panes. The guests stood around in expectant attitudes, looking

at their fallen hostess in pardonable surprise. Only for a moment did that capable woman leave them in doubt: 'There,' said she, in the most matter-of-fact manner, as though events had simply followed the usual course, 'you see how it works. Now, let's go into the garden and look at the chrysanthemums.'" This is an old story but it is well re-told.

* * *

The Register of Lehigh University, South Bethlehem, Pa., for the year 1898-99, shows few changes in the governing of teaching force. The department of mechanical engineering has lost the services of Messrs. B. H. Jones and L. O. Dansc as instructors, and their places are filled by Messrs. L. N. Sullivan and J. C. Peck. We notice that liberal provision is made for the aid of poor students in the form of scholarships covering the cost of tuition and of loans from funds controlled by the president. It is announced that in 1900 and thereafter the requirements for entrance to the course in science and letters or to any course in the school of technology will include plane trigonometry and logarithms through the solution of right and oblique triangles. The principle of elective studies is introduced into the technical courses. In the courses of mechanical and electrical engineering a large proportion of the work is identical and students in either course may in addition elect a considerable amount of special work in the other course, under the advice of the faculty, as a substitute for the same amount of work in his own course. We notice that a very large proportion of the members of the last graduating class, that of 1898, are reported as actively engaged in the practice of their professions, and that about one-half of those not so reported are engaged in graduate study either at Lehigh or elsewhere.

* * *

The equipment purchases of the Baltimore & Ohio in the last few years have been remarkable in amount. The recent order of this road for five thousand steel coal cars to be built by the Pressed Steel Company and the Carnegie Company, brings the total purchases of the receivers of the Baltimore & Ohio Railroad up to 30,394 since March 1, 1896. The locomotive purchases during that time have been 216, of which about 20 are still to be delivered. The company has also purchased five postal cars, ten express cars, ten combination cars and six dining cars.

* * *

The records of train-parting on the Nashville, Chattanooga & St. Louis up to November, 1898, we have given in previous issues. We now present a resume of the causes of trains parting as found on this road during December as follows: Slip pin broke, 4; slip pin key gone, 5; slip pin key broke, 1; draft timbers pulled out, 2; coupling pin broke, 14; knuckle pin broke, 3; coupling pin jumped out, 4; lock pin jumped out, 1; carrier iron bolts broken, 1; knuckle broke, 3; knuckle opened, 13; continuous drawbar strap broke, 1; link broke, 7; push bar broke, 1; drawbar broke, 1; drawbar pulled out, 1. The causes of the 13 knuckle openings recorded are given as follows: In one case the conductor thought that wrong knuckle had been applied (the inspector's opinion is not given); in 3 cases the lock pin was worn; in 2 the lock worked up; and there was 1 case each reported of "lock of lock pin worn," "tail of knuckle worn," "lock broke," "lock pin broke," and "knuckle worn." Three were unexplained.

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Apropos of all that has been printed within the past month or two concerning that late, distinguished, Phialdelphia citizen, Keeley, the motor man, whose motor never "moted" just right, there comes to mind, says Cassier's Magazine, a once suggested possible connection between Keeley's mysterious working force and the water supply of the city of Philadelphia, which, for many years, had the reputation of being almost the worst in the world. Keeley, as is just now fresh in memory, promised to accomplish all sorts of wonderful performances through the possibilities stored up in nothing more than a cup of water, one of the prospective achievements having been the running of a fast express train from Philadelphia to New York in a half hour or thereabouts, with the aforesaid cupful of water as one of the mainsprings of the requisite power. Some one, therefore, said that, after all, there was nothing wonderful about it, providing the water used were Philadelphia water which had been left standing for a day or two. The animals in it would, by that time, have become large enough to climb out and help push the train.

* * *

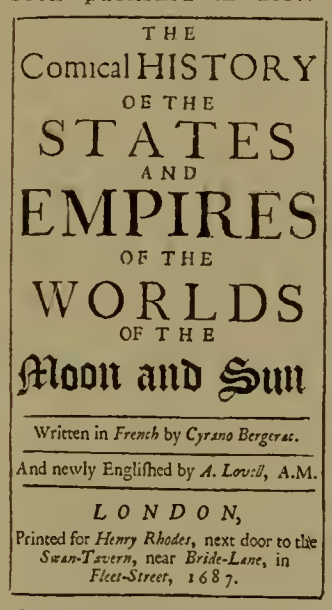
An annual prize for "the most important contribution to human knowledge" is given by the Institute of France. For the year 1898 this prize, which is a gold medal and 4,000 francs, has been given to Mr. Charles A. Schott, of the United States Coast Survey, for his development of a method of anticipating, for three years in advance, the variations in the compass at any point. Mr. Schott has made a very close study of terrestrial magnetism with the important results thus substantially rewarded.

* * *

At the Altoona shops of the Pennsylvania Railroad recently a mogul locomotive was erected and turned out of the shops in less than 21½ hours working time. At the hour when work commenced all the parts of the locomotive, large as well as small, were unassembled.

* * *

A remarkable anticipation of the phonograph and of the electric light has been discovered in an old book published in 1687. The special interest in Rostand's play, "Cyrano de Bergerac," caused a Chicago book lover to dig up an old volume written by Cyrano de Bergerac over 200 years ago. The title page of this work, given by the Chicago Tribune (together with extracts from its pages) we reproduce. The author tells of his wonderful trips to the sun and to the moon. The wonderful works of the philosophers, composed by one of the greatest wits of the sun, were presented to De Bergerac, who, in describing them as follows, gives an almost perfect idea of the phonograph invented for the use of man two centuries later. It should be explained that "my spirit" is his other spiritual self, which makes a first appearance to him on the moon by rescuing him from the difficulties in which his worldly and therefore unnatural physique and mannerisms have entangled him. "My spirit," he says, "had translated those books into the language of that world (the sun), but because I have none of their print I'll now explain to you the fashion of these two volumes. As I opened the box I found within somewhat of metal, almost like to our clocks, full of I know not what little springs and imperceptible engines. It was a book indeed, but a strange and wonderful book that had neither leaves nor letters. In fine, it was a book MADE WHOLLY FOR THE EARS AND NOT THE EYES. So that when anybody has a mind to read in it he winds up that machine with a great many little springs, then he turns the hand to the chapter which he desires to hear, and straight as from the mouth of man or a musical instrument, proceed all the distinct and different sounds which the lunar grandees make use of for expressing their thoughts, instead of language. Thus you never want for the company of all great men living and dead, who entertain you with living voices."


THE
Comical HISTORY
OF THE
STATES
AND
EMPIRES
OF THE
WORLDS
OF THE
Moon and Sun

Written in *French* by *Cyrano Bergerac.*

And newly Englished by *A. Lovell*, A.M.

LONDON,

Printed for *Henry Rhodes*, next door to the *Swan-Tavern*, near *Bride-Lane*, in *Fleet-Street*, 1687.

* * *

De Bergerac's divination of electric light is scarcely less notable. It is remarkable to think that two hundred years ago De Bergerac should have so clearly anticipated an invention of modern times, in the following: "The old landlord brought in crystals full of glow worms to light the parlor, but seeing those little fiery insects lose much of their light when they are not fresh gathered, these which were ten days old had hardly any at all. My spirit staid not till the company should complain of it, but went up to his chamber and came immediately back again with two bowls of fire so sparkling that all wondered he burnt not his fingers. 'These incombustible tapers,' said he, 'will serve us better than your week of worms. They are rays of the sun, which I have purged from their heats; otherwise the corrosive quality of their fire would have dazzled and offended your eyes. I HAVE FIXED THEIR LIGHT AND INCLOSED IT WITHIN THESE TRANSPARENT BOWLS.'"

* * *

Another substitute for india rubber has been produced in England. Previous attempts there to use linseed oil or like vegetable oils are said to have been unsuccessful because of imperfect methods of manufacture. The new process, which is said to overcome previously met with obstacles, consists of saturating a quantity of tow with the oil, and then, in a centrifugal machine, throwing out every particle of the oil except that which clings in minute globules to the fiber of the tow itself. The bunches of tow are then put on grids of metal in a chamber where warm air is forced through them and in twenty-four hours the oil is thoroughly oxidized. The material is then ground up, mixed with any desired coloring matter, and finally rolled out into sheets, in which condition it resembles india rubber and possesses many of the qualities of rubber and gutta percha. It is said to be as resilient as rubber, but not as elastic, to be impervious to chemical action, and to withstand heat up to 240° Fahrenheit, and it can be vulcanized by the same processes used for rubber and gutta percha. It has high electrical insulating qualities and can be used for cable wire coverings and other forms of electrical insulators, and it is made into wheel tires, which are said to be equal to those of rubber. It can be dissolved in ethereal spirits of all kinds, and from these solutions it can be applied as waterproofing coverings for fabrics of any sort.

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The Federal Steel Co. is about to order a number of extremely long cars, to be 66 ft. 4 ins. long. The design of these cars was left to Mr. F. H. Stark, master car builder of the Cleveland, Lorain & Wheeling. Very careful consideration has been given to the nice points involved in the designing of such a car, and the drawings thereof, which we hope to give in an early issue, will be examined with careful interest.

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In the disinfection of stock cars on the European continent it has been found impossible, it is reported, to obtain effective results with either carbolic acid, steam or formaldehyde. Satisfactory results have, however, been attained with a filtered 5 per cent solution of chloride of lime.

* * *

At the Oneonta shops of the Delaware & Hudson hydraulic hoists are used for raising locomotives. These hoists, says the Railroad Gazette, consist of four cylinders and plungers, each about 10 ins. in diameter. Two of these are fixed in the floor while the other two are movable through a range of eight feet by means of a rack and pinion. The two movable cylinders rest upon rails whose upper surfaces have been planed and upon which lugs cast on the cylinders slide. The water is admitted to each separately by four valves placed in a pit beyond the limits of the engine which is being raised.

* * *

Comparative records of the coal consumption of simple and compound locomotives on the Chicago, Milwaukee & St. Paul Ry., based upon the observations of one year, show up very favorably for the compound. The compounds were of the Vauclain four-cylinder type. The simples were identical with the compounds aside from the cylinders, etc. The average saving for the year shown by the compounds was, on the East La Crosse division, 16 per cent, and on the West La Crosse division, 19 per cent. It is figured that had all the engines been compounded there would have been saved on the East La Crosse division during the year $11,555, and on the West La Crosse division $10,741.

* * *

Something rather notable in the way of locomotive performance has just been reported on the Cincinnati, Hamilton & Dayton Ry. A certain engine was overhauled thoroughly and sent out of the shops and then ran 36 months with no attention other than that given through ordinary roundhouse repairs. The engine made during this time a little over 140,000 miles and her tires showed only ⅛ inch of tread wear. The engine was very light and not of modern date and build. She was of Rhode Island make, had 16x22 inch cylinders, and weighed about 72,000 lbs., of which about 46,000 lbs. was on the drivers.

LOCOMOTIVE REPAIR SHOP DESIGN.

The designing of locomotive repair shops is interestingly treated, under the title of "American Locomotive Repair Shops," in the January issue of Cassier's Magazine by Mr. William Forsyth, now superintendent of motive power of the Northern Pacific Ry, but who wrote the article, we believe, while in his late position as mechanical engineer of the Chicago, Burlington & Quincy.

Mr. Forsyth opens with some interesting figures as to the cost of locomotive repairs, giving a general idea of the expense to railroads for keeping locomotives in good working order and of the large amount of money expended in operating repair shops. He points out that the economy of shop operation depends not only upon the efficiency of the machine tools and the management of labor but also upon the convenient arrangement of the shops and their equipment with facilities for the proper handling of material. He considers that the size of a locomotive repair shop should be determined by the probable number of engines to be kept in repair, and he figures that the capacity of the erecting shops should be 8 per cent of the equipment, or, say, if the equipment amounts to 500 locomotives the erecting shop should have a capacity for 40 locomotives.

The author proceeds with a review of the arrangement of a number of railroad shops, illustrating his remarks with numerous plan views, sections and perspective elevations. The shops so reviewed are those of the Burlington & Missouri River at Havelock, Neb., of the Chicago & North Western at West Chicago, of the Pennsylvania R. R. at Juniata and at Altoona, Pa., of the Chicago, Burlington & Quincy at West Burlington, of the Boston & Maine at Concord, N. H., of the Grant Locomotive Works at Chicago, Ill., of the Pittsburg Locomotive Works at Pittsburgh, of the West Shore at Frankfort, N. Y. (proposed), and of the Lancashire & Yorkshire Ry. at Horwich, England. He also gives a plan proposed by himself, and this plan we reproduce herewith.

Mr. Forsyth covers a number of features of shop design but dwells chiefly, perhaps, upon the desirability of combining in one building the erecting shop, the machine shop, and the boiler shop. We give the substance of that portion of his paper which refers more directly to this consideration, as follows:

The erecting shop has been combined with the boiler shop in one long building, as illustrated by the Roanoke shops and the new Boston & Maine shops [illustrated in the Railway Master Mechanic for March, 1898—Ed.] and in a plan made by the writer (given herewith). In these latter plans the boiler shop is separated from the erecting department by a thin partition, sufficient to prevent the noise of riveting and clipping or calking from being heard in the adjoining shop. This appears to be the only objection to such an arrangement, and the plan has several advantages:—

First. It is the obvious and natural arrangement to so locate the boiler shop that the finished boilers pass directly and most easily to the erecting shop.

Second. No transfer table nor switching engine are required for communication between the principal departments.

Third. No outdoor work is necessary in winter, and no outside doors are opened for the transfer from one shop to the other

Fourth. There is a large saving in the cost of the building, by dispensing with two large brick gables with their windows and doors.

A fifth advantage is that boilermakers and their tools are often required on repairs in the erecting shop, and by this plan they are most convenient to their work.

We may next consider the advantages or disadvantages of the relative positions of the machine and erecting shops in the plans illustrated. For shops engaged almost exclusively on repair work, it is most convenient to have the machine shop in the same building with the erecting shop. For building new locomotives this is not so important, as the work may be organized so that there is a natural flow of finished machinery to the erecting shop; but in the case of repairs there would be a constant flow back and forth from one building to the other, causing considerable waste of time. In the case of a shop like that at Roanoke, or the Juniata shop, engaged upon new work and repairs, it is a question which might be profitably discussed as to whether it would have been more convenient to have had the boiler shop or the machine shop in the same building with the erecting shop. [In the Juniata shops the boiler shop lies at the end of the erecting shop, being separated therefrom by a transfer table, and the machine shop lies at the side of, and some distance from, the erecting shop. In the Roanoke shops the boiler shop is in the same building with the erecting shop, and the machine shop lies at one side of the erecting shop in another building.—Ed.]

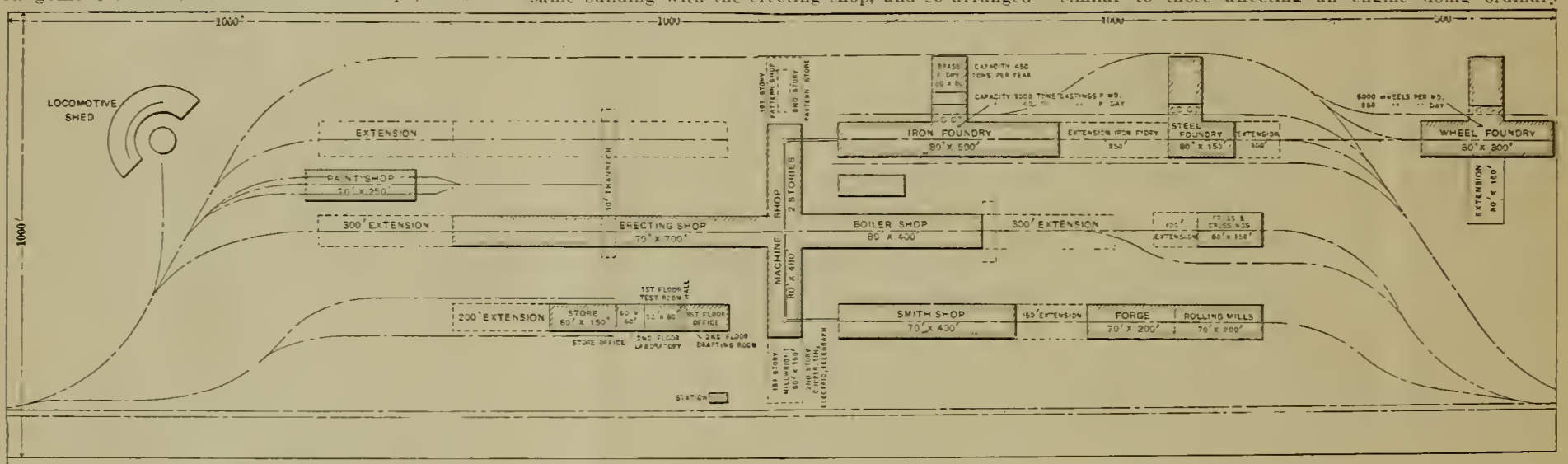
In thus studying the plans for locomotive repair shops and their relations to one another, to arrive at the most convenient arrangement it may be suggested that it is possible to have both boiler and machine shop in the same building with the erecting shop, and so arranged that the work will have the previously mentioned natural flow from each department where details are made to that where they are assembled on the finished engine. Such a plan is shown herewith, where the main shop building is in the form of a cross, the erecting shop and boiler shop in a straight line, with through tracks, and the machine shop at the center and at right angles to the erecting shop. It will be noticed that the iron foundry is near one end of the machine shop and the smith shop near the other.

It is intended that the tools for finishing castings shall be located near the foundry and those for forging near the smith shop. While this cannot be done in all cases and with small pieces, yet with the larger or heavy pieces requiring most labour in handling, it can be carried out. The tools for planing and boring cylinders, driving wheel lathe, tools for boring and planing driving boxes, wedges and shoes and for finishing eccentric straps, could be at the end of the shop near the foundry. The frame planers and slotters, axle lathes, link motion and rod planers could be at the end next the smith shop. The bolt and screw machines and brass lathes, shaping machines and other light machinery could be in galleries, forming a second story of the machine shop.

The boiler and erecting shops are necessarily high buildings, and in order to make the roof lines intersect properly and be symmetrical, the machine shop should be of the same height, and can thus be a two-story building. The advantages of this plan, so far as the buildings are concerned, are the same as those claimed for the combined boiler and erecting shop, but with the additional economy of saving four gable ends and having so large an amount of work under the same roof, and avoiding all outdoor communication between buildings, and open doors in winter time.

The plan concentrates the three departments required for locomotive repairs from the time of the original construction of the building and admits of the extension of each, while shops built on the longitudinal plan are often placed far apart for this purpose, and are operated at great inconvenience for many years before the gaps are filled in.

This article on locomotive repair shops merits a place in every master mechanic's scrap book. It may be found in its entirety in the January, 1899, Cassier's Magazine, which periodical is published in New York.



A PROPOSED SHOP PLAN. (By courtesy of Cassier's Magazine.)

BOILER COVERING TESTS.

Last August a very thorough series of tests of boiler coverings was made by the Chicago & Northwestern Ry. The tests were in charge of Mr. W. H. Marshall, assistant superintendent of motive power, and Mr. F. M. Whyte, mechanical engineer, of that road. Prof. W. F. M. Goss of Purdue University represented the manufacturers of the various coverings tested, and took charge of the data as taken. The manufacturers also had their direct representatives attending the tests. Upon Prof. Goss' report Mr. Robt. F. Quayle, superintendent of motive power of the Chicago & Northwestern, based a paper which he presented at the January meeting of the Western Railway Club, the facts in this paper being abstracted and arranged from that report. The substance of Mr. Quayle's paper follows:

Plan of the Tests.—In carrying out the tests two locomotives were employed; the "experimental locomotive" coupled ahead of the normal engine, and, consequently, first when running, to enter the undisturbed air, and a locomotive serving to give motion to the experimental locomotive. The action of the air currents upon the experimental locomotive, therefore, was in every way similar to those affecting an engine doing ordinary work at the head of a train. The boiler of the experimental locomotive was kept under a steam pressure of 150 pounds by a supply of steam drawn from the boiler of the normal engine in the rear. There was no fire in the experimental boiler. It was at all times practically void of water. Precautions were taken which justified the assumption that all water of condensation collecting in the experimental boiler was the result of radiation of heat from its exterior surface. This water of condensation was very carefully collected and weighed, thus serving as a means from which to calculate the amount of heat radiated. The whole grate of the experimental boiler was deadened by brick work and as a further insurance against the movement of air currents through the fire box, tubes, etc., the top of the stack was securely filled with wood. The furnace and front-end doors were also carefully closed and fastened. A steam separator in the supply pipe within the cab of the experimental boiler was assumed to deliver to it steam of a uniform quality. As a safeguard against air pockets and to further insure a uniform temperature of all portions of the interior of the boiler, steam was allowed to waste from it through a small orifice at the end of a pipe connecting with the front end, and leading outside to the top of the stack, and some leak was allowed also at the whistle valve.

The Experimental Boiler.—The principal dimensions of the boiler are as follows: Diameter in inches, 52; heating surface (square feet), 1391; total area of exterior surface, not including surface of smoke box, 358; area of surface covered (square feet), 219; area of steam heated exposed surface not covered, 139; ratio of surface covered to total surface, 61. The values here given are based upon projected areas of the plain boiler. No account has been made of the edges of plates at joints, or of surface due to the projection of rivet heads, or to the surface of various attached projections

The tests made were of two sorts: First, with the experimental engine at rest, and second when in motion at, approximately, 28.3 miles per hour. Both standing and running tests were made with the experimental boiler bare, and also when protected by six different coverings. There were nine standing tests and nine running tests made. These are designated as follows: A, B, C, D_1, D_2, E, F_1, F_2, and G. "A" repre-

sents the test of the bare boiler. "D_1" and "D_2" are different tests of the same covering, and, similarly, "F_1" and "F_2" are tests of a single coveriug.

Results.—The observed and calculated results are given iu detail iu Tables V aud VI. A summary of these is given in Table I.

TABLE I.

Pounds of steam condensation per minute.

	A (Bare Boiler)	B	C	D_1	D_2	E	F_1	F_2	G
Standing test.	6.78	2 63	3 42	2.91	2 80	3.52	3 04	3 22	3 03
Running test. Sp'd,28.3 m'l's	14.27	5.68	5.47	5.03	5 34	5 21	5.29	5 30	5.70

The values, as given, have been reduced to a common basis with reference to steam pressure, atmospheric temperature, and running speed, and so far as these factors are concerned, are comparable. They have not been corrected for variations in thickness of covering which, in all cases, was slight, or for variations in the velocity and direction of the wind.

Efficiency of Coverings.—The percentage of the heat transmitted from the bare boiler, which is saved by any covering, may be obtained by subtracting the amount of condensation for the covering iu question from the condensation for the bare boiler, and by dividing one hundred times this differeuce by the condensation for the bare boiler. The result expresses the efficiency of the covering. Values thus obtained are given in Table II:

TABLE II.

Efficiency of coverings as disclosed by running tests (per cent).

B	60.2
C	61.7
D_1	64.8
D_2	62.6
E	63.5
F_1	62.9
F_2	62.8
G	60.1

These results are corrected for variations in steam pressure, atmospheric temperature and speed, but not for variations in weather and wiud conditions or for variations in thickness of covering. The average efficiency disclosed by the eight tests is 62.3 per cent. The greatest variation from this average is that for test D_2, which represents a 3 per cent higher efficiency. The conclusiou, stated in very general terms, is that any of the coverings tested can be relied upon to save frou 60 to 64 per cent. of all the heat which would radiate frou the boiler were it not covered at all.

Comparison of Results.—It should be continually borne in mind that it was uot proposed to measure with scientific accuracy the non-conducting properties of covering materials, but to show the valne of laggings made up of various materials, and in various forms, when subjected to the conditions of locomotive service. The purpose sougbt has been attained. The work has been conducted upon an unprecedented scale, and the extent of such losses has for the first time heen fully disclosed. But service conditions which were necessary to the general demoustration could not always give similar conditions for different tests, though it is believed that no single test was affected by variations of conditions, by more than 2 or 3 per cent., an amount which would seem to be entirely negligible. It is important to emphasize the fact, that the relative standing of any two coverings, as disclosed by the results here given, is not to be relied upon when the difference between them is small. In this connection it should be noted that for comparative purposes the results of the runuing tests are more reliable than those from the standiug tests. The fact that the results obtained from the several coverings are so nearly alike can hardly fail to occasion surprise. Had thin layers of the material tested been subjected to carefully planned laboratory tests, the results would doubtless have differed more widely, but it must be expected that the value of such difference will diminish as the specimens experimented upon are increased in thickness. A material which is rather an indifferent non-conductor will serve to prevent the passage of heat if applied in sufficient thickness. While, therefore, the coverings tested were of normal thickness, it would seem that this thickness is sufficient to reduce to a negligible amount the effect of the superior non-conducting properties which the material of one covering may have possessed over others.

Efficiency of Covering the Different Portions of the Boiler.—The results show that the covering of 61 per cent. of the exterior surface of the experimental boiler saves 62.3 per cent. of all the heat radiated from the same boiler under similar circumstances, when bare. It does not, however, follow from this statement that if 100 per cent. of the exposed surface of the boiler were covered, 102 per cent. of the heat lost from the hare boiler would be saved. Such a conclusion must obviously be absurd, though a hasty consideration of the facts presented might seem to justify it. The fact, as first stated, however, proves that there is a vast difference in the character of the exposure to which different portions of the boiler are subjected. While only 61 per cent. of the surface of the boiler was covered, the protectiou was evidently applied where it was most needed. The percentage of the total exposure guarded against was greater than the percentage of surface covered. For this reason, increasing the covered area by 10 per cent. cannot be depended upou as a means of redncing radiation losses by a like amount. It is for this reason, also, that all comparisons in this report have been upon the boiler as a whole. The radiation is stated in terms of pounds of steam condensed per minute for the boiler experimented upou, rather than as pounds per minute per square foot of exposed surface.

Radiation and Its Power Equivalent.—Assuming that a locomotive will develop a horse power by a consumption of twenty-six pounds of steam power, and assuming that the steam thus consumed must be geuerated from water at 80 degrees F., the radiation losses already given may be expressed in terms of power losses of equal value. The practical effect of these assumptions is to define a horse power as equal the condensation, under the conditions of the tests, of thirty-four pounds of steam per hour, the steam having a pressure of 150 pounds aud the water the temperature due to this pressure. Upon this basis the following results are obtained. They apply only to the boiler tested:

TABLE III.

Power lost by radiation.

	Horse-Power Equivalent to Radiation Losses.
Bare Boiler—	
Locomotive at rest, under conditions of test...	12.
Locomotive running 28.3 miles per hour and otherwise under conditions of test.....	25.
Covered Boiler—	
Locomotive at rest, under conditions of test...	4.5
Locomotive running 28.3 miles per hour and otherwise under conditions of test.....	9

A locomotive similar with that tested may be expected to deliver a maximum of 600 horse power. It is evident that if the uncovered boiler were under conditions of speed, etc., which are not now uncommon in service, that at least 10 per cent. of the total power of the machine would be lost in radiation from its exterior surface. This then, discloses the extent to which locomotive performance may be effected by radiation. A perfect covering enveloping the entire external surface of the boiler would prevent the entire loss. Actual coverings, such as those tested, extending over a portion of the surface, prevent approximately 62.3 per cent of the loss. It seems to be a fact, therefore, that a boiler protected in accord with good practice loses

TABLE V.

	Designation of Test	BARE A BOILER	B	C	D_1	D_2	E	F_1	F_2	G
1		Aug.11	Aug.10	Aug.12	Aug.14	Aug.18	Aug.15	Aug.16	Aug.17	Aug.19
2	Duration of Preliminary Warming - min	50	93	204	127	111	49	53	75	71
3	Duration of Test - min	62.3	35.5	30 5	56.9	38.0	26.5	60.3	75.8	40 8
4	Average Boiler Pressure - lbs	152	156.9	156	150.2	150 1	153.2	152.6	151.5	152.9
5	Average Atmospheric Temperature - Degrees F	74	72	78	72	72	73.6	71	79	70
6	Direction & Force of Wind, Miles per Hour	6 to 10	0 to 2	3 to 8	5	3 to 5	5	10 to 15	3	3
7	Observed Condensation for Test - lbs	432.6	97	106.1	176	109.5	96	189.5	246.5	128.5
8	Amount to be added to or subtracted from 8 to convert it to an equivalent amount which would have been observed had the average steam pressure been 150 lbs. & Atmos Temp. 80°F	-10.4	-3.7	-1.8	-4.8	-3.0	-2.6	-6.4	-2.5	-5.0
9	Total Condensation under Standard Conditions of Pressure and Temperature	422.2	93.3	104.3	171.2	106.5	93.4	183.1	244	123.5
10	Condensation per Minute	6.78	263*	3.42	2.91	2.80	3.52	3 04	3.22	3.03

* THE VALUE 263 IS PROBABLY TOO LOW. IT IS ESTIMATED THAT THE TRUE VALUE IS NOT LESS THAN 3 00

TABLE VI.

	Designation of Test		BARE A BOILER	B	C	D_1	D_2	E	F_1	F_2	G
1											
2	Duration of Test - min Time between initial and final balance	a 1st Quarter	106 2	86.5	88.7	86 0	88 7	86 1	120 2	85.6	84 5
		b 2nd "	81.0	80 5	76 7	78.4	80 5	77 8	75 6	81 0	79.2
		C 3rd "	75.6	78.8	77 4	73 1	77 8	75.7	80 0	76 6	74 5
		d 4th "	96.2	112 8	95 4	89 3	97 9	105.5	93 5	103 0	108.2
		e Total for test	359 0	358.6	338.2	326.8	344.9	345.1	369 3	346.2	346 4
3	Actual Running Time minutes	a 1st Quarter	95 0	81 5	82.9	81 5	83.1	81 6	98 5	81 0	81.1
		b 2nd "	70 0	68 3	67.3	68.6	69.0	67 8	69.1	68.6	69.1
		C 3rd "	73.5	73 0	72.7	71.2	73.3	72 5	60 7	73 5	71.2
		d 4th "	84 7	90.5	83 4	84 3	80.2	86 9	82 5	84 9	79 7
		e Total for test	323.2	313.3	306 3	305.6	305.6	308.8	318.8	308.0	301 1
4	Actual Standing Time minutes	a 1st Quarter	11.2	5 0	5 8	4.5	5.6	4.5	21 7	4.6	3.4
		b 2nd "	11 0	12.2	9 4	9.8	11.5	10.0	6 5	12.4	10 1
		C 3rd "	2.1	5 8	4 7	1.9	4.5	3.2	11 3	3 1	3 3
		d 4th "	11.5	22.3	12.0	5.0	17.7	18.6	11.0	18.1	28.5
		e Total for test	35 8	45.3	31.9	21 2	39.3	36.3	50 5	38 2	45 3
5	Average Boiler Pressure Pounds by Gauge	a 1st Quarter	146.6	148 2	155 3	150.8	149 9	150 6	149 9	150 6	152 1
		b 2nd "	146 1	150.9	148 3	150.2	148.5	151.3	150 8	152 3	151 8
		C 3rd "	143 2	151 5	153.8	152.2	151.6	151.4	152.3	151 4	151 6
		d 4th "	147 4	150 1	152.6	150.6	152.0	151.8	150.3	150 1	151 0
		e Total for test	145 8	150.1	152.6	151.0	150 5	151 3	150.7	151 0	151.6
6	Average Atmospheric Temp F	a 1st Quarter	79 8	74.3	81 3	72 8	76.8	81 3	81 5	79 0	78.2
		b 2nd "	85.0	79 3	82.0	74.0	79.2	86 0	84 3	80.0	79 8
		C 3rd "	82.0	85.8	82.0	76.3	79.3	90.7	90 0	81 0	84.6
		d 4th "	82.0	83.3	81 3	77.0	78 0	90 3	88.2	81 0	83.3
		e Total for test	81 7	80.3	81 6	75.0	78.2	86 8	85.5	80 3	81.1
7	Direction & Force of Wind N M P H	a 1st Quarter		10 TO 12	2	10 TO 15	5	3 TO 4	3 TO 6	5 TO 7	3 TO 4	2 TO 3
		b 2nd Quarter		10 TO 12	2	10 TO 18	5	3 TO 4	10	6 TO 10	3 TO 4	2 TO 3
		C 3rd "		10 TO 12	2	10 TO 18	5	3 TO 4	10	5	2 TO 4	3
		d 4th "		10 TO 12	2	10	5	3 TO 4	10	CALM	2 TO 4	3
8	Condition of Sky.			HAZY SUNSHINE	HAZY	CLEAR	CLOUDY VARIABLE	CLEAR	BRIGHT HAZY	ALTERNATELY BRIGHT & CLR	CLEAR	CLEAR
9	Observed Condensation Lbs. of Water Delivered to Weighing barrel	a 1st Quarter		1376.9	419.0	545.7	388.4	458.4	397.2	548.8	449.9	467.1
		b 2nd "		1137.8	452.1	413.6	375.2	397.7	416 7	411.9	390.7	418.4
		C 3rd "		975.4	410.7	343.2	393.7	401.9	363.7	378.2	393.7	402.2
		d 4th "		1168.1	590.5	479.1	472.4	494.3	515.8	437.6	560 3	575.5
		e Total for test		4458.2	1872.3	1781.6	1629.7	1752.3	1693.4	1776.5	1750 6	1863 2
10	Amount to be added to or subtracted from the total observed condensation to convert it into an equivalent amount which would have been observed had the average steam Pressure for the test been 150 lbs. and the Atmos. Temp 80°F			+60.6	0.	0.	-31.0	-12.3	+37 3	+32 0	0	+0 9
11	Total condensation for test under conditions of 10			4718.8	1872.3	1781.6	1598.7	1740.0	1730.7	1808.5	1750.6	18641
12	Assumed time during which Engine was running Min.			305	305	305	305	305	305	305	305	305
13	Assumed rate of speed - Miles per Hour.			28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3
14	Assumed time during which engine was standing = duration of test minus assumed time engine was running = item 2(e) - item 12			54.0	53.6	33 2	21.8	39.9	40.1	643	44 2	41.4
15	Total condensation during running = condensation for test minus the product of the rate of condensation while standing and the assumed standing time.			4352.7	1731.5	1668.1	1535.3	1628.3	1589.5	1613.0	16179	17387
16	Condensation per min. while running 28.3 miles per hour			14.27	5.68	5.47	5.03	5.34	5.21	5.29	5.30	5.70
17	Reduction in condensation per min. while running at a speed of 28.3 miles per hour resulting from covering applied to 61% of total surface of boiler. Pounds.				8.59	8.80	9.24	8.93	9.06	8.98	8.97	8.57
18	Ratio of heat saved by covering to total heat transmitted from bare boiler				0.602	0.617	0.648	0.626	0.635	0 629	0.628	0.601

power when standing in warm weather, at the rate of four and a half horse power, which amount will increase if the pressure of steam is increased, or the temperature of the atmosphere is reduced, or the engine is put in motion.

Cost of radiation from the boiler experimented upon may be stated as follows:

TABLE IV.

Bare boiler.

Pounds of coal per hour equivalent to radiation losses, assuming evaporation from and at 212 deg. F., of 6 lbs. of water per lb. of coal—	
When standing	60.
When running 28.3 miles per hour	126.
Tons of coal per month, assuming boiler to be under steam standing 200 hours and running 28.3 miles per hour during 300 hours per month	25.
Cost of radiation per year for the boiler tested, assuming the conditions of the preceding paragraph and assuming the price of coal $2.00 per ton	$600

As locomotives are never run entirely bare, the estimated annual loss by radiation, of $600 per engine, is higher than would be likely to occur on any engine in service. It is, however, a statement of the total loss which may occur, and as such will be useful in estimating the value of savings which may be effected by the application of coverings.

It has been shown that the several coverings tested have an efficiency which is not far from 62.3 per cent. The annual saving, therefore, which would be effected by the application of any of the coverings would be

$600×.623=$383.80,

the remaining $226.20 still going to waste through radiation. The results show that anything which will increase the efficiency of the covering on the engine tested by 1 per cent. will result in a saving of $6 per annum. A 2 per cent. increase of efficiency will save $12, a $3 per cent. increase $18, and so on. This holds for the particular engine tested and for the conditions under which the engine was tested. The fact should be emphasized that the results thus far given are those derived from the actual experiments in August, with a boiler of moderate size, carrying steam pressure which is now regarded as low at a speed of less than thirty miles per hour. It is evident that other conditions, quite common to actual service, would operate to greatly increase the radiation losses described. The effect of changes in some of these conditions will next be considered.

The effect of changes in speed on radiation has long been an open question. It has been argued that a boiler perfectly covered would be, to a very great extent, unaffected by surrounding air currents, and hence that its radiation losses would not be materially greater when the locomotive is at speed than when standing. But those who appreciate the intensity of the cooling currents, which circulate about a locomotive when at speed, have been slow to accept such a view, and the tests under consideration confirm their position. They

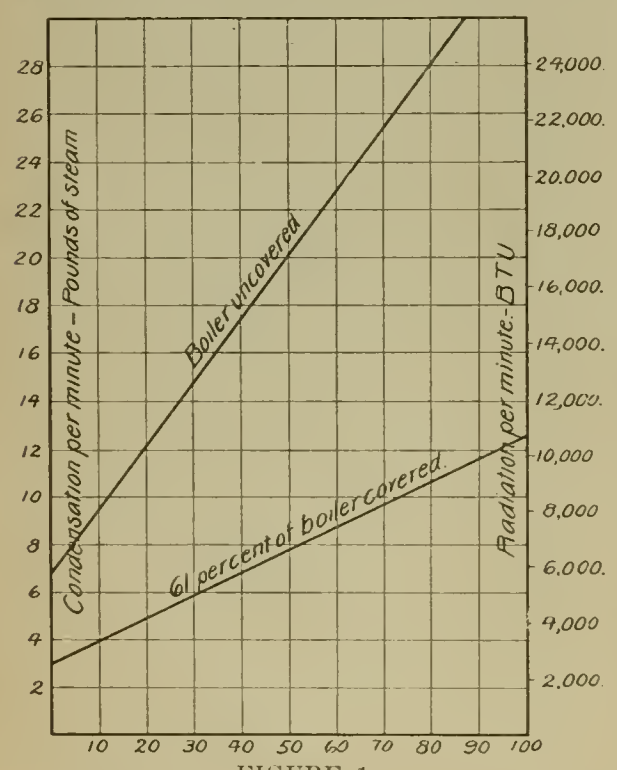


FIGURE 1.

give a measure of the radiation losses, both when the locomotive is at rest and when moving at a uniform speed of 28.3 miles per hour. While these points are not sufficient to establish with accuracy the complete relationship of radiation and speed, an estimate, based upon them, is presented in the form of a diagram, Fig. 1. This shows that the bare boiler, when at rest, radiates sufficient heat to condense 6.78 pounds of steam, at 150 pounds pressure, per minute, which amount is increased to twenty-eight pounds when the same boiler is driven at a speed of eighty miles an hour. Similar values for the covered boiler are 3.0 pounds and 10.6 pounds respectively.

Changes in Atmospheric Temperature.—The results recorded were obtained in mid-summer and all have been corrected for an atmospheric temperature of 80 deg. F. For each 10 deg. reduction in atmospheric temperature below 80 degrees, the radiation may be expected to increase 3.5 per cent. For zero degrees temperature the radiation losses recorded in this report should be increased by about 28 per cent. For example, if, when the atmospheric temperature is 80 deg. the conditions are such as result in the condensation of five pounds of steam per minute, when the atmospheric temperature is 0 degrees the condensation will be

$$5 + 5\ (.035 \times 80) = 5 + 1.4 = 6.4$$

From this it appears that very low temperatures are attended by radiation losses of considerable magnitude.

Changes in Steam Pressure.—The experiments were conducted under a boiler pressure of 150 pounds by gauge. With an increase of pressure the boiler temperature will become higher, and the radiation losses will, as a consequence, be augmented. Changes arising from this source, however, are not great. For each ten pound increase of pressure above the limit of 150 pounds the radiation may be expected to increase by about 1.6 per cent., but this will not apply for pressures much above 200 pounds. A pressure of 200 pounds will involve losses by radiation which are 8 per cent. greater than those making up the record of this report.

Possible Losses from the Boiler Experiment Upon.—Applying the results expressed in the preceding paragraphs, it can be shown that with the boiler bare and the locomotive running at eighty miles an hour, under a steam pressure of 200 pounds, with the atmospheric temperature 0 degrees, the loss by radiation would be the equivalent of sixty-seven horse-power, while a covered boiler running under the same conditions of speed, pressure, and atmospheric temperature, would still be subject to a loss of twenty-five horse-power. As a locomotive similar to that tested may be expected to deliver a maximum of 600 horse-power, it is evident that under the extreme conditions just assumed, which are not at all uncommon to service, at least 10 per cent. of the total power of the engine would be lost in radiation. An application of any of the coverings tested would reduce the loss to about 4 per cent.

Conclusions.—In view of the very strong air currents which circulate about the boiler of a locomotive at speed it is not surprising that the losses by radiation are large. While their value is dependent upon conditions which may vary widely, they always go on whenever the boiler is under steam. In this respect radiation losses are unlike those which occur within the engines of the locomotive, since, to a considerable extent, these latter cease to operate whenever the throttle is closed

All of the experimental results and the conclusions based upon them were obtained from an engine of moderate size, carrying a pressure which, in the light of modern practice, must be considered low, and under conditions of summer atmosphere. The running speed, also, was not high. These conditions cannot be considered as in any way calculated to disclose large radiation losses, and yet the results are such as will merit the earnest attention of all who are interested in improving locomotive performance. In this connection it will be well to again emphasize the fact that the losses which have been measured and which are defined in this report do not include radiation from saddles and cylinders, or from any portion of the locomotive excepting the boiler itself.

It may be assumed that the boiler as covered in each of the several tests involving covering, was as well protected against radiation as is the average boiler of American locomotives, notwithstanding the fact that when thus covered there is still a loss of heat, which in money value annually represents many times the cost of the best covering which the market to-day affords. Improvement is to be found not only in improving the character of the covering itself, but chiefly, probably, in extending the covered area of the boiler and projections attached thereto.

In the discussion of this paper Mr. W. H. Marshall presented an elaborate statement comprising valuable deductions from the data presented in the report. This statement we give in full.

STATEMENT

Deduced from Report of Lagging Tests; showing Probable Losses through Surfaces Lagged and through Surfaces Unlagged, and the Annual Cost of these Separate Losses.

No. of Line	DESIGNATION OF LAGGING	A (Bare Boiler)	B.	C	D	E	F	G
1	Total condensation during test (line 9, Table No. 6 of report)	4658.2 lbs.	1872.3 lbs	1781.6 lbs.	16.910 lbs.	1693.4 lbs.	1763.6 lbs.	1663.2 lbs
2	Total condensation corrected to 150 lbs. steam and 80 deg. atmospheric temperature (line 10, Table 6 of report).	4718.8 lbs.	1872.3 lbs	1781.6 lbs.	1669.3 lbs.	1730.7 lbs.	1779.6 lbs	1864.1 lbs.
3	Actual standing time (line 4, Table 6 of report).	35.8 min.	45.3 min	31.9 min	30.2 min.	36.3 min.	44.3 min.	45.3 min
4	Assumed rate of condensation while standing	6.78 lbs.	3.00 lbs	2.95 lbs.	2.85 lbs.	2.85 lbs.	2.85 lbs	3.00 lbs.
5	Total condensation while standing, based on rate assumed in line 4.	242.7 lbs.	135.9 lbs.	94.1 lbs.	86.1 lbs.	103.5 lbs.	126.3 lbs.	135.9 lbs
6	Total condensation while running (figures in line 2 minus those in line 5).	4476.1 lbs.	1736.4 lbs.	1687.5 lbs.	1583.2 lbs.	1627.2 lbs.	1653.3 lbs.	1728.2 lbs.
7	Actual running time (line 3 Table 6 of report)	323.2 min.	313.3 min	306.3 min.	305.6 min	308.8 min	313.4 min.	301.1 min
8	Condensation per minute while running (line 6 divided by line 7)	13.82 lbs	5.54 lbs.	5.51 lbs.	5.18 lbs.	5.27 lbs.	5.27 lbs.	5.75 lbs.
9	Average speed in miles per hour.	26.7	27.6	28.2	28.3	28.0	27.6	28.7
10	Total condensation per minute while running, corrected to average speed of 28.3 miles per hour	14.25 lbs.	5.62 lbs.	5.52 lbs.	5.18 lbs.	5.30 lbs.	5.34 lbs	5.74 lbs.
11	Condensation per minute from unlagged surfaces while running 28.3 miles per hour (calculated)	3.07 lbs.	3.07 lbs.	3.07 lbs.	3.07 lbs.	3.07 lbs.	3.07 lbs.	3.07 lbs.
12	Condensation per minute from lagged surfaces while running 28.3 miles per hour (line 10 minus line 11)	11.18 lbs.	2.55 lbs.	2.45 lbs.	2.11 lbs	2.23 lbs.	2.27 lbs.	2.63 lbs.
13	Condensation per minute from lagged surfaces, while running in atmosphere at 50 deg. temperature	12.30 lbs.	2.81 lbs.	2.70 lbs.	2.32 lbs.	2.45 lbs.	2.50 lbs	2.89 lbs
14	Loss through lagged surfaces annually while running, assuming average service of 250 hours per month at 28.3 miles per hour, average temperature of air 50 deg., and 1 lb. of coal equal to 8.2 lbs. of water evaporated from 367 deg. temperature to steam at 367 deg. (150 lbs. pressure). Coal.	135.0 tons	30.8 tons.	29.6 tons	25.5 tons.	26.9 tons.	27.4 tons	31.8 tons.
15	Loss through unlagged surfaces under same conditions as line 14. Coal.	37.0 tons	37.0 tons.	37.0 tons.	37.0 tons.	37.0 tons.	37.0 tons.	37.0 tons.
16	Assuming ratio of losses from lagged and unlagged surfaces to be same when standing as when running, then condensation from unlagged surfaces per minute equals when standing in air at 50 deg.	1.795 lbs.	1.795 lbs.	1.795 lbs.	1.795 lbs	1.795 lbs.	1.795 lbs.	1.795 lbs
17	And condensation from lagged surfaces under conditions of line 16 equals per minute.	5.64 lbs.	1.48 lbs.	1.43 lbs.	1.32 lbs.	1.32 lbs.	1.32 lbs	1.48 lbs.
18	Loss of coal per year from lagged surfaces, engine standing 200 hours per month in air of average temperature of 50 deg.	49 tons	12.8 tons	12.4 tons.	11.5 tons	11.5 tons.	11.5 tons	12.8 tons.
19	Loss of coal through unlagged surfaces under same conditions as line 18.	15.8 tons.	15.8 tons.	15.8 tons.	15.8 tons.	15.8 tons.	15.8 tons	15.8 tons.
20	Total loss of coal through lagged surfaces per year, including time running and standing (line 14 plus line 18).	18.4 tons	43.6 tons.	42.0 tons.	37.0 tons	38.4 tons.	38.9 tons.	44.6 tons.
21	Total loss of coal through unlagged surfaces per year, including time running and standing (line 15 plus line 19).	52.5 tons	52.5 tons	52.5 tons.	52.5 tons.	52.5 tons.	52.5 tons	52.5 tons.
22	Total loss in money through lagged surfaces per year, assuming coal at $1.50 per ton	$276.00	$65.40	$63.00	$55.50	$57.60	$58.35	$66.90
23	Total loss in money through unlagged surfaces per year, coal at $1.50 per ton.	78.75	78.75	78.75	78.75	78.75	$78.75	78.75

NOTE.—This table was prepared on the following basis: First, The total condensation is derived from the tests. Second, The running and standing time is the same as in the tests. Third, The standing condensation per minute is taken at figures believed to be more consistent than those derived from the tests. Fourth, Running condensation is total condensation minus *assumed* standing condensation. Fifth, Condensation per minute running is obtained for actual speed of tests and then corrected to a speed of 28.3 miles per hour. Sixth, Condensation due to uncovered surfaces is calculated by assuming an efficiency (when running) of 80 per cent for one well known covering used in the tests. Seventh, The average temperature of the atmosphere for the year is taken at 50 deg. Lagged surface as applied to bare boiler means that surface lagged in other tests. Unlagged surface as applied to bare boiler test means the surface not covered in other tests.

The June Conventions.

The thirty-third annual convention of the Master Car Builders' Association will be held at Old Point Comfort, Va., commencing Wednesday, June 14. The thirty-second annual convention of the American Railway Master Mechanics' Association will be held at the same place commencing on Monday, June 19.

The headquarters of both associations will be at

Hotel Chamberlin, which has made rates jointly with the Hygeia Hotel, as follows, to all those in attendance at the conventions:

Single room ..... $3.00 per day.
Double room, two persons, each..... 3.00 per day.
Double room, occupied by one person 4.00 per day.
Single room, with bath..... 4.00 per day.
Double room, with bath, two persons, each..... 4.00 per day.
Double room, with bath, one person.. 5.00 per day.

Members of the associations will have preference of rooms at these hotels until March 15, 1899. Applications should be made to Alan F. Campbell, Manager, Hotel Chamberlin, or F. N. Pike, Lessee, Hygeia Hotel, before that date in order to be sure of such accommodations.

Messrs. Robert Quayle, J. H. McConnell and W. S. Morris constitute a joint committee of arrangements for the master mechanics' association, and Messrs. C. A. Schroyer, C. M. Mendenhall and W. S. Morris the joint committee for the Master Car Builders' Association.

A NEW TRAIN RESISTANCE FORMULA.

The Street Railway Journal presents in a recent issue a new general formula for train resistance, and says concerning it:

A general formula which appears to be applicable to passenger trains of all weights, running at all speeds up to the highest limits so far reached, has been lately worked out by John Lundie as a result of a long series of tests of trains in actual service, and is here given to the engineering public for the first time. His methods of obtaiuing data are decidedly different from, and much more satisfactory than those commonly employed hitherto, where indicator cards of engines drawing trains at constant (?) speed on level (?) track have been made the basis (with an arbitrary allowance for engine friction) of estimates of resistance per ton moved. In order to be of any value such tests must be made in long distance runs, and it is almost impossible to find a hundred miles or more of absolutely level track for the purpose, while it is also difficult to obtain perfectly uniform speed even on a dead level. Mr. Lundie's method of determining train resistance is based on an examination of the speed curves of a train when coasting from any speed to a dead stop. The possibilities of such a method will be instantly evident to an engineer, and it may be said, at once, that the results warrant a decided predisposition in its favor. It is not only possible to obtain the gross resistance due to track and journal friction and air resistance combined, but to differentiate between the air and the friction elements. The frictional resistance of a train being reasonably constant within somewhat wide limits of speed, the speed curve should be a nearly straight descending line from full speed to a point somewhere near a full stop. Now the actual speed curve dips below this straight line, as seen in Fig. 2, clearly showing a decreasing retarding force (due to air resistance), with decreasing speed.

In Fig. 1 are shown in graphic form the results calculated from more than 150 runs made by Mr. Lundie with trains of different weights on the South Side Elevated Railroad, of Chicago. It will be seen that these results, expressed by the location of points on the diagram, cluster around "straight line curves," and that these lines intercept each other, with surprising accuracy, at a single point located at a definite distance above the origin. This indicates, of course, that the first step in obtaining the final formula has been reached, in the establishment of a constant, representing the minimum possible train resistance for all speeds and weights, and it is interesting to note, by the way, that in none of the recorded experiments so far made on passenger or freight trains of all weights has the resistance per ton been less than the figure indicated by this constant—4 pounds.

Mr. Lundie's formula is as follows:

$$R = 4 + S\,(0.2 + \frac{14}{35 + T})$$

where.

T = the weight of the transportation unit in tons (2,000 lbs.).

R = resistance in pounds per ton.

S = speed in miles per hour.

It will be seen at once that unlike most previous formulæ, there are here but two variables after the constant, namely, speed and train weight. Many other investigators have endeavored to accomplish this, but unsuccessfully, and in the formula which has been in most general use in engineering hand-books, that of D. K. Clark, speed only appears as a variable. From a careful study of his results, Mr. Lundie developed the formula on the following mathematical basis: The expression by which "S" is multiplied is proportional to the tangents of the angles made by the lines developed for different weights, as shown in Fig. 1, and is the characteristic of a rectangular hyperbola which (throughout the range of tests made) co-ordinates quite accurately the relations between train weights and the inclinations of the lines mentioned for corresponding weights. The term 0.2 is an intercept on the axis of y; 14 is the constant product of x and y; with the intersection of the asymptotes as origin; and 35 is an intercept on the axis of x.

The test of any formula lies in its application. Gaged by this test, Mr. Lundie's formula unifies in a remarkably close manner nearly all recently published experiments, together with other formulæ of more limited application, as will be seen by an inspection of the accompanying table. The Stroudley, Sinclair and Dudley tests of train resistance scheduled in this table were brought together by A. M. Wellington in the Engineering News in 1892, and referred to as intrinsically worthy of confidence on account of the careful manner in which they were made. To these we have added further experiments made on the Philadelphia & Reading Railroad in 1889, and on the Central Railroad of New Jersey in 1892, so that a fairly complete range of train weights from 200 to 400 tons, and of train speeds from 40 to 70 miles per hour is given in the table. The Lundie formula checks up all these tests very closely, though in all but one case the results obtained by its use are slightly higher than the observed results. In this connection it may be noted that Mr. Lundie obtained his speed figures by positive methods, having found that speed recorders for variable speeds are not sufficiently accurate, owing to the inertia of the moving parts.

These tests are all for heavy railroad passenger trains, upon which Mr. Lundie himself has made no experiments. For trains of from 20 to 100 tons, and for speeds of from 5 to 30 miles per hour, the Lundie formula is accurate, inasmuch as it is obtained directly from 150 or more observations made by Mr. Lundie in Chicago, as before stated. For lighter units still, the formula agrees with the results of private tests made by several of the great electric companies, and checks very well indeed the Clark formula—

$$(R = \frac{S^2}{171} + 7.16),$$

bearing in mind that the latter is generally admitted by engineers to be from one to two pounds too high.

Now it need scarcely be pointed out that when a formula of this general kind, deduced on mathematical principles from a large series of experiments within a comparatively narrow range of action, is found to be equally applicable over a much wider range, a strong presumption in favor of the soundness of its underlying principle is established. It seems practically certain, therefore, that the Lundie formula is thus applicable to the whole range of passenger train traction on straight, level, exposed track in a calm atmosphere. It cannot, however, be said to be applicable to street cars running on gritty or dirty rails, and, in fact, it is unfortunately too probable that no formula whatever can be devised for street railway work for which a large factor of safety would not have to be allowed in practice to provide for great differences in condition of track.

An interesting question now arises as to whether the Lundie formula can be made, with some modifications, applicable to all kinds of train transportation, freight as well as passenger. It does not check the most recently obtained data for exceedingly heavy trains. Tests on the Chicago, Burlington & Quincy Railway, made by the old method of engine indicator diagrams, checked by dynamometer car, show that a 940-ton train of loaded freight cars, running at 20 miles an hour, has a resistance on a straight, level track of 5.5 lbs. per ton. By the Lundie formula this would have been 8.3 lbs. per ton. An extremely heavy train of freight cars on the New York Central, weighing 3428 tons, had an average train resistance, at 20 miles per hour, of about 4 lbs. per ton, or the limiting resistance by the Lundie formula as expressed in the first constant. Other tests on fairly heavy freight train work recently made have shown approximately 6 lbs. per ton as an average, when track conditions were good, but these results vary greatly with the condition of the track.

Now it being reasonable to suppose that with the heaviest freight train work, the train resistance will approach the minimum, and the New York Central experiment above referred to, indicating that this minimum is Mr. Lundie's first constant of 4, it would seem that the latter's first constant within the parenthesis, namely: 2, must be inapplicable to very heavy freight-train work, and should be, in fact, modified by a variable, probably T. It would be interesting, therefore, to bring together and plot in diagrammatic form, reliable results of a large number of freight-train tests taken with different weights and speeds, to see if a modification of the Lundie formula cannot be made for general application to the heavy class of work, as well as light, and we are inclined to believe that were this experimenting once done there might quite possibly be found a common ground of reconciliation between the two grades of service, by which a formula possessing the general characteristics developed by Mr. Lundie could be made applicable to the entire range of railroad transportation.

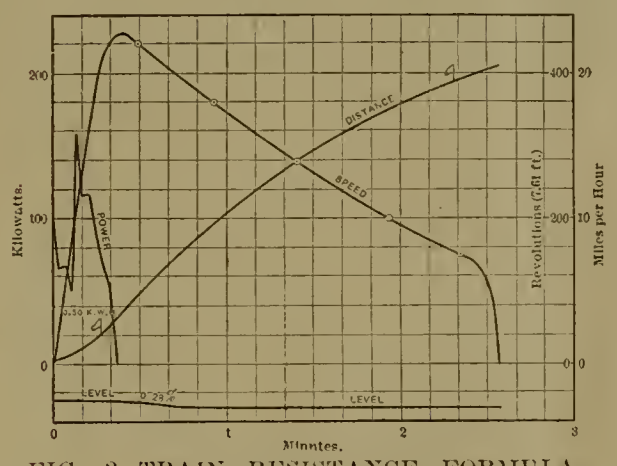


FIG. 2—TRAIN RESISTANCE FORMULA—SPEED CURVE.

CONSOLIDATION LOCOMOTIVE, LONG ISLAND RY.

The Brooks Locomotive Works recently built three consolidation locomotives for the Long Island Railway, several views of one of which we here present. These engines have the Wootten firebox, which will burn anthracite and soft coal. They weigh 155,000 lbs., of which 135,000 lbs. is on the drivers. They have cylinders 21x28 inches; 51-inch drivers, a straight top boiler 72 inches in diameter, and de-

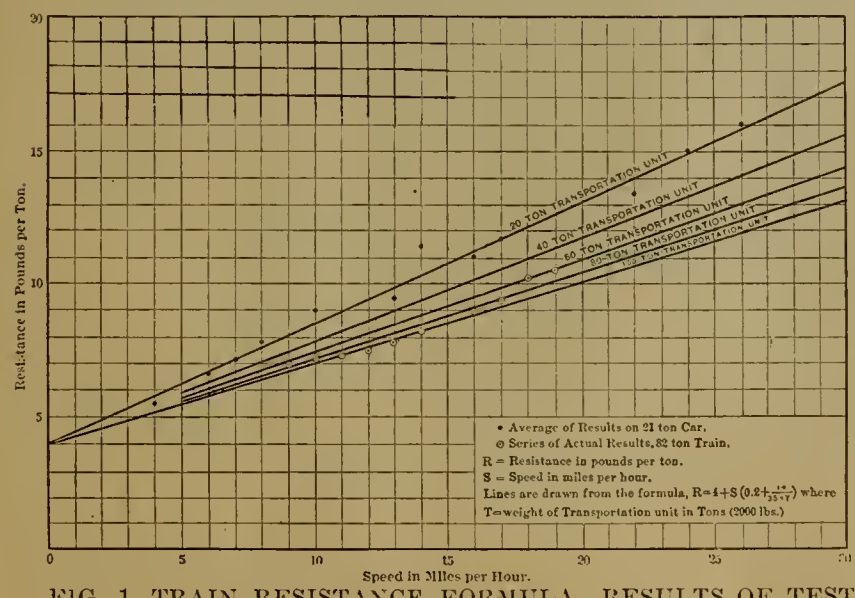


FIG. 1—TRAIN RESISTANCE FORMULA—RESULTS OF TESTS.

Test Made By	Year	On	Mem.	Average Speed. Miles per hour	Train Weight. Tons.	Train Resistance. Observed.	Train Resistance. Lundie Formula.
William Stroudley.....	1885	London, Brighton and South Coast.	Single test.	43.3	376	13.2	14.1
Augus Sinclair.....	1892	New York Central.....	Mean of six tests.	70.	270	19.03	21.1
" "	1892	" "	Single test.....	60.5	276	19 8	21.2
H. Dudley.....	1882	" "	Single test.....	51.43	313	16 9	16.35
" "	1889	Philadelphia and Reading.....	Single test ..	60.	242.5	18.35	19.0
" "	1889	" "	Single test	63 5	242.5	19 8	19.9
" "	1892	C. R. R., N. J.....	Single test.....	63.2	213	19.0	20.2
ark formula.....	....	.....	.....	{ 10	100	7.78	7.04
" "	....	.....	.....	{ 10	200	7.74	6.6
" "	....	.....	.....	{ 10	300	7 74	6.4
" "	....	.....	.....	{ 20	100	9.5	10.06
" "	....	.....	.....	{ 20	200	9 5	9.2
" "	....	.....	.....	{ 20	300	9.5	8.8
" "	....	.....	.....	{ 30	100	12.42	13.1
" "	....	.....	.....	{ 30	200	12.42	11.8
" "	....	.....	.....	{ 30	300	12.42	11.3

FIG. 3—APPLICATION OF LUNDIE TRAIN RESISTANCE FORMULA.

CONSOLIDATION LOCOMOTIVE—LONG ISLAND RAILROAD.
Built by Brooks Locomotive Works.

signed to carry 180 lbs. of steam pressure; a heating surface of 1952 square feet and a grate area of 69 square feet. The leading dimensions of these engines are appended:

GENERAL DIMENSIONS.

Weight on drivers	135,000 lbs.
Weight on trucks	20,000 lbs.
Weight, total	155,000 lbs.
Weight, tender, loaded	86,000 lbs.
Wheel base, total, of engine	22 ft. 9 in.
Wheel base, driving	14 ft. 6 in.
Wheel base, total, engine and tender	49 ft. 6 in.
Length over all, engine	35 ft. 6 in.
Length over all, total, engine and tender	60 ft. ¾ in.
Hight, center of boiler above rails	8 ft. 8 in.
Hight of stack above rails	14 ft. 3½ in.
Heating surface, fire box	179 sq. ft.
Heating surface, tubes	1773 sq. ft.
Heating surface, total	1952 sq. ft.
Grate area	69 sq. ft.

WHEELS AND JOURNALS.

Drivers, number	Eight.
Drivers, diameter	51 in.
Drivers, material of centers	Cast steel.
Truck wheels, diameter	30 in.
Journals, driving axle	8 in. x 10 in.
Journals, truck	5½ in. x 10 in.
Main crank pin, size	6¼ in. x 6 in.

CYLINDERS.

Cylinders, diameter	21 in.
Piston, stroke	28 in
Piston Rod, diameter	4 in.
Kind of piston rod packing	U. S. Metallic.
Main rod, length center to center	120 in.
Steam ports, length	18 in.
Steam ports, width	1⅝ in.
Exhaust ports, length	18 in.
Exhaust ports, width	3 in.
Bridge, width	1½ in.

VALVES.

Valves, kind of	Richardson Balanced.
Valves, greatest travel	6¼ in.
Valves, outside lap	¾ in.
Valves, inside lap	None.
Lead in full gear	None.
Lead constant or variable	Variable.

BOILER.

Boiler, type of	Straight Top.
Boiler, working steam pressure	180 lbs.
Boiler, material in barrel	Steel.
Boiler, thickness of material in barrel	11-16 in.
Boiler, thickness of tube sheet	½ in.
Boiler, diameter of barrel	72 in.
Seams, kind of horizontal	Sextuple.
Seams, kind of circumferential	Triple.
Crown Sheet, stayed with	Radial stays.
Dome, diameter	30 in.

FIRE BOX.

Fire box, type	Wide, over wheels.
Fire box, length	120 in.
Fire box width	84 in.
Fire box depth, front	64 in.
Fire box depth, back	58 in.
Fire box material	Steel.
Fire box, thickness of sheets	Tube ½ in.; sides, top and back ⅜ in.
Fire box, brick arch	None.
Fire box mud ring, width	Back 3½ in; sides 3½ in.; front 4 in.
Grates, kind of	Cast iron shaking.
Tubes, number of	294
Tubes, material	Charcoal iron.
Tubes, outside diameter	2 in.
Tubes, thickness	No. 11 B. W. G.
Tubes, length over tube sheets	11 ft. 7 3-16 in.

SMOKE BOX.

Smoke box, diameter outside	75 in.
Smoke box, length from flue sheet	63 in.

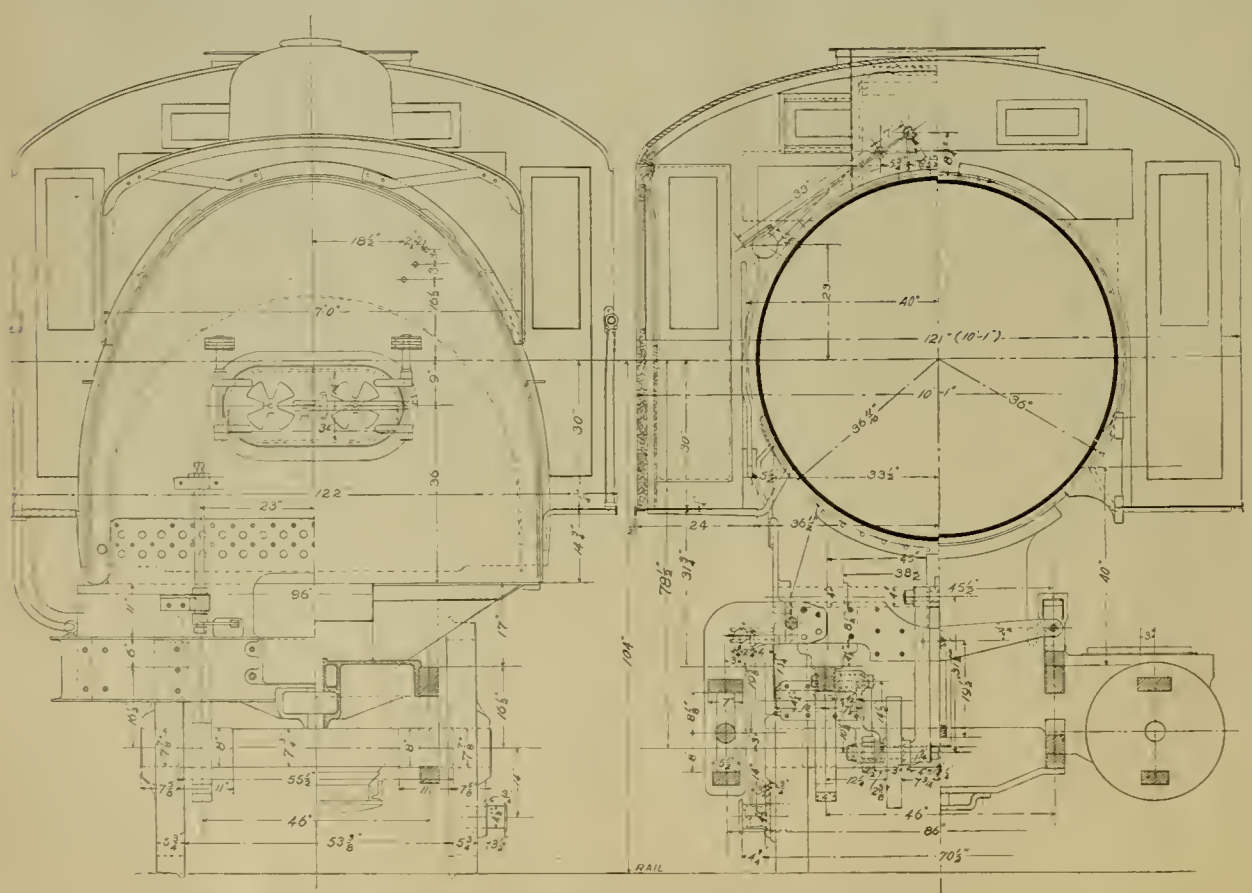
OTHER PARTS.

Exhaust nozzle, single or double	Single.
Exhaust nozzle, variable or permanent	Permanent.
Exhaust nozzle, diameter	5 in., 5 3-16 in., 5⅜ in.
Exhaust nozzle, distance of tip above center of boiler	1 in.
Netting, wire or plate	Wire.
Netting, size of mesh or perforation	2½x2½ and 2¼x1¼.
Stack, straight or taper	Steel taper.
Stack, least diameter	15⅞ in.
Stack, greatest diameter	18⅞ in.
Stack, hight above smoke box	30 in.

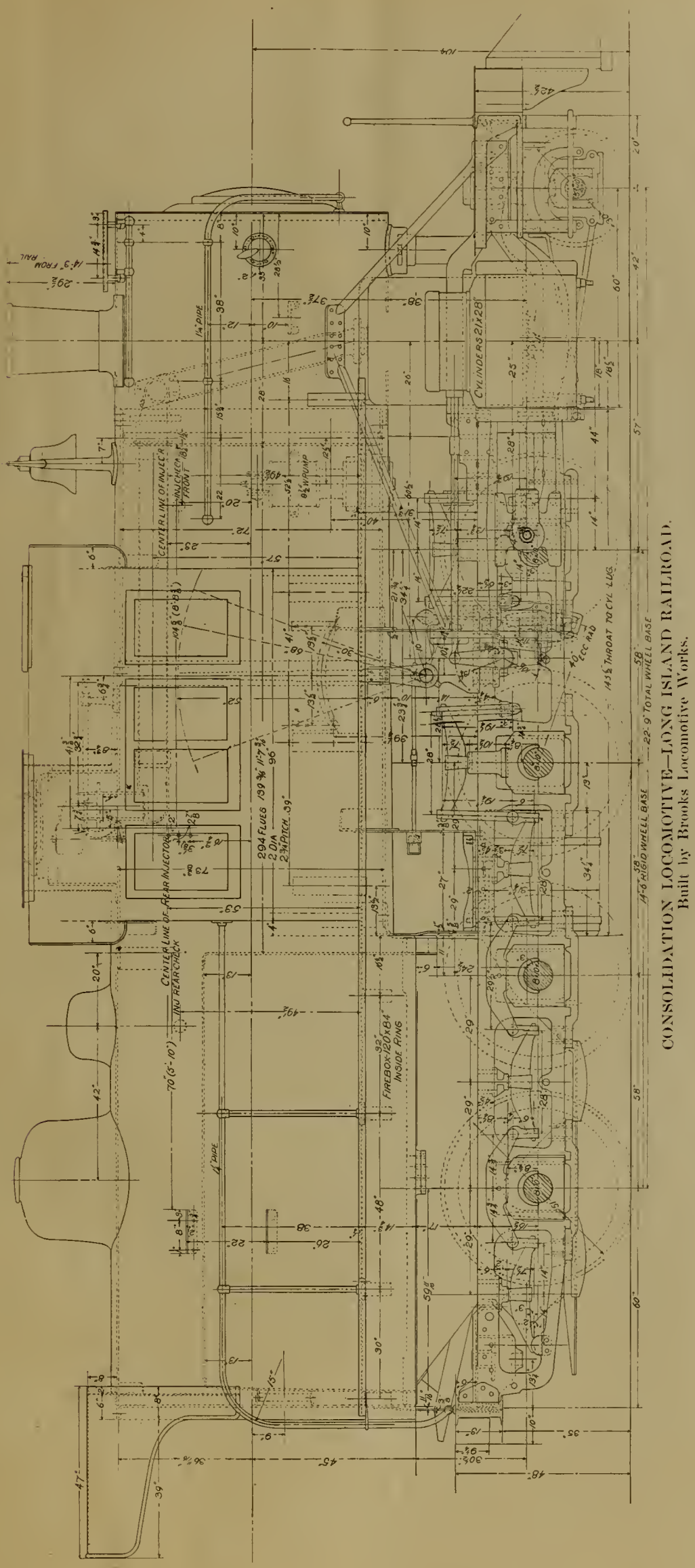
TENDER.

Type	Eight-wheel, steel frame.
Tank, type	"U" shape.
Tank, capacity for water	4,000 gallons.
Tank, capacity for coal	8 tons.
Tank, material	Steel.
Tank, thickness of sheets	3-16 in. and ¼ in.
Type of under frame	Steel channel.
Type of springs	½ Elliptic.
Diameter of wheels	33 in.
Diameter and length of journals	4¼ in. x 8 in.
Distance between centers of journals	5 ft. 4 in.
Diameter of wheel fit on axle	5⅜ in.
Diameter of center of axle	4¾ in.
Length of tender over bumper beams	23 ft. 6 in.
Length of tank	20 ft. 0 in.
Width of tank	8 ft. 7 in.
Hight of tank, not including collar	52 in.
Type of draw gear	M. C. B. Standard.

The special equipment of these engines is: American driver brake, Westinghouse tender brake, 9½ in. air pump, Detroit sight-feed lubricators, Prince safety valves, Sellers' injectors, French springs, U. S. metallic packing and Bell improved spark arrester.



CONSOLIDATION LOCOMOTIVE—LONG ISLAND RAILROAD.



CAR FOREMEN'S ASSOCIATION OF CHICAGO.

FEBRUARY MEETING.

The regular meeting of the Car Foremen's Association of Chicago was held at the Briggs House, Chicago, February 9. President Morris called the meeting to order at 8 p. m. On account of the inclemency of the weather a much smaller number than usual were present. Among those in attendance were:

Ashcroft, Norman.	Johannes, Albert.
Callahan, J. P.	La Rue, H.
Canfield, L. T.	Morris, T. R.
Cook, W. C.	Miller, Wm.
Davies, W. O., Jr.	Olsen, Louis.
Depue, Jas.	Prickett, Jas.
Earle, Ralph R.	Penn, O. A.
Gruhlke, E.	Rieckhoff, Chas.
Groobey, Geo.	Smith, E. B.
Grieb, J. C.	Showers, G. W.
Goehrs, W. H.	Stuckie, E. J.
Guthenberg, B	Schultz, August.
Green, C. E.	Wentsel, Geo.
Hennessey, J. J.	Williams, Thos.
Hansen, A. P.	Weaverson, Fred.
Holtz, Chris.	

Miscellaneous Business.

President Morris reported that since the January meeting the question of another meeting room had been considered. Some correspondence had been had with the Chicago, Milwaukee & St. Paul Ry. and with the Chicago, Burlington & Quincy Ry. General Manager Brown, of the latter railway, had offered quarters in his company's general office building, the offer also being made to run the electric lights and the elevator on the nights of the meetings. The directors' room was originally proposed, but as this was later necessarily used for other purposes the use of the rotunda of the building was offered, it being proposed to provide plenty of chairs and a table. President Morris further stated that only temporary arrangements had been made with the Briggs House for accommodations but that the proprietor of that house was favorably disposed towards continuing to provide the room occupied at this meeting. These statements resulted in the appointing of a committee to make arrangements for the regular use of the Briggs House facilities if possible.

President Morris announced that the executive committee had decided, in the matter of the revision of remarks made at the meetings, that those who wished to revise their remarks should notify the secretary to that effect at least two weeks before the 1st of the month, so that that part of the proceedings containing their remarks could be sent to them for examination.

Secretary Cook: The following names have been submitted to the executive committee and approved, and the gentlemen will be enrolled as members:

Ralph R. Earle, Provision Dealers' Dispatch; H. C. Kehm, I. C. Ry.; Wm. Miller, Nelson Morris & Co.; Jos. Opie, Chas. Rieckhoff, D. Twombly and A. J. Sherman, C., M. & St. P.; G. N. Sanm, C. & E.; E. Hedrick, Live Poultry Trans. Co.

Secretary Cook: We had enrolled at the last meeting 154 members, which, together with the nine applications we have to-night, make a total of 163 at the present time.

President Morris: At the last meeting, on motion of Mr. Grieb, a committee was to be appointed to make recommendations concerning the revision of the M. C. B. rules at the next annual convention. The chair did not appoint the committee at that time, but has since notified the following that they are on that committee, and has received word that they will serve: J. C. Grieb, chairman, W. E. Sharp, T. B. Hunt, S. Shannon, C. S. Stagg, Wm. Miller and George Wentsel. Has the chairman of that committee any remarks to make?

Mr. Grieb: I think that most of the railway clubs, at least the Western and the Southwestern railway clubs, will present their reports at the April meeting. I think by reason of the importance of the subject that it would be well to allow this committee two months' time to canvass the field thoroughly and present a report at the April meeting.

President Morris: If there are no objections the committee will be allowed two months' time.

A vote of thanks was extended to Mr. John W. Cloud, secretary of the Master Car Builders' Association, for the two bound volumes of their proceedings, and the books were ordered placed in the files of the association.

Secretary Cook: Since our last meeting we have received from the Car Foremen's Association of Cincinnati, copies of their proceedings from October, '98, to the present time. They will be placed in the files, where the members who wish to do so may look them over. There is a suggestion in their letter that we might exchange proceedings. I believe it would be of benefit to both associations if this were done.

President Morris: In looking over these proceedings I find that they are not quite so voluminous as our own. They do not go into details quite so much as we do. They, perhaps, have not the facilities for getting them out. However, they are interesting and

show the trend of the discussion and feeling, and I think if there were some means whereby we could get them to the members it would be very good for all concerned. I do not know that there is any other way than by having the members look them over when they are brought to the meetings.

Secretary Cook reported that at the meeting of the executive committee, Mr. Grieb, of the advisory committee, had suggested the advisability of having a box placed on the secretary's table, in which the members might deposit questions which they desired to be brought before the association for discussion. After several affirmative expressions of opinion, it was the sense of the meeting that such an arrangement be instituted to start with the next meeting.

Responsibility for Broken Sills.

President Morris: We will now take up the first question on this evening's program, topic No. 3, of the January meeting, which was not completed, relating to responsibility for broken sills following two broken ones originally.

Mr. Davies, Jr.: In my opinion there are two or three ways of disposing of a car in that condition. In the first place, if he received car from connecting line with two sills broken, and while handling it he broke two more, he could replace the two he broke and send car back to the receiving line on his record of two broken sills; or, if he received car from connecting line with two sills broken and he afterwards broke two more, he could hold the car and notify the owner, stating that he had a record of receiving car with two broken sills and had broken two more. The owner is surely responsible for the four sills, in my opinion.

Mr. Wentsel: I beg to differ with Mr. Davies. I think there is a question arising there. If he had not received the car with two broken sills, it is like as not he would not have broken the other two. I do not think he can bill for the four sills.

Mr. Davies, Jr.: I do not say to charge the four sills to the owner. Of course it is natural enough when two sills are broken that it weakens the others; but at the same time the owner is responsible for two broken sills, and the railroad that is handling this car has only broken two, and still has a record of two broken when car was received.

Mr. Prickett: I think the proper way, if they hold a record of two broken sills when car was received from owner, and they afterwards broke two more, would be to notify the owner that he has a record of two broken sills, and get his consent before putting the others in, and then he could charge the owner.

Mr. Miller: It is my opinion that if a railroad company receive a car from another one with two broken sills, that they should make repairs to it before breaking two more, and if they fail to do so, they are responsible for the damage. The rules as they read give railroad companies the privilege of making all kinds of repairs and chargiug the owners for it. The owner gives that privilege in order to be protected, and any railroad company that fails to take advantage of this privilege certainly ought to be held responsible for the damage that is done through its negligence.

Mr. Depue: The last gentleman says he thinks that the company receiving the car with two broken sills should at once make repairs. I do not think that could always be done. If a company receives a car with two broken draw sills, the prineipal sills in a car, and breaks two more in handling the car, it does not seem to me that it should be made responsible for the inter sills, providing the two draw sills were broken. But I think, as Mr. Prickett says, that if it notifies the owner and gets his consent to make repairs, then the owner has got to be responsible for all the damage or for the repairs made to the four broken sills.

Mr. Showers: It don't seem exactly right that the receiving road should be held responsible for the two additional sills that were broken under those conditions, yet I think we are compelled to confine ourselves to the present rules—not only to the present rules, but to the present system in effect since Sept. '96. Take rules 1 and 2. Rule 1 specifies that each line shall give to foreign cars the same care it gives its own in regard to inspecting. Rule 2 says, cars shall be received if in serviceable condition, the receiving road to be the judge. Is there any special provision in Rule 3 whereby a line may receive a car with two broken sills? None that we can find. I am of the opinion that where a car is received with two broken sills that they should at once make the repairs and bill the owner. I am of the opinion that the arbitration board will bear us out in this matter. We may refer to case No. 484 under the rules of '96, where it was held to be the duty of all roads to give foreign cars the attention necessary to keep them in safe hauling condition, and in case of breakage or damage resulting from their negligence does not relieve them from any additional damage. Also in case 531 (Peoria & Pekin line), where they had plenty of evidence that the two draft sills were broken, yet they were held by the arbitration committee for the additional defects, because the repairs were not made at once. That is why I say we should confine ourselves to the rules.

Mr. Grieb: I believe that there has recently been a decision made, by the arbitration committee, that very fully covers the question at issue; but as these decisions have not yet been made public. I do not think anything can be said as to the contents of the same.

Mr. Davies, Jr.: While everything that Mr. Showers has said is true, yet in many cases, in a majority of cases, I might say, in receiving a car with two broken sills, it is impossible to immediately replace them. The receiving line is the judge: and there is any number of cars received every day with two broken sills and allowed to run and considered perfectly safe. A railroad company may have a car on its line with two broken sills. If it delivers this car with two sills broken, and two additional sills are subsequently broken, I fail to see why the railroad company handling this car is responsible for the sills.

A member: It looks to me that the case as decided is simply trying to make the owner pay for consequential damage: in other words, the damage caused by receiving car in defective condition. I do not think you can make the owner pay for any more sills than the first two broken when car was received, because the receiving road has the right to reject that car or transfer it. If you don't want to put the sills in, send it back. If the car is empty and you can put the sills in, mark it to the repair track and bill the owner. But if you run it with two sills broken and you break two more, I think you are responsible for the extra sills broken.

President Norris: If car has two sills broken and you mark it for the transfer track, and before getting it there, two other sills are broken as a result of the original defects, you are placed in a position where you will have to decide what you will do with the four sills. What would you do in a case like that?

A member: In a case like that, I would not acknowledge that the receiving road had record of the car at all. The inspector rejected it and marked it for transfer, and the road to whom it was intended to be delivered does not receive it, consequently it is not responsible for any damage to the car. The road handling the car would be responsible, if it were the owner of a foreign road.

Mr. Hennessey: It seems to me that the receiving road is the judge as to whether the car is safe to handle or not with two broken sills. If they consider it safe to handle, they accept it; if they break additional sills before they make repairs which form a combination, I think the receiving road is responsible for the whole damage. The owner is responsible for nothing. If there are new decisions out that fully cover this point, I think it had better be laid over and no action taken on it to-night.

A member: There may have been cases decided in the line of this talk; but I cannot see the justice of forcing a road to put in sills that were broken when car was received. There is no justice in making them pay for four sills, if they have record of receiving car with two broken.

Mr. Hennessey: I will say that I do not know what the decisions are, but the fact still remains that a railroad company has no right to accept a car in imperfect condition, do additional damage and then charge the owner. It was never intended that the owner of the car should pay for repairs unless such repairs were made in time to prevent further damage.

Mr. Stuckie: The point was just now made of rejecting an inspector's record of two sills. I hold that where a car is received with two broken sills the load of the car has a great deal to do with immediate repairs: and I also hold that if an inspector receives a car and marks it "transfer" that he is not receiving the car—he is receiving the commodity and not the car. If in sending the car to have the commodity transferred into another car additional sills are broken, I think the owner should be responsible. The owner should have made repairs before tendering it to his connection. Where they tender a car to me with two broken sills, I would consider that they were fully as justified in repairing these two sills, before tendering it to me, as for the company which I represent to repair them, every bit.

Mr. Showers: In case the delivering company was the second party—that is, a delivering company offering a foreign car—then would the owner be responsible? The delivering company has broken two draft sills and offers the car in interchange, and it is rejected—goes back on his hands. Should he not make repairs and bill the owner for the two sills? If he broke two more, the combination is broken. Let him stand the whole of it.

Mr. Olsen: How many cars are received and accepted with two broken sills and not transferred? I, for one, as a car inspector, receive cars every day, and if I receive a car with two broken sills I would transfer the load. It is in my opinion not safe to go out on the road with two broken draft sills.

Mr. Smith: I would like to have the secretary read the article on page 28 of the February Master Mechanic, entitled "Owner's Rights and User's Responsibilities," for the benefit of the members. That covers the ground very fully. (Secretary Cook read the article.)

Mr. Grieb: In order to close the discussion, I would make a motion that we endorse the position taken by the writer in that article; and that the line that accepts a car in such condition that further damage is liable to ensue, which damage, in connection with that existing on the car when received by him forms a combination under the rules defining rough usage, should be responsible for the entire damage.

Seconded.

Mr. Smith: I do not agree with the gentleman on that; I think the owner should pay for two sills broken and the party handling the car for the balance.

Mr. LaRue: I move as an amendment to Mr. Grieb's motion that we carry this over to the next meeting. I think we are voting on what the decision is going to be.

This amendment was carried, and the original motion as amended was also carried.

President Morris: At the present time the question stands in this way: Mr. LaRue's amendment to carry it over to the next meeting was carried. We have decided nothing so far as this question is concerned—merely to carry it over to the next meeting for further discussion.

Pocket Bolt Holes in M. C. B. Couplers.

President Morris: The next question for discussion will be No. 2, which was postponed from the last meeting. It reads as follows: "Is it a deviation from M. C. B. standards for an M. C. B. coupler to have but one hole for bolt to secure pocket to shanks. How should such coupler be credited if removed?"

Mr. LaRue: The only question that presents itself to me is this: If a car is equipped with that kind of a coupler, should it be stenciled on the end "M. C. B. coupler?"

President Morris: That resolves itself into the question whether the coupler is M. C. B. or not. That is what we are trying to get at. We all know there is no question about the head being M. C. B., providing it has the contour lines. The question is as to whether the shank is or not.

Mr. LaRue: It is also a question of credit.

President Morris: Yes. If it is decided the shank is not M. C. B. standard, it is an easy matter to decide as to the credit, I should think.

Mr. Smith: Refer to page 389 of the Master Car Builders' proceedings for 1898.

Mr. Davies, Jr.: The drawings of the M. C. B. Association show only one shank and that is a shank with two holes for the pocket rivet; so, according to that, any shank made of a different shape or having one hole for pocket rivet would be wrong; also any shank that is longer than the shank recommended by the M. C. B. Association would be wrong.

Mr. La Rue: I would like to ask then, if cars are equipped with a shank with only one bolt, if we place an M. C. B. coupler in there with two bolts, can they remove that and place one with one bolt in and scrap the M. C. B. coupler?

Mr. Davies, Jr.: I should say not. Putting in a standard M. C. B coupler would not be wrong. Anything the Master Car Builders include as M. C. B. standard, if it properly fits the car, is not wrong; but in case of a coupler with only one hole, that would be wrong on account of not being an M. C. B. coupler.

Mr. Prickett: In a case of that kind, if you should attach an M. C. B. coupler with one hole in the rear end for a tail loop and no gib on the end for your tail loop to go in, I should consider it wrong repairs; but if you take and attach an M. C. B. coupler with one hole and the gib on, I think it would be standard.

Mr. LaRue: For the benefit of the members, I will state the circumstance as nearly as I can. This was a coupler with only one bolt, and with the gib on pocket. That coupler was put in the car for an M. C. B. coupler. It was received by the owner and was run for five or six months, when he discovered it in some way and took it out and wants to scrap it, as not being standard to the car. That is a standard coupler with only one hole in. Last meeting I made the assertion that the rear end was not M. C. B. standard. I did it expecting somebody to pick me up. I do not make it, because I do not know it. Then I turned around and asked the question whether that coupler, if not standard to the car, should be scrapped or 75 per cent allowed.

Mr. Showers: Rule 4 of Section 13 is very plain (Reads Section 13.) Therefore I claim that if the drawbar is an M. C. B. standard it surely is proper repairs and it may be used.

President Morris: Do you also claim that a drawbar that has an M. C. B. head and only one bolt hole is standard M. C. B.?

Mr. Showers: That is an M. C. B. standard.

A member: I do not think there is much chance for argument as to what is an M. C. B. coupler. The drawings are very plain. They give all the measurements and also show the number of holes, the distance from center to center and the distance the first one is from the back and the length from end to stop. All these measurements are given, so I do not see that there is any argument. Anything deviating from that I should not consider M. C. B. standard.

Mr. LaRue: I would like to ask why a road stencils "M. C. B. coupler" on a car when the coupler only has one bolt hole.

A member: That is the fault of the painter.

A member: I would say that the fact of a man stenciling "M. C. B." on the end of a car does not make the coupler M. C. B., because it has no connec-

tion with the coupler at all. It is not a part of the coupler.

Mr. Davies: I would say it could still be an M. C. B. coupler although having only one hole for bolt. An M. C. B. coupler could mean the head. A shank with only one hole is not standard. You can call it an M. C. B. coupler because it couples automatically, but it would not be an M. C. B. standard.

Mr. Hennessey: I do not think there is any ground for argument. The M. C. B. Association say they shall conform to the drawings, and anything deviating from them is not an M. C. B. coupler. You might just as well say you could put in a coupler 4 inches too long or too short. You could put it in, but the owner would have to remedy it; he could not use it in his own car; it would be scrap to him. As a matter of equity the coupler might be returned and an allowance made for whatever they could agree upon.

Mr. LaRue: I think that if a coupler were too long it would not be complying with the rules. This coupler did fit properly; there is no doubt about that; only the question of credit.

Mr. Davies, Jr.: In that case I should say that the body of the coupler should be credited as scrap; the knuckle, locking arm and lifting pin at 75 per cent.

Mr. LaRue: Where are you going to draw the line? Would you scrap the body of the coupler right behind the shank or right behind the head?

Mr. Davies, Jr.: If the shank is not M. C. B. the coupler is not M. C. B.; it is all one piece; you can not change them.

Mr. Miller: I think in a case of this kind the road that applies the coupler ought to have the privilege of taking the coupler back. I do not think it would be right to scrap the coupler, that is, throw it away entirely, without giving them the privilege of taking it back. In case one of our cars was returned to us with a coupler of that kind, the pocket being wrong, I would not accept it, because our freight might be delayed on that account. If a pocket breaks, nobody has time to make a special pocket. We all know that is quite a job. It takes up time. If the road does not want to take the pocket back, the shank to the pocket ought to be scrapped—ought to be allowed scrap credit. It would be worthless to us. If you want to accept it, that is all right. Anybody that wants to accept a coupler of that kind can do so; but the owner should not be compelled to accept a coupler of that kind.

Mr. Showers: I would like to have the secretary read arbitration case No. 529. (Secretary Cook reads case.)

Mr. Showers: M. C. B. axles were used which were not of the size or dimension that were originally standard to the car, and the decision was that only scrap credit should be allowed for the axles.

Mr. Hennessey: It was even worse than that; it was an M. C. B. axle that was scrapped; one 40,000 and one 60,000.

Mr. Showers: For the benefit of the association I will say that we had a case of that kind some time ago with a certain line where they applied a 60,000 capacity axle to our cars and they were ¾-in. too long, in other words, ¾-in. longer than the axle we were using, and our brass would not work well in the box. The matter hung fire for some time, but they finally accepted scrap credit, inasmuch as we could not use the axle. An M. C. B. axle was standard.

Mr. Davies, Jr.: I move that the sense of this meeting is that any coupler that has only one hole in the shank for pocket rivet is not a standard M. C. B. coupler, and that coupler body and pocket should be scrapped.

The motion was carried.

Slid Wheels.

President Morris: The next case is No. 3, in regard to slid wheels. I will say in regard to this that when the executive committee took this up, they understood that according to a strict construction of the M. C. B. rules any wheel that was slid less than 2½ in. was not cardable; that is, the party doing the damage is not responsible for it. This question is, perhaps, more in the way of a recommendation to the committee on revision of the rules and is in the way of equity. It seems wrong that a party should slide a pair of wheels —one 2⅝ in. and the other 2⅜ in.—and compel the owner to throw that 2⅜ in. wheel in the scrap and get nothing for it; but we perfectly understood when we got this up that the M. C. B. rules did not allow for the carding of a wheel that was not slid 2½ in. or over. With this in view, I would like to hear a few expressions of opinion in regard to it.

Mr. Callahan: I do not think anybody, especially around Chicago, would stand on that at all. I think that any company around Chicago that slid one wheel 2½ in. and the other 2¼ in. would card for both wheels without trouble

President Morris: My experience has not been that way.

Mr. Callahan: I do not think I would stand on it for a minute, and I do not think anybody else would; that is not doing justice toward a brother.

Mr. Wentsel: If they make a request and state the flatness of the wheel we generally card.

President Morris: If it is not 2½ in.?

Mr. Wentsel: They generally say it is 2½ in. They do not say one wheel 2½ in. the other 2¼ in., but they are always 2½ in.

Mr. Davies, Jr.: My experience is entirely different from Mr. Callahan's. If I take out a pair of slid wheels and have the foreman of the different lines come to look at them, they will fight for ⅛ of an inch. If one wheel is 2½ in. and the other 2⅜ in., you don't get a card for the 2⅜ in. So my opinion is that a railroad company sliding a pair of wheels, one wheel 2½e, the other less than that, you cannot do anything with them, as the M. C. B. rules say wheels should be slid 2½ in. in order to be cardable.

Mr. Callahan: I will say in answer to Mr. Davies that I was no speaking from experience; I have never had a case of that kind. I was speaking from a common sense point of view

Mr. Penn: My experience has been that wheels are generally slid 2½ in. Sometimes when you run across them they are generally less. But they generally manage to figure out 2½ in.

Mr. Showers: The rules say (in Sec. 13 of Rule 3, flat sliding): if the spot caused by sliding is 2½ in. or over in length, delivering company is responsible. Why is delivering company responsible? Because it is unfair usage. I believe at the last meeting one of the members made the statement that where unfair usage was proven in any case, that for all additional damage, if it be no more than a nail, they were responsible for the damage, and I think we are safe in saying that wherever they slide one wheel 2½ in. it is unfair usage, and any additional damage to the axle or any other part caused by that sliding they would be responsible for. That is my opinion.

Mr. Grieb: It seems to me that there are some limitations to this question of unfair usage; and in case where the rules specify as accurately as they do in the case of slid wheels, it does not leave much room for argument as to what disposition shall be made of a case of that kind. This matter of equity I hardly think enters into the consideration. We ought to be guided by the reading of the rules, when we have a definite rule on the point at issue. There are but few cases in actual experience where you have two pair of slid wheels under the same car, one pair exceeding the limit and one pair less than the limit.

Mr. LaRue: It seems to me, in fact I know, that the Master Car Builders have tried to do what they thought was right; but, of course, in making up a list of defects there is an undefinable line that has to be drawn somewhere, and they have done that, and I think if we have to live up to the rules in regard to M. C. B. couplers we might as well live up to the rules in regard slid flat wheels.

A member: The way I understood this question when it started out is different from what Mr. Grieb speaks of. I understood that one wheel was slid 2½ in. and the opposite one 2¼ in. Would you bill for both wheels or for one? You will find lots of wheels slid that way I would say that they would have the right to bill but for one wheel, because the other wheel is not up to the limit as laid down by the Master Car Builders. It is not slid 2½ in. The company taking it out has the right to grind it and put it in service again.

Mr. Showers: Would it be advisable not to remove a wheel from an axle when one was slid 2½ in. and the other 2⅜ in.—when it only lacks such a small amount? If there is any reason why he should scrap that wheel, is there any reason why he should not be paid for it?

A member: In answer to Mr. Showers I will say that if the wheel was not slid 2½ in. a man would be justified in putting another on, provided it mated. There are a great many wheels that are slid 2¼ in., probably 2½ in. They are mated up and sent to the grinding room and after being ground are put back into into service again. They are not as good as a new wheel, but they are perfectly safe. The only objection to them is that they will shell out in time where the flat spot was, from having been burnt. But there is nothing in the rules that will prevent a man from shoving another right on with one slid 2 in. I think most anybody would do it; I have done it myself.

Mr. Hennessey: I do not think there is much room for discussion on this question—2½ in. is defined by the M. C. B. rules as the limit; less than that is not scrap. The arbitration committee have tried to decide cases according to the rules; they have not tried to decide according to equity. It is only by reason of living up to the rules strictly that they are as valuable as they are.

Mr. Callahan: The way I understand the question, one wheel was slid 2½ in. or over, and the other ⅛ in. or ¼ in. less than limit. I do not think there is a car foreman in Chicago, if you had a case of that kind and called him over to see the wheel, but what would card for both wheels without trouble.

A motion by Mr. Smith, as amended by Mr. Davies, Jr., to the effect that "It is the sense of this meeting that any wheel slid less than 2½ in. is not cardable," being seconded, was carried.

Protection of Car Inspectors and Repair Men.

President Morris: We will now take up the fourth question, in regard to protecting car inspectors and repair men while on duty working at inspection points. What is the general practice?

Mr. Wentsel: On our line, where it is necessary, we use a blue flag at all points. It is necessary at all points to use the flag and also on our repair track.

President Morris: At both ends of the train?

Mr. Wentsel: Yes

President Morris: What rights have the switchmen?

Mr. Wentsel: No right to remove the flag. The party that puts the flag on the car is the one to remove it.

Mr. Prickett: On the road that I represent, the C. & E. I., we use a blue flag in all cases. My repair tracks are stub tracks, having only one end, and the flag is put up the first thing in the morning. If we go out in the yard to make repairs on a car that has become damaged by switching, we flag both ends with a blue flag, and the flag is not touched until the car is repaired, and the man who put it up takes it down, in all cases.

Mr. Davies Jr.: On the Milwaukee in inspecting a train, there are no flags put up at all. Mr. Prickett has mentioned what their practice is on the repair track. I would like to ask him what the inspectors do when they are inspecting a train.

Mr. Prickett: Use a blue flag

Mr. Davies, Jr.: On both ends?

Mr. Prickett: Only on the end they commence at; the rear end of the train.

President Morris: Is there not danger of a switch engine coming in at the other end?

Mr. Prickett: In nearly all cases they "open" the train at the south end of the yard. It is generally switched from the south end of the yard. They put their blue flag up on the rear end in day time, and a blue light at night, and it remains there, unless they want to take a car out. For instance, if a car comes in that they want to send out in a fast train, they walk down and tell the inspector that such and such a car is in there and they would like to have it taken out. The flag is raised, the car taken out, and the flag put back again. I should state that this is a state law and should be lived up to in all cases.

President Morris: Mr. Hunt, of the Ft. Wayne, told me of a method they put in practice on their road, which seems to be a good plan. He says that each car repairer is provided with a tin flag that has his name printed on it. When he goes under a train to make repairs, he puts his flag at the end. Each man does that; there may be six men working on a train, and no one is allowed to take those flags away but the men to whom they belong. That makes it almost impossible for a switch engine to come in thinking that the track is clear, because the flag has been taken away. He says there have been no accidents since it was put in practice.

Mr. Callahan: I make use of these tin flags. I borrowed the idea from Mr. Hunt. I put each inspector's name on; also my oilers. The oilers often have to jack up a box to take out a brass. I have the flags for my inspectors and car repairers and for my oilers on passenger work, and I find it very convenient and handy. As each man has his flag you can always tell where he is if you want him. Before we made these we used to have bunting, but we had to renew them every two or three weeks at least. The tin is much more durable. It is the best thing of the kind I ever saw. We take a 1 in. pipe 4 ft. long, and put a sharp bolt in the end and point the end down. The flag part is about 10x14 in.

Mr. Stuckie: This protection business is something that is very essential both to the railroad companies and to the inspectors. A man that is not protected cannot give a car the attention that he should give it. For example, I had a case of this kind last week, where the Lake Shore delivered to us a car with one broken draft timber; the car also had other defects that formed a combination, but for lack of protection with the flag, and there being an engine on the train, I did not like to go in under and I could not get the combination; consequently the company is out that much. If they had furnished the protection necessary I could have given it a better inspection. The A., T. & S. F. claims, or some of their foremen do, that for lack of room they cannot use a flag, but still they want to hold their inspectors down to a rigid inspection. I hold that no inspector can give a car the inspection that he should give it unless he is thoroughly protected with a flag, and knows that the cars are not going to move while he is under them.

Mr. Showers: The question of protecting an inspector is a matter that I think too little attention is paid to over the entire country. We start a freight train out over the line and shortly after comes a passenger train. We have a number of passengers—no matter who they are—who take their places in the coaches with the understanding that everything is in proper shape so there will be no accidents upon the line. We reach the first division with the freight train; there is some switching to be done, some cars taken out, some cars picked up; the inspector starts out in a hurry to look over the train; the conductor is in a rush to get off the first division ahead of the passenger train—to make time and get over the line ahead of the passenger train, and in doing so he rushes the inspector. The inspector knows he has no flag up to protect him and for that reason neglects his

duty in the way of proper attention, most especially to the wheels, and thereby is liable to cause considerable damage to the freight train, and not only delay the passenger, but cause an accident to the train and lives. I think the matter of protecting an inspector is a matter of vital importance. It should be adhered to very strictly.

A member: I have been connected with two or three different roads and they all have a rule in the time card, or usually in a book of instruction, compelling the car foremen or car inspectors to protect themselves with flags of different colors. Most of the roads use blue. The road I just left used red. If they fail to protect themselves the company is not responsible, but the man who has charge of the men. But where a car repairer's flag is up, no switchman or any other man than the one who put it up there has the right to take it down. As to the safety of the passengers I am reminded of an incident that happened to me at Kankakee a good while ago, perhaps in '79. I used to work for a man named Riley who would always go around tapping the wheels of a passenger train but who never looked over the trucks or drawbars. I said to him one day, "Pat, can you tell a cracked wheel by the sound of it?" "No," he says, "I can't." "What do you tap them for," I asked. "Don't you know," he replied, "it makes the passengers feel a little safer, that is all."

Mr. Prickett: I will state that I have put up the blue flag at both ends of the yard and blocked four tracks, and the switch engine has laid there ten minutes while they walked from the north to the south end to find out why I had the tracks blocked. I might have set my flag up and blocked one track, but to make myself clear and protect my men, I blocked all of the tracks. The yardmaster came down to find out why I had blocked all the tracks. When I explained he said it was a good idea.

Mr. Stuckie: There is another question I would like to bring up. When a man is not protected, should he be censured for anything that is missed? For instance, on a combination of defects where he dare not put his head under unless he is liable to get it chopped off. Of course he runs that risk. Should that inspector be censured for missing an article under the car where he is not protected? I know of one instance where the general yardmaster threw a flag off the right of way and said he was running that right of way. That is where the mechanical department was a little bit lame and not willing to cooperate with the traffic department—where they did not meet each other half way, where if they had met each other half way there would have been no trouble of that kind. I believe in meeting the traffic department in every instance; and I believe in having a little protection for myself and others, especially for the safety of the company. It is money in their pockets, and they get much better inspection and better service.

Mr. LaRue: There are certain responsibilities attached to our positions and most of us, no doubt, are blamed for a great many things that we do not know about, but which we are responsible for, and I think it is the same way with an inspector, and they will have to take it the same as the rest of us.

The meeting here adjourned.

The next meeting will be held Thursday, March 9, at the Briggs House, Chicago, corner Randolph street and Fifth avenue; the meeting will be called to order at 8 o'clock sharp. The program will be as follows:

Two cases in dispute between roads represented by members of the association, as follows:

Case No. 1.—"A" received a car from the builders' shops and after hauling it a short distance, delivered it to "B" ("B is not the owner). "B" discovered a hot box and examination developed the fact that brass was cut and spoiled—journal was not cut but was rough on account of not being properly finished off by builders. "B" smoothed off journal and applied new brass. Who should be responsible for brass and journal?

Case 2.—"A" delivered to "B" a car foreign to both. After "B" had run the car some distance a more rigid inspection shows that there is a 7 in. brass on one journal. Car is equipped with standard 60,000 capacity axles, with 4½x8 journals. Wrong brass did not run hot. "B" removes the 7 in. brass and applies a standard 8 inch brass, billing owner for same. Is this right according to the rules of 1898?

There will also be topical discussions as follows:

1—What is the current practice in renewing dust guards and charging same to owner?

2—Is the owner properly chargeable for repairs to defects that follow knocking a car off center?

COMMENT BY CAR FOREMEN.

This column is edited by the Publication Committee of the Car Foremen's Association, and the RAILWAY MASTER MECHANIC is not responsible for any of the views expressed therein. Communications and items of interest to car men are solicited. T. R. Morris, chairman.

Responsibility for Flat Wheels.

The question relating to wheels flattened by sliding which was discussed by the members of the Car Foremen's Association at its February meeting, was brought forward by the executive committee with the full understanding that as at present constituted, the M. C. B. rules of interchange make the railway company doing the sliding responsible only for wheels having spots 2½ in. long or over. It brought out many and varied expressions of opinions, but could not, of course, be decided except in one way, which was that the rules must be strictly construed. This decision is, however, but another instance of a conflict between law and equity. The M. C. B. rules are supposed to be based on justice to all.

The arbitration committee is supposed to base its decisions on the rules, and if in arriving at its conclusions a deviation from justice is the result, so much the worse for the rules and so much more need for their revision. It certainly is not justice for "A" to slide a pair of wheels under "B's" car, the spots on one wheel being 2½ in. and the other 2⅜ in., and send the car home to owner giving him a defect card for one wheel slidden. This leaves the owner with a wheel on his hands having a flat spot 2⅜ in. What shall he do with it? He can perhaps grind it down, but this process means the reducing of the life of the wheel a certain number of months and even if there be chill enough to allow this to be done, the probabilities are that the metal in the flat spot has become so destroyed by burning that it crumbles very quickly, making the wheel worthless. As a suggestion, would it not be a good thing to have the new rules specify, that when one wheel is slidden 2½ in. or over and the mate wheel, say, 2¼ in. or over, the party doing the sliding shall be held for both wheels?

The M. C. B. Coupler.

The number of people who are of the opinion that the M. C. B. coupler is a failure seems to be increasing right along. There are a great many more who, it is very evident, while being reluctant to put themselves on record in opposition, intrench themselves behind the statement that "It is the best we have," or "It has been applied to thousands of cars," and wind up with the question, "What are you going to do about it?" It will be remembered that during the palmiest days of rascality in New York City, W. M. Tweed asked the same question. We all know what the reply was in his case. Heroic measures were adopted and it was found that something could be done by going about it in the right way.

At the present time the inventive genius of the country is handicapped by being restricted to certain lines and forms. Why not let it be known that the present type of coupler is not satisfactory and invite suggestions for new designs. This proposition is made in good faith, knowing that the gentlemen who would be so unfortunate as to be on the committee to investigate are apt to be driven to early graves.

According to the arguments quoted above, the present type of M. C. B. coupler will continue to be the standard to the end of time. If it is ever the intention to change the standard, why not begin to take steps in that direction at once? In answer to the argument that it would cost too much to change from the present standard, it can be said that there will never be fewer of these couplers used than at the present time so long as it continues to be the standard.

Inspection of Steel Trucks.

The publication committee would be very pleased to receive communications from inspectors on the subject of "Inspection of Steel Trucks." It cannot be disputed that there is no one so competent to give actual facts as him through whose hands cars so equipped pass every day.

The trouble seems to be in getting the inspector to come forward and put on paper for publication the ideas and opinions he is anything but backward in expressing, when among his own kind.

This department could be made much more interesting if the inspectors would come to the front in this way. The names need not be printed, but should be given the committee for its own information.

COMMUNICATIONS.

The Water Distribution System for Pullman Cars.

To the Editor: The reference in my paper at your November meeting to the water raising system requires something in the way of explanation.

Various schemes have been devised for supplying air pressure in the water tanks for the purpose of forcing the water, when desired, to the basins and while this pressure accomplishes the purpose intended it has been at the expense of many skid wheels, mysterious brake performances and confusion to the train and car men. The system now generally employed, if properly inspected and maintained, will reduce the danger of interference to a minimum.

The principal sources of trouble are from foreign matter lodging in the governor valve and the reducing valve. To avoid this the former valve should be kept in a condition to insure the proper seating of the return check or feed valve No. 38, and the diaphragm valve No. 40, and in the latter a perfect seat of the supply valve No. 18, (references herein made are to the numbers given in Westinghouse Air Brake Plate, No. F 60).

If the diaphragm valve fails to seat there is a constant communication between the auxiliary reservoir and air tanks and the reservoir can only be charged with extreme slowness, but if sufficient time is given to fully charge the auxiliary reservoir, air tank and water tanks to the maximum pressure intended, the situation, at times, is most inviting, when the brakes are applied, even lightly, for skid wheels or "stuck brakes." With this maximum pressure, immediately following a light application of the brakes, the return flow past the unseated valve No. 38 from the air tank forces the triple valve to application position and holds it there, thus permitting the air from the air tank to flow into the auxiliary reservoir and brake cylinder and increase the pressure in them to a point considerably in excess of that derived from an emergency application of the brakes.

The reducing valve should be regulated to permit but 20 pounds pressure in the water tanks. If the feed valve fails to seat, the pressure in the water tanks may in time equalize with that in the air tank (or 70 pounds). Under these conditions the water is forced violently through the faucet to the discomfiture of the passenger from splashing.

The following will, perhaps, be of assistance to the car man not "well up" in the water pressure devices:

(a) The water pressure governor valve should be adjusted at 60 pounds, which, when in good condition, will permit no air to flow from the auxiliary reservoir to the air tank until this pressure is accumulated in the former.

(b) If the brake fails to apply with a train line reduction of 20 pounds, after giving the auxiliary reservoir a resasonable time to charge, look for dirt under the diaphragm valve.

(c) If the auxiliary reservoir and air tank are both fully charged and the brake continues to apply after a few pounds train line reduction (sufficient to move the cylinder piston past the leakage groove), the train line being free from leaks, examine the feed valve No. 38.

(d) Should air only escape when faucet is opened, the water tanks are empty.

(e) If neither air or water escapes, examine valves, beginning with the reducing valve.

(f) A weak flow of water can be located in a similar manner.

(g) A strong flow at the faucet is a result of too high pressure in water tanks; cause, dirt under supply valve No. 18, or improper adjustment of the reducing valve.

Many of these troubles can be conveniently located by the use of a duplex air gauge erected in the car, one pointer designating the air tank pressure, the other that in the water tanks.

No doubt the car foremen long since realized that as a rule, the usual location of these water pressure valves is such that they are inaccessible, and with increased knowledge of the importance of the proper maintainance of the valves they will more and more realize that these adverse conditions are great annoyances for him who endeavors to keep down the cost of making repairs. S. J. Kidder.

SAFETY CHAIN DESIGN.

At the last meeting of the Southern and South western Railway Club a committee (consisting of J. M. Holt and C. F. Thomas, both of the Southern Railway) presented a suggestive report on the question of "Safety chains—to what extent is their use beneficial, and how can it be increased." This report, which we give in part, was ordered to be referred to a special committee, which in turn is to further consider the matter with a view of possibly making recommendations to the next M. C. B. convention. The substance of the present report is as follows:

In practical handling we find some cases where the safety chains on passenger train cars have had sufficient strength to hold the load after the draw gear had failed, but more frequently we see the hooks, links, or eye bars break and the cars separate.

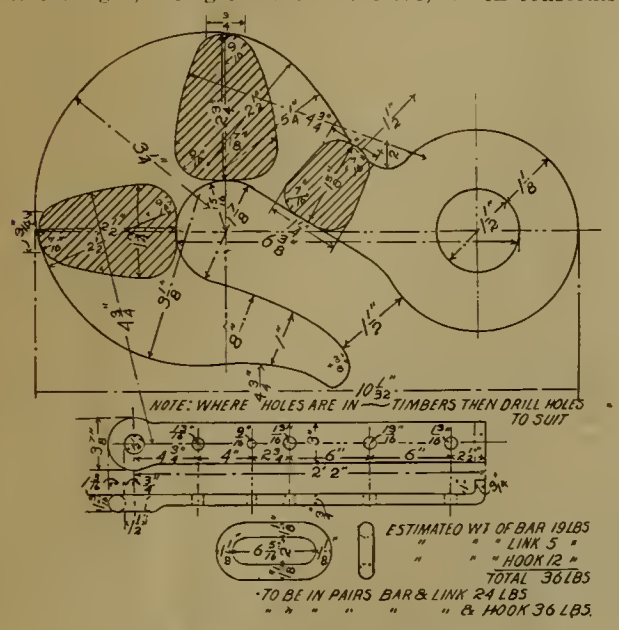
Finding these conditions, the road with which your committee are connected required special attention given this subject, which resulted in finding that the safety chain and hook adopted by the M. C. B. Association in 1890, could not be depended on to stand a load of more than 35,000 pounds, when made of good material.

These safety chains being considered too weak it was determined to design a safety chain of sufficient strength and also to attach these chains in such manner as to prevent passengers falling between cars, which condition will also prevent air and steam couplings becoming detached, which will prevent delays to trains. While these conditions are provided for in the safety chain which was adopted there is sufficient slack in chains to prevent any tension being placed on them while cars are moving around sharpest curves, even if the draft springs are fully compressed by pulling.

This safety chain can be depended on to stand a load

of 75,000, when made of best Brown engine bolt iron, as compared to 35,000 for the chain recommended by the association; the actual test being 77,700. We have had many of these safety chains in actual service for more than a year, and on account of the satisfactory nature of this service they are now being applied to the entire passenger train equipment of the road.

The hook is placed to the left side while the link is to the right, facing the end of the car, which conforms



SAFETY CHAIN DESIGN.

to the M. C. B. recommended practice, and there is only one link and one hook. For this reason it cannot be hooked up wrong, which is frequently done where unnecessary hooks and links are applied.

In application, the measurement is given from inside bearing of knuckle which insures exact length of chains when coupled to any M. C. B. form of coupler, regardless to style of platforms; the links being varied to suit style of platform, the hook to remain the length as shown.

The importance of using safety chains on our passenger equipment is growing with the length and weight of our trains, as well as with the power of the locomotives, which are required to pull them. The absolute importance of making a safe passage way across vestibuled platforms, as the traveling public pass from one car to another in changing cars, or to reach the dining car, must not be lost sight of.

The platforms and eye bars to which these chains are fastened must be rigid and have the strength to stand jerks so as not to allow the sliding foot plates to separate enough to allow the passenger to fall in, and either one of these safety chains must have the strength to hold the load alone, as the coupler failure may occur as the cars pass around a curve, in which case only one chain will catch the load.

If this proposition could be left entirely out of the question, there would still be service for the safety chains in preventing train delays from trains parting and accidents which sometimes follow such cases over crowded tracks, coupled with mail fines, delayed time, draw bars falling on track, and other such items which cost money enough each year to apply safety chains, not only to passenger train cars, but would attach them to a number of freight cars as well.

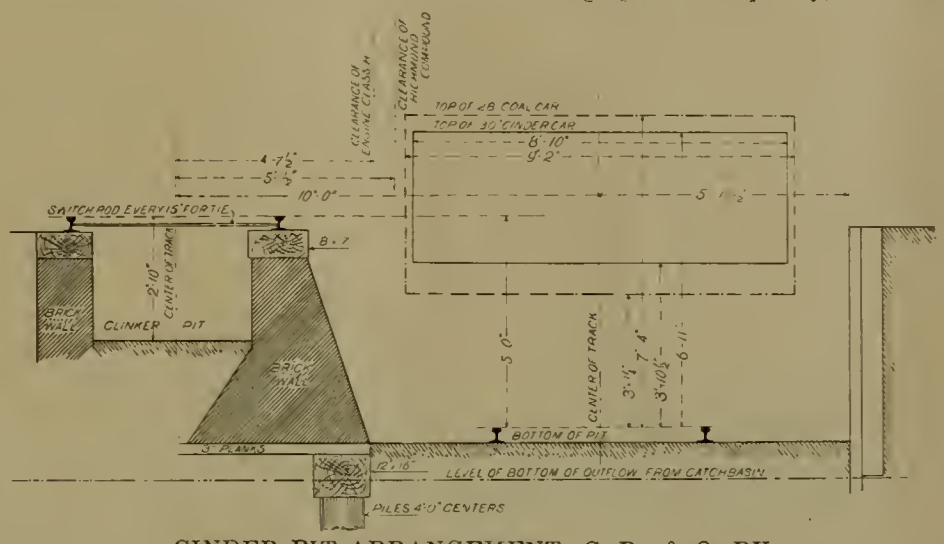
The Master Car Builders' Association do not recommend the application of safety chains to freight cars, but do recommend a position where these chains should be fastened in case they are applied to cars for special service, this position being 27 inches from center each way, while the position recommended for passenger train cars is 14½ inches from center each way. If we equip each class of cars as the association recommended, when we coupled these cars together in our mixed trains, we would find the safety chains 12½ inches out of line and could not couple them together.

(The bar shown in the engraving, carrying the link and hook, is placed on the outside of the side platform sill and in addition to being bolted thereto is lipped into it.)

CINDER TRACK, C. B. & Q. RY.

At the Western Ave. (Chicago) roundhouse of the Chicago, Burlington & Quincy Ry. there is a good piece of practice in the way of a clinker pit track arrangement, the design of which is shown in the accompanying illustrations. It consists of an ordinary clinker pit enclosed on both sides, with a depressed track running by its side. It will be seen that the bottom of this depressed track is about 5 ft. lower than the track on which the engines are clinkered. The centers of the track in the clinker pit and in the track pit are 10 ft. apart. This close proximity, and the lowering of the cinder car by running it into the depressed track, permits of simply one handling of the cinders, which are shoveled directly from the clinker pit into the car. The pit is 90 ft. long. The cinder cars used are ordinary flat bottom cars with 36 inch sides. They have three doors on each side that are held in position with stakes and ordinary stake pockets, the stakes being hung on chains so that when they are knocked out they will not be lost off. In ordinary practice the stakes are knocked out and the cinders shoveled from the bottom of the car out onto the track where needed.

As to the cost of handling cinders at this pit, we are given these figures: Before the depressed tracks



CINDER PIT ARRANGEMENT—C. B. & Q. RY.

were used the cinders were shoveled from the pit to the platform and from this platform into the car, at a cost of $1.77 per car. After the depressed track was put in, and the practice of loading direct from the pit into the car was commenced, the cost was decreased to 97 cents a car. We may add that the cars used at this point hold a little more than 26 cubic yards each and, by heaping in the center, hold 27 cubic yards each.

A NEW FLOORING MACHINE FOR CAR SHOPS.

The new No. 15 six-roll double-cylinder "Lightning" flooring machine which has just been designed and built by J. A. Fay & Co., is the latest in the field, and, as new and important improvements have been incorporated in it that have never before been assembled in any one machine, it can not otherwise than prove of interest to all who are engaged in manufacturing flooring, ceiling, siding, casing, etc. The machine is made in two sizes, to plane four sides 10 inches and 15 inches wide and 6 inches thick. The framing is massive, strongly braced inside to resist all strains and vibrations; and has heavy girts, so placed as to come under the working parts of the machine where there is the greatest resistance. All surfaces are accurately planed and securely jointed. By a system of interchangeable parts and adherence to exact standard sizes the designers have brought the machine to a greater degree of perfection than ever.

The cylinders are two in number, made from solid steel forgings of fine quality, have four faces slotted to receive two or four knives, and chip-breaking lips for working cross-grained lumber. The upper cylinder is mounted in a heavy yoked frame, has journals 2¼ inches in diameter, and runs in self-oiling bearings 10½ inches long. It has double-flanged pulleys close to bearings on each end, fitted on taper bearings, and secured with wrought nuts. The cylinder-raising screws are outside of the frame, and are fitted with ball-bearings and a device for quickly taking up all lost motion in the screw caused by wear of the threads. The lower cylinder is mounted in a heavy yoked frame, has 2¼ inch journals that run in self-oiling bearings 10½ inches long, and is vertically adjustable at each end. It is driven by flange pulleys at each end.

The matching works are heavy. The arbors are of steel 1¾ inches in diameter where the cutter-heads are applied, and revolve in long, self-lubricating bearings, both of which are adjustable vertically and horizontally, and are rigidly locked in any desired position by a lever conveniently located out-

CINDER PIT ARRANGEMENT—C. B.-& Q. RY.

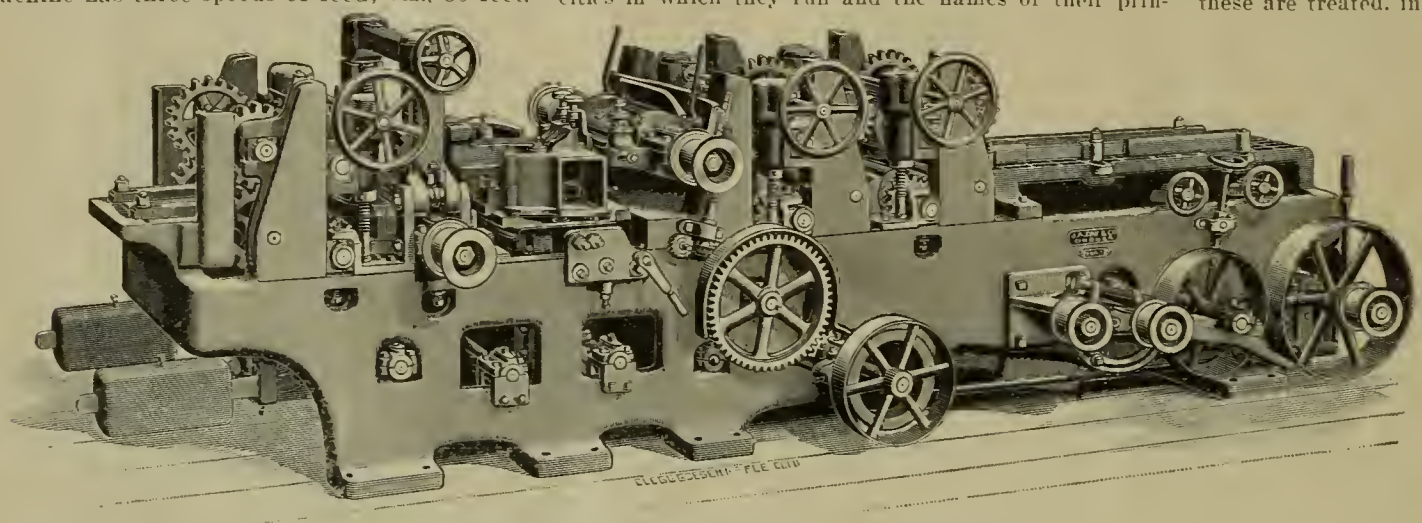
side the frame. The top plate of each matcher hanger is detached from the main casting for convenience and economy. The machine will match stock as narrow as 1½ inches. The patent weighted matcher clip has an adjustable toe, is hinged to the matcher hanger, and produces uniform pressure on the material. Shaving hoods are provided, which can be swung out of the way to give access to the heads.

The feed works consist of six large feed rolls, 8 inches in diameter, driven by a train of powerful gearing, each gear on a shaft extending through the machine and running in babbited bearings. The expansion gears on feed rolls are inside the frame, and run in bearings. The screws for raising the rolls do not revolve, the rolls being mounted in sleeve housings that travel on the screws. This makes the roll adjustment very easy, as the pressure weights do not have to be lifted. All roll boxes are long and large in diameter. The feed-out roll is covered and provided with scrapers. The weight levers are inside the frame, and move with perfect freedom. The machine has three speeds of feed; viz., 30 feet, 45 feet and 60 feet per minute. The feed is under instant and positive control of the operator by means of a lever engaging a ring friction.

The pressure bar before the upper cylinder is adjustable to and from the cut, and has a chilled toe, reducing wear to a minimum. The bar after the cut is adjustable for difference in thickness of material worked. The bars before and after the lower cylinder are adjustable to and from the cut, and are vertically adjustable for varying depths of cut. The bar over the lower cylinder is adjustable on heavy stands, and securely locked in position. It can be instantly swung over from either side by simply loosening one nut. A continuous pressure bar extends over the matching works with independent adjustment, and can be quickly thrown out of the way to give access to the heads.

This machine is equipped with a new and improved belt-tightening apparatus for both cylinder and side-head belts, quickly adjustable while the machine is running, and permitting the use of endless belts, that run more smoothly and do not require to be cut for the stretch to be taken up. By the use of this apparatus 1½-inch stock may be matched, and the belts stand at least 10 inches apart on the countershaft, obviating the riding of matcher belts one on another, as under old methods.

The name "Lightning" is the trade-mark, and the exclusive property, of the builders of this improved machine, Messrs. J. A. Fay & Co., Nos. 8 to 28 John street, Cincinnati, O. This firm has had a special corps of expert mechanics and draftsmen at work for the past year, designing and perfecting new and improved wood-working machines, and this is one of those that they have just brought out and which surpasses anything they ever before placed on the market of its kind. This company make a full and complete line of high grade machines for manufacturing articles, of every description, out of wood, and they can furnish single machines or complete outfits for any kind of plant with their make of machinery.



A NEW FLOORING MACHINE FOR CAR SHOPS.

The Buffalo Forge Co., of Buffalo, N. Y., have published a rarely beautiful pamphlet entitled "American Schools of Mechanical Technology." The greater portion of its 142 pages is taken up with photographic views of the various technological institutes, industrial schools, etc., in this country, the page opposite each view being occupied by an interior view of the forge shop of each college. Interior views of a large number of industrial plants are also given. The book embodies a very clever idea very handsomely carried out.

BOOK NOTES.

The Electric Railroad List of the World. Containing also Cable and Horse Railroads. Published Quarterly by the Railroad Gazette.

This is the first number of a small directory of about 250 pages. The paper is good and the type clear. In size it is well fitted to be carried in the pocket, but it hardly belongs, so far as size and appearance are concerned, to the class of directories which meet with the most favor and which are generally recognized as authoritative books of reference. It belongs rather in the "Baby Pathfinder" class. The list of foreign tramways is, avowedly, very incomplete. In a great many instances the name only of the tramway company is given and the location of the offices and the names of the officers do not appear. Unquestionably it is a difficult and expensive matter to give a satisfactory list of all the tramways of the world with the cities in which they run and the names of their principal officers; and one wonders whether even complete information of this nature would be of any use to the manufacturers or to any one else in this country. No one wants incomplete information; but does any one want even a perfect "list" of this kind? We very much doubt it.

As to the lists of roads and officials in this country it is fairly complete and correct. We note, however, that there are important omissions, and some of them seem to be intentional. For instance, the names of the master mechanics of important lines do not appear, and the office of "master mechanic" seems to be ignored. It seems strange that a directory of this kind published in New York City should not give the name of Thos. Millen, general master mechanic of the Metropolitan road in that city, nor that of M. McNally, master mechanic of the Manhattan elevated. The name of C. F. Baker, superintendent of motive power of the great Boston elevated system, is not given in this "list," nor is that of Geo. O. Kane, master mechanic of the Union railroad of Providence. It appears that the Electric Railroad List of the World proposes to ignore the superintendents of motive power and master mechanics.

As regard accuracy, a hasty examination of a few leading roads shows that the publishers have not fully realized the necessity of being up-to-date. This list, which was sent out after the middle of February, gives W. J. Fransioli as general manager of the Manhattan railway. Mr. Fransioli resigned from this position in December last, and if the publishers of this new directory had consulted the January number of the Monthly Official Railway List, they would have learned that Mr. Alfred Skitt had succeeded him. As the Electric Railroad List of the World is published only every three months, it will continue to disseminate this misinformation for the next quarter of a year. In the case of the North Hudson Company, in New Jersey, David Young is president and Miles Tierney, whose name is given as president, has not held that office for some time. Similarly, Wm. M. Green has not been manager of the Baltimore Belt road for some months, although this list gives him as now occupying that position. We readily admit that no such list can be issued free from any error; but some errors are less excusable than others.

The plan followed in this publication of giving the roads by states, the states being arranged alphabetically, but with no indication on the margin of what state the roads named on any page are in, will make the finding of roads difficult and headachy.

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The special publications of the Railroad Car Journal, of New York, are each and all of distinct value. Among those worthy of especial commendation is the Car Interchange Manual, which comprises an abstract of the proceedings of the M. B. C. arbitration committee, a table of depreciated values, a table of words often mis-spelled on defect cards and a table of synonyms, or parts of cars known by different names, etc. The Car Journal also publishes three valuable charts giving respectively the anatomy of a passenger car, a box car and a hopper-bottom gondola car. In these charts all the parts of the various cars are given numbers which, through an accompanying key, give the more commonly accepted names of the various parts. This paper has other special publications, but we will now mention only one of them, the Interchange Poster, which is a diagram showing combinations of defects which, under the M. C. B. rules of interchange, denote unfair usage if caused at one and the same time and at the same end of the car. All these publications are sold at a nominal figure.

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The Locomotive Up to Date. By Charles McShane, author of One Thousand Pointers for Machinists and Engineers. Illustrated. Chicago: Griffin & Winters. Price, $2.50.

This is a book which merits very high commendation. It is, in a sense, a scrapbook, but it is a rarely good one. It covers a remarkably wide range of topics and these are treated, in many cases, by specialists. Every subject is fully illustrated and the descriptions given of all new devices were prepared by the inventors or designers themselves. A notably valuable feature of this book is the series of exhaustive articles prepared especially for this work by the locomotive builders, including the Baldwin, Rogers, Schenectady, Pittsburgh, Brooks, Dickson, Cooke and Richmond companies. This feature alone, grouping in one cover authoritative descriptions and illustrations of the various compound locomotives, makes the book of distinct value. The various parts and appliances of the modern locomotive receive separate consideration, and those of a given class are conveniently grouped together in the volume. The author has attempted to be careful in his selections when treating of special appliances, and we think that it will be conceded that there are few devices admitted to its pages that do not merit a place therein. Of the general topics belonging properly in such a book we note chapters on combustion, incrustation, counterbalancing, compressed air, the air brake, etc. The columns of the technical press have been drawn upon here and there for material and we note that quite a number of articles from the Railway Master Mechanic have been used. There is little in the 695 pages of this work that lacks direct value and there are so many excellent things that cannot be elsewhere found gathered together in such compact and convenient form that the book should have a place in every railway man's library. The work is handsomely clothed typographically, and its very numerous illustrations are, for the most part, finely executed. A very complete index makes readily available the wealth of contents of this book.

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The Mechanical World, London, sends us "The Mechanical World Pocket Diary and Year Book for 1899 Containing a Collection of Useful Engineering Notes, Rules, Tables and Data." This should prove a very useful handbook. We notice that some of the topics are treated by specialists, notably "Gas Engines," "Oil Engines" and "Beams and Girders."

* * *

"Practical Shop Talks" is the title of a valuable little book published by Locomotive Engineering, of New York. It consists of a collection of letters on shop subjects which show by actual examples some of the existing methods of shop management and practice. These letters were written by Mr. Fred H. Colvin, and appeared in Machinery during his editorship of that paper. They may be remembered by some of our readers as "Notes from Notown, by Ichabod Podunk." The book is replete with practical observations and suggestions of direct value to thinking shop men.

PERSONAL.

Mr. Lewis Hall, foreman of the South Railway shops at Tuscumbia, Ala., has resigned.

Mr. Joseph Geimer has been appointed master mechanic of the Maricopa, Phoenix and Salt River Valley Road, with office at Phoenix, Ariz.

Mr. William S. Douglas, who for 30 years was chief storekeeper of the Pennsylvania at Altoona, died Jan. 30 of heart disease, aged 65 years.

Mr. T. A. Brown has been appointed superintendent of motive power of the Louisiana & Arkansas Railway, vice Mr. M. J. Redding, resigned.

Mr. Robert McLaren, chief instructor on the instruc-

tion car of the Pennsylvania Railroad, has been appointed inspector of the steam-heating on that road.

Mr. Ashbel Green, a son of the late Ashbel Green, general connsel of the New York Central, has been appointed purchasing agent of the Manhattan Elevated.

Mr. F. P. Rngh has been appointed coal inspector on the Burlington & Missonri River Railroad. He will look after locomotive fuel and instruct enginemen in its nse.

Mr. F. L. Barber, acting general car foreman of the Dnluth, Missabe & Northern, has been appointed general car foreman of that road, with headquarters at Duluth, Minn.

Dr. W. B. Middleton, of Cuyahoga Falls, has resigned his position as superintendent of the relief department of the Baltimore & Ohio and Pittsburg & Western Railroads.

Mr. T. J. Mann has been appointed general storekeeper of the Nashville, Chattanooga & St. Louis, with headquarters at Nashville, Tenn., in place of Mr. John C. Kennedy, promoted.

Mr. John C. Kennedy, heretofore general storekeeper of the Nashville, Chattanooga & St. Louis, has heen appointed purchasing agent of that road, with headquarters at Nashville, Tenn.

Mr. J. S. Chambers, heretofore snperintendent of motive power of the West Virginia Central & Pittsbnrg, has been appointed master mechanic of the Buffalo division of the Lehigh Valley.

Mr. J. W. Blabon has resigned as purchasing agent of the Great Northern and has been appointed Western traffic manager of that road, with offices at Seattle, Wash., vice W. L. Benham, resigned.

Mr. E. Robertson has been appointed foreman of the Wahash at Ashley, Ind., succeeding A. G. Hollinghead, formerly assistant master mechanic at that place, and who has been assigned to other duties.

Mr. Howard Williams has been appointed mechanical engineer of the Erie, vice G. H. Goodell, who, as we noted in our last issue, resigned to accept a similar position on the Northern Pacific.

Mr. Richard English, formerly with the Santa Fe Pacific, has been appointed master mechanic of the Rio Grande Western at Helper, Utah, with jnrisdiction over the line from Castlegate, Utah, to Grand Junction, Colo.

Mr. S. Phipp, heretofore road foreman of the Canadian Pacific, has been appointed assistant master mechanic of that road, with headquarters at Winnipeg. His territory will extend from Swift Current to Port Arthur.

Mr. C. Skinner, hitherto master mechanic of the Alabama Great Southern, has heen appointed master mechanic of the Toledo, St. Louis & Kansas City, with headquarters at Frankfort, Ind., vice Mr. F. J. Pease, resigned.

Mr. J. Thurman has resigned as mechanical engineer of the Missouri Pacific system to engage in pnshing some of his inventions, particnlarly, we believe, his compressed air locomotives, street cars and anto-trucks.

Mr. F. H. Whitney has been appointed assistant air brake inspector on the Eastern district of the New York, New Haven & Hartford R. R., and Mr. H. C. Oviatt has been appointed to the same position on the Western district.

Mr. J. J. Ellis, heretofore master mechanic of the Chicago, St. Paul, Minneapolis & Omaha, has heen accorded, by his company's management, a very pleasant recognition of his services hy being given the title of superintendent of motive power and machinery.

Mr. R. O. Cnmback, heretofore general foreman of the St. Joseph Terminal, has been appointed superintendent of motive power of the West Virginia Central & Pittsbnrg, vice J. S. Chambers, who resigned to become division master mechanic of the Lehigh Valley at Buffalo.

Mr. W. N. Cox, trainmaster and road foreman of engines of the Alahama Great Sonthern, has heen appointed acting master mechanic of that road, with headquarters at Birmingham, Ala., vice Mr. C. Skinner, resigned to become master mechanic of the Toledo, St. Louis & Kansas City.

Mr. C. W. Booth has been appointed general storekeeper and accountant of the Wisconsin Central, with jurisdiction over material, supplies and acconnts at Stevens Point and Waukesha, Wis., and Mr. R. A. Grange, who has been storekeeper and accountant at Stevens Point, has heen assigned to other duties.

Mr. T. Appleton, formerly well known in Chicago as a civil engineer making a specialty of railway bnildings and water stations, and who was for some time in the engineering department of the Great Northern engaged in similar work, is now chief engineer of the Copper Range Railway, with office at Houghton, Mich.

Mr. S. F. Forbes, superintendent of car and machine shops of the Great Northern, and formerly for many years general storekeeper of that road, has been appointed purchasing agent of the same road, vice J. W. Blabon, resigned to become western traffic manager of the Great Northern Railway system at Seattle, Wash.

Mr. J. W. Leary has resigned as master mechanic of the New York, New Haven & Hartford shops, at New Haven, to become general superintendent of the Alnminnm Plate & Press Co., Plainfield, N. J. Mr. James Hocking, who was general foreman at New Haven, has been appointed to fill the vacancy occasioned by Mr. Leary's resignation.

Mr. Henry Watkeys has resigned as master mechanic of the Chicago, Indianapolis & Louisville on account, it is stated, of advancing years. Mr. W. P. Coburn, assistant master mechanic of that road, succeeds Mr. Watkeys. Mr. Chas. Coller, hitherto master car builder of the road, has heen made assistant master mechanic in charge of the car work.

Mr. William E. Baker, snperintendent of the Metropolitan Elevated, of Chicago, has resigned to enter the service of the Manhattan Railway Company, of New York, as general superintendent and chief engineer Mr. Baker, who designed and installed the Intramnral electric railroad at the World's Fair in Chicago, has been very prominently identified with the development of electric motive power on elevated railways.

On the Illinois Central the following changes in the mechanical department have been made: Mr. M. S. Curley has been appointed master mechanic of the Illinois Central shops at Paducah, Ky., vice William Hassman, resigned. Mr. Curley is succeeded as master mechanic of the same road at Water Valley, Miss., by T. F. Barton. Mr. A. C. Beckwith is appointed to succeed Mr. Barton as master mechanic at East St. Lonis.

Mr. W. S. Calhoun, general eastern agent of the American Steel Foundry Company is dead. Mr. Calhonn was widely known in railway and railway supply circles. He had been some years ago connected with the Chicago Tyre and Spring Company and later with the Brussels Tapestry Company. For the past year or so, and up to the time of his death, he had been with the American Steel Fonndry Company in the capacity above noted.

Prof. J. B. Johnson, of Washington University, at St. Lonis, has resigned to go to the University of Wisconsin as Dean of the College of Mechanics and Engineering. Prof. Johnson has gained a most enviable fame throngh his departmental work at Washington University and especially throngh his various works of original investigation, notably that directed to the study of the strength of beams. The University of Wisconsin is to be congratulated upon securing the services of so eminent a scientist as Prof. Johnson has shown himself to be.

Mr. Thomas Meegan, chief clerk of the Pennsylvania shops at Ft. Wayne, has been retired on a permanent pension. He has been in the employ of the company nearly forty years, and in point of both years and service was the veteran clerk in the employ of the Pennsylvania company. His career has been an enviable one, and he retires with the esteem and friendship of the hundreds of employes with whom he has been associated. Mr. J. H. Hobrock, who for some time past has been the assistant of Mr. Meegan, has been appointed his successor.—Indianapolis Sentinel.

Mr. E. P. Mooney, for the past seven years connected with the Lehigh Valley R. R., as traveling engineer and master mechanic, and prior to that time, for twenty-four years, with the Lake Shore & Michigan Southern R. R., as locomotive and traveling engineer, has severed his railroad connections to take charge of the Buffalo office of the Chicago Pneumatic Tool Company. Mr. Mooney has a wide acquaintance among railroad men, and with his well-known push and energy will assuredly make a success in his new position, and still further increase the sales of the Chicago Pneumatic Tool Company in his territory.

The following have heen elected members of the advisory committee of the Baltimore & Ohio Relief Department: Messrs. U. B. Williams and J. M. Templeton, of the condncting transportation department, Messrs. E. L. Weisgerber and I. N. Kalbaugh, of the motive power department, and Messrs. B. F. Hanna and J. E. Cassell, of the maintenance of way department, east of the Ohio river; and Messrs. J. L. Davis and G. W. Spencer, of the conducting transportation department, Messrs. W. H. Harrison, Jr., and James Wares, of the motive power department, and Messrs. D. Lee and J. A. Spielman, of the maintenance of way department, west of the Ohio river. These committees are to serve for one year from October 1, 1898.

Mr. Robert S. Miller has been appointed assistant professor in charge of the department of machine design, at Purdue University, and Mr. L. V. Ludy has been made Assistant in the Engineering Laboratory, assuming the work which has hitherto been carried by Mr. Miller. Mr. Miller is a graduate of the school of Electrical Engineering, class of '95, and received the degree of Mechanical Engineer from the same institution in '97. Since graduating he has been assistant in the engineering laboratory, and later instructor in mechanical engineering. In addition to his routine work at Purdue he had a leading part in the exhaustive series of tests made two years ago at Purdue npon the balanced compound locomotive, and last year was in immediate charge of the fuel tests made at the University for the Big Four Road, and still more recently assisted in the dnty test of the 20,000,000 gallon Snow pumping engine at Indianapolis, the results of which have attracted general attentien.

Mr. William McIntosh, division master mechanic of the Chicago & Northwestern Railroad, at Winona, Minn., has been appointed superintendent of motive power of the Central Railroad of New Jersey, vice Mr. C. A. Thompson, resigned. It will he of interest, jnst at this time when Mr. McIntosh is making snch an important change to briefly review his railway career. He was horn in 1849 in Franklin, Quebec. He entered railway service in 1864 as a locomotive fireman on the Chicago, Milwankee & St. Paul Railroad. He remained on that road in this capacity, and as machinist and engineer, until 1871. From 1871 to 1872 he was machinist on the St. Paul & Pacific Railroad. In 1872 he went to the Chicago & Northwestern Railroad, as locomotive engineer, continuing in this capacity until 1877, when he was made foreman of locomotive repairs on the same road. He held this position for the next 10 years, being located at both Waseca, Minn., and Huron, S. D. Since July, 1887, he has been division master mechanic for the same road at Winona, Minn., ably fulfilling the duties of that office until called to the higher post in the East, which he has just accepted. The many friends of Mr. McIntosh will be greatly pleased to learn of this decided advance in his interests. He has long been known as one of the best of our Western railway mechanical officers and has done work of recognized value, not only upon the road with which he was so long connected, but in the Northwest Railroad Club, of which he was an active member and at one time president. In his present change of connection it may be truly said that the loss of the West will be the gain of the East.

Mr. W. H. Harrison, snperintendent of motive power of the Baltimore & Ohio lines west of the Ohio river, has resigned, his purpose being to retire to private life. By this step there passes from the active duties of life one of the oldest, and one of the best equipped railway men in the country, one who is, moreover, a picturesque and lovable character. At this time it is well to take a brief glance at his business career. Mr. Harrison was born in Baltimore, Md., July 10, 1832, and learned the trade of a machinist in the old Baltimore & Susquehanna shops, now a part of the Pennsylvania system. He later entered the employ of the Baltimore & Ohio Ry. and rose through the following offices, the service so recorded covering a period of 45 years, with only 52 days of lost time: In 1856 he was promoted from the bench to the position of foreman in the shops at Fetherman, W. Va.; he was master mechanic at Wheeling in 1858, and master mechanic at the Mt. Clare, Md., shops in 1862; bnt the growing importance of Wheeling took him back there in 1864. In 1871 he was promoted to be master of machinery of the Pittsburg division, with headquarters at Connellsville, Pa., and in 1880 he was made master of machinery of the Trans-Ohio division, with headquarters at Newark, Ohio. He was, in 1886, made superintendent of motive power, with his office at Mt. Clare, and two years later the office was re-transferred to Newark and has since remained there. Mr. Harrison was a charter member of the B. & O. Relief Department, one of its fonnders and chief promoters, and from it his declining years will draw some of the support he gave it years ago. During the Civil war he was prominently located with the great artery of commerce which ran throngh that most strategic of points, Harper's Ferry. He was regularly sworn in as a military railroad man by Provost Marshal Mayor Oakes, at Wheeling, W. Va., and it was his duty and privilege as such, to take a hand in and see much of what is now the history of the war, pass in review before him. Mr. Harrison has given up his present position, not so much because his exacting duties were telling on his health, as because he was born in 1832. He is within three years of the Psalmist's allotment of life, and he desires to enjoy the remainder of his days in the quiet of his home in the enjoyment of a rest which has heen amply merited in his active, industrial

MR. W. H. HARRISON.

life of 45 years. Although 67 years of age, Mr. Harrison shows little of the ravages of time and the strain of the varied responsibilities which have rested on him.

Some time ago we noted the death of Mr. Wilson Eddy, who was for nearly 30 years master mechanic of the Boston & Albany Railroad. The Boston Transcript gives an extended notice of Mr. Eddy's career, containing much of an interesting reminiscent character, and we append the substance of this notice: "Mr. Eddy was born in Chelsea, Vt., Feb. 24, 1813. At nineteen he went to Lowell with the Locks and Canal Company and in 1840 to Springfield to work for Major Whistler as a mechanic on the new Boston & Albany road. Mr. Eddy retired from active work in 1880. Mr. Eddy was a thoroughly skilled mechanic, and during his forty years' active life made a lasting impression on railroad mechanism in New England. As an inventor and builder of locomotives he had a distinct place in the history of the century. He began working on locomotives when less than a dozen had been made in America. His were among the first practical locomotives built this side the ocean, and he kept pace with their movements so that the last one of the 135 he built was as complete and able to meet the demands of the period as his first. He was the disciple of Major Whistler, who gave the line of the Western Railway its impetus. He studied locomotives in Baltimore and later was connected with the Locks and Canal shops at Lowell, where Mr. Eddy first met him. When Whistler came to Springfield as manager of the Western Railway he sent back for Eddy to come as foreman of the local shops. Mr. Eddy reached Springfield in October, 1840, just after the line had been opened to Worcester and while work was being done on the road west to Albany. The road then had six locomotives when Mr. Eddy went there. They were built with inside crank connections, weighed 12½ tons and had no cabs. Soon afterward three eight-wheeled locomotives, weighing 22 tons each, were built by Major Whistler, and for the first time the principle of allowing the expanding steam to finish the piston stroke by means of an independent cut-off valve was applied. When the road was opened through the hilly country to Albany, new requirements for locomotives came about and efforts were made at once to secure engines that had strength to pull loads up steep grades and round curves with safety. With this in mind, Major Whistler made several locomotives which were nicknamed 'crabs,' and became historic machines. They were a failure, however, and in the passing of the 'crabs' came Mr. Eddy's opportunity. Mr. Eddy was promoted from foreman of the shop to master mechanic in 1850, succeeding Henry Gray, who became superintendent. Mr. Eddy then began building his own locomotives, sending out the first in April. It was named the Addison Gilmore, in honor of the president of the road, and became famous for its speed and general excellence Mr. Eddy went to Russia in 1856 and expected to locate there. The plans of the capitalists failed, however, and he returned to New England. He retired in 1880, and was immediately succeeded by his son, Horace W. Eddy, who had received his mechanical experience in his father's shops. At that time the two shops were consolidated and the local industry removed to Boston. The company passed a resolution recognizing his long and faithful service. Mr. Eddy never cared to secure patents on his many inventions, and only one was taken out. This was for a car brake, which was soon displaced, and the patent netted him but small revenue."

SUPPLY TRADE NOTES.

—An inquiry is made in our want columns for a strictly high class salesman to take the field for a well established railway device. This should prove a good opening for the right man.

—Various new shops and additions thereto have been reported during the month, as covered by the following items: The Santa Fe is completing its new shops at Cleburne, Tex.—At Council Bluffs a new roundhouse is to be erected by the Chicago, Rock Island & Pacific. —It is reported that the Wabash will build new shops at Peru, Ind.—It is stated that the car shop of the Big Four at Mattoon, Ill., will be equipped with an electric light plant.—It is expected that the Louisville & Nashville will erect large new shops at Paris, Ky. That city has offered the grounds necessary for a site. —The blacksmith shop of the Santa Fe Pacific Railroad Co. at Albuquerque, N. M., was destroyed by fire Feb. 17.—The Philadelphia & Reading Railroad Co. will erect large car shops at Schuylkill Haven.

—The Falls Hollow Stay Bolt Co. recently received from the Pacific coast an order for half a car load of hollow stay bolt iron.

—Gould & Eberhardt have sold the Eberhardt patent tool holder, and all connected therewith, to the Hugh Hill Tool Co., of Anderson, Ind.

—The Shaw Electric Crane Co., of Muskegon, Mich., is to furnish the Pressed Steel Car Co., of Pittsburg, with 14 electric traveling cranes of 7½ tons capacity each.

—Mr. W. H. Frisby, hitherto with the Pearson Jack Co., of Boston, has been appointed manager of the railway supply department of Roberts, Throp & Co., of Three Rivers, Mich.

—The Otto Gas Engine works will furnish the Erie R. R. two 120-horsepower gas engines and one 60-horsepower gas engine, to be used for running air compressors and for electric lighting.

—The Hilles & Jones Co. will build a new machine shop. The new shop will be a modern steel frame structure, 80x150 ft. in dimensions, and will be equipped with a 40-ton electric traveling crane.

—In a suit for infringement of coupler patents, brought by the McConway & Torley Co. against the Shickle, Harrison & Howard Iron Co., a decision has been rendered in favor of the former company.

—The Bullard Machine Tool Co., of Bridgeport, Conn., is building a large addition to its new erecting shop. The addition is of the single-story type with side galleries and a traveling crane traversing the entire building.

—The Michigan Lubricator Co., of Detroit, handled last year the largest and most satisfactory business in its history. Its improved Michigan triple locomotive lubricator and automatic steam chest plug has met with special favor

—The Boston Belting Co. has placed its St. Louis agency, hitherto in the hands of the Simmons Hardware Co., with the Railway Supply Co., of St. Louis. The latter company will carry a stock of the Boston Belting Co.'s goods.

—The Brown Hoisting & Conveying Machine Co. will supply coal handling machinery for the coaling station at Mare Island Navy Yard, Cal., the sixth navy coaling station which this company has equipped. This company will also furnish a 100-ton steel floating crane for the Brooklyn Navy Yard.

—The American Manufacturing Company has been organized under the laws of New Jersey to manufacture car couplers and other railway supplies. A. D. Keyes is president: Geo. B. Hulme, vice-president, and Geo. B. Morse, secretary. Mr. W. E. Seeley has been appointed general manager of the company. The offices of the company is at 20 Broad St., New York City.

—The Carnegie Steel Co., which had seriously started in on a project to establish a steel car building plant, and which had secured orders for several thousand steel cars, came to an agreement with the Pressed Steel Car Co. by which it abandons its purpose. It will make all the plate, etc., required by the Pressed Steel Car Co., for that firm, for a term of ten years, and will, during that time, keep out of the car building field itself.

—The Franklin Steel Casting Co., of Franklin, Pa., declared a quarterly dividend of 1½ per cent at its recent meeting. At this meeting the business of the company was reported to be in a very prosperous condition. The contracts in hand will, it is said, consume the entire output of the present year. Among these contracts is a large order from Russia. The following officers were elected: President, Chas. W. Mackey; first vice-president, Chas. Miller; second vice-president, Jas. W. Rowland; treasurer, W. J. Bleakley; secretary, Robert McCalmont; general manager, W. B. Corinth.

—McCord & Co., of Chicago and New York, are putting on the market the McCord spring dampener. This device may be thus described: In the top of the coil spring a malleable iron sleeve is inserted. In the bottom two half sleeves are inserted, and these project up into the upper sleeves. The bases or flanges of these half sleeves do not rest flat on the spring plate but are beveled off on the under side, thus throwing their bearing point in towards the center. The coil spring rests upon the outer part of the bases of the half sleeves. These latter therefore become rocking levers, fulcruming at their bearing point on the plate, their short arm being pressed down by the pressure of the spring which bears the weight of the car, and their long arm being thus thrown outwardly into close frictional contact with the upper sleeve. This frictional contact consequently dampens the motion of the spring, causing it to settle down slowly and then come back to rest with only one vibration. Tests that have been made show that this device reduces the vibrations of the coil spring so that they accord practically with those of an elliptic spring, while at the same time it gives a softer spring motion than an elliptic spring has.

—Henry L. Leach, of North Cambridge, Mass., sends to us a list of his January orders for Leach locomotive sanders, as follows: Baldwin Locomotive Works—for Philadelphia & Reading, 10; for New Mexico Railway & Coal Co., 2; for Manistee & Northeastern, 1; for Nashville, Chattanooga & St. Louis, 7; for Erie, 4; for Baltimore & Ohio Southwestern, 15; for Raritan River, 1. Richmond Locomotive Works—for Erie, 15; for Big Four, 1. Schenectady Locomotive Works—for Rutland, 2; for Southern Pacific, 6; for Vandalia, 4; for Chicago & Northwestern, 5. Brooks Locomotive Works—for Buffalo, Rochester & Pittsburg, 5. Pittsburg Locomotive Works—for Pittsburg, Bessemer & Lake Erie, 4; for Chesapeake Beach, 3; for Union Railroad, 4. Manchester Locomotive Works—Bangor & Aroostook, 4. Rogers Locomotive Works—for Erie, 5; for Great Northern, 10. In addition to these orders from locomotive works, the following orders from railways also came in during the month: Southern Pacific, 28; Chesapeake & Ohio, 22; Erie, 18; Cincinnati, New Orleans & Texas Pacific, 2; Delaware, Lackawanna & Western, 8; Chicago & Northwestern, 2; Detroit, Grand Rapids & Western, 2; Pittsburgh & Lake Erie, 2; Chicago, Rock Island & Pacific, 15; Norfolk & Western, 6; Baltimore & Ohio Southwestern, 2; Big Four, 3; Elgin, Joliet & Eastern, 2; Atchison, Topeka & Santa Fe, 20; Southern, 4; Toledo & Ohio Central, 1; Chicago, Burlington & Quincy, 8; Pennsylvania, 12; Lehigh Valley, 1; Union Pacific, 24; Minneapolis, St. Paul & Sault Saint Marie, 2; Duluth, Missabe & Northern, 16; Santa Fe Pacific, 4; Buffalo, Rochester & Pittsburgh, 6. The total sets ordered figure up to 318, of which 86 per cent were of style "D2." The best previous record was in December, 1898, when 255 sets were ordered.

—A large number of car building concerns were combined during the month in a company known as the American Car and Foundry Co. The companies entering the combination were: Michigan-Peninsular Car Co., of Detroit, Mich.; The Jackson & Woodin Manufacturing Co., of Berwick, Pa.; Missouri Car & Foundry Co., of St. Louis, Mo.; the Ohio Falls Car Manufacturing Co., of Jeffersonville, Ind.; Union Car Co., of Buffalo, N. Y.; St. Charles Car Co., of St. Charles, Mo.; Wells & French Co., of Chicago; Terre Haute Car & Manufacturing Co., of Terre Haute, Ind. (The Buffalo Car Manufacturing Co. and the Niagara Wheel Co., of Buffalo; the Ensign Manufacturing Co., of Huntington, W. Va., and Pennock Bros., of Minerva, O., are reported to have entered the combination later.) The total annual capacity of the united companies first named is: Freight cars, 86,500; coaches, 500; wheels, 820,000; castings, 125,000 tons; pipe, 30,000 tons; bar iron, 90,000 tons. The company will have an authorized capital stock of $30,000,000 of 7 per cent non-cumulative preferred stock, and $30,000,000 of common stock. Of this authorized capital, $2,400,000 preferred and $2,400,000 common are to be retained in the treasury of the new company for acquirement of additional facilities, enlargements, improvements, etc. The prospectus say: "The net profits in the future on a business to the extent of 70 per cent of the capacity as stated above would, according to the estimates of the constituent companies, produce over $4,000,000 annually, and as the component companies are to be taken over on March 1, 1899, with adequate working capital and free from debt, the profits to accure on contracts already secured will be available for dividends, quarterly, which the new company proposes to pay, beginning June 1, 1899, as follows: On the preferred stock 1¾ per cent, and on the common stock at least 1¼ per cent, continuing quarterly thereafter. The cash assets of the constituent companies to be covered into the treasury of the new company exceed $5,000,000." The board of directors agreed upon is as follows: W. K. Bixby, of Missouri Car & Foundry Co.; George Hargreaves, of Michigan-Peninsular Car Co.; J. L. Smyser, of the Ohio Falls Car Manufacturing Co.; Frederick H. Eaton, of the Jackson & Woodin Manufacturing Co.; J. J. Allbright, of Union Car Co.; Lewis J. Cox, of Terre Haute & Car Manufacturing Co.; H. B. Denton, of St. Charles Car Co.; Chas. T. Schoen, of Pressed Steel Car Co.

Pneumatic Tools in Foreign Markets.

The experience of the Chicago Pneumatic Tool Co. in introducing its specialties abroad has been something truly remarkable. Mr. J. W. Duntley, president of that company, has just arrived home from the sixth trip to Europe that he has made within three years. After having made a two months' trip throughout Great Britain and the Continent, he reports a very rapid extension in the demand for the company's pneumatic tools, with inquiries that show that this rapid extension is likely to increase very much. The company's London house report that they have now supplied complete plants in the following parts of the world: Belgium, France, Germany, Holland, Italy, Sweden, Russia, Egypt, Australia, India, Japan and South Africa.

In Europe, prior to the introduction of the Boyer tools, the use of pneumatic hammers had been greatly restricted, owing to the decided opposition of the workmen to handling the valveless tools, on account of the injurious vibration; but with the advent of the Boyer hammers, this objection has vanished and they are now coming into general use throughout Great Britain and Europe. Previous to the coming of the Boyer piston air drills, rotary pneumatic drills had been used in Europe, but when the Boyer drills were shown, their very superior working qualities (amounting, in many cases, to double that of the rotary drills), and

their economy in the use of compressed air (being only a fraction of that required by others), has very quickly led to their general adoption. The superior work of the Boyer pneumatic riveters, has also overcome the European prejudice against anything but hand rivetiug, and it is now generally acknowledged that the work is superior and obtained at a fraction of the cost of hand riveting. In Glasgow recently Mr. Duntley made a trial exhibition of the Boyer riveters, hammers and drills, before a general convention of ship builders, and these tools have now been adopted by all the shipyards on the Clyde. The high standard of excellence of the Boyer tools, with their very superior working qualities, freedom from vibration and economy in the use of air, has won the same recognition of their merits in Europe, which prevails in this country, and has led to their universal adoption. That this claim for the superiority of these tools is not an idle one, is evidenced by an article on Good Workmanship in London Engineering of January 6, 1899. The writer of this article took to pieces some of the Boyer tools, and in regard thereto he says: "The examination thus made showed this work to be, all things considered, one of the best examples of mechanical engineering we have ever met with." From its home office the company has furnished complete plants to China, Japan, South Africa, South America, Central America, Mexico, Hawaiian Islands, Canada, Alaska, and all parts of the United States, so that it now has its pneumatic tools in use, and is enabled to furnish references, throughout the entire civilized world.

The company recently received a report from John Macdonald & Son of Glasgow, relative to the exhibition of pneumatic tools held in Glasgow, above referred to. This exhibition was held in Messrs. Muir & Findlay's Parkhead Boiler Works, Glasgow. We quote from the report as follows:

"There were exhibited: The new Boyer hammers for chipping and calking; the Boyer riveting hammers, the Boyer riveter with pipe frame, the Boyer deck riveter and pneumatic holder-on, the Boyer casting cleaner, together with the Whitelaw reversible drills, and the chain hoist operated by Whitelaw motor.

"We are very pleased to state that all the tools worked admirably, and were a great surprise to all the gentlemen present, who expressed themselves highly satisfied, and at the same time admitted that the results obtained were far beyond their expectations. Among the firms represented were all the principal shipbuilders of the Clyde, railroads, locomotive builders, and a large number of engineers and boiler makers.

"The Boyer hammers we have had in use for some time in many of the leading works in Scotland, and are glad to say that they are the only hammers in existence in which there is no vibration, this being the great objection to other hammers. The Boyer drills are also adopted in many places, and we find they are superior to any other pneumatic drills on the market, and for boring and tapping stay holes, etc., in marine boilers and other work, the firms using these inform us that they can get through their work in one-fifth of the time formerly taken.

"The Whitelaw drills are certainly the cleverest and most useful tools that have come under our knowledge. With a No. 6 Drill we bored a 3½" hole through a 6" wood sleeper in fifteen seconds. The larger drills, having a reversible motion, are invaluable for tapping and staying boiler work. The No. 8 drill tapped a two and one-half inch stay tube hole through both plates of a marine boiler in about two and a half minutes, which was considered to be quite a feat.

"The deck riveter surprised everyone who saw it, owing to its being so easily handled, the total absence of vibration, and by the very speedy and efficient way in which it did its work. It does not require an experienced man to work it, and we are quite certain that this machine will form one of the principal tools in shipbuilding yards in this country. With the pipe frame riveter we riveted one inch rivets at the rate of four seconds per rivet. We shall place a large number of these among the shipbuilders and others, as it was admitted by all to be the best and most efficient pneumatic riveter they had ever seen.

"The chain hoist, operated by air motor, is a very clever machine, and nothing has been seen here to approach it. It seems marvelous that such a small machine, weighing only forty pounds, should have lifted fifteen hundreds pounds, and could have done more if the chain had been heavier. It lifted this weight as quickly and as easily as it did half that amount; in fact, one has to see this machine before they can realize its capability, and we are anxiously waiting on a stock of these hoists, as they are now largely in demand."

The Chicago Company also has a letter from Mr. W. F. Dickson, Chief Engineer of the Sormovo Locomotive Company in Russia, in regard to arranging for the sale of its specialties in Russia. He says: "We have obtained such good results from the various Boyer tools in our shops, and they have attracted so much favorable comment, that a large business could be done, with arrangements for proper representation here."

From these letters it will be observed that the Chicago Pneumatic Tool Company's tools are held in high estimation abroad and that they have secured a firm footing there.

WANTED—A leading manufacturing and selling firm, dealing in railway material, is desirous of taking over one or more first-class railway specialties—something used on cars or locomotives or in railway shops. An advantageous arrangement will be made with the owner of a really good article. Address "C.," care of Railway Master Mechanic.

A POSITION is open to a first-class locomotive draftsman. Is wanted by a leading railway. Must be well up in locomotive design. Excellent place for the right man. Address "W.," care of the Railway Master Mechanic.

SITUATION WANTED—As Chief Clerk Motive Power Department or in similar capacity. Have had 15 years' experience in practical mechanical work and in administrative duties. Have a thorough knowledge of all classes of equipment in detail. Have had extended experience in the organization of forces and discipline of same. Can offer indorsements and recommendations by many high railway officials and others more or less intimately connected with railway affairs. Address "Charles," care of Railway Master Mechanic.

WANTED—One or more strictly first class salesmen to push a well known railway device in the Middle and far West. Must have a good acquaintance with the motive power department. A liberal salary and good commission will be paid to a good man. Address Supply, M. D. P., care of the RAILWAY MASTER MECHANIC.

SITUATION WANTED—With railroad, or railroad supply house. Applicant was originally a machinist and first-class draftsman, also locomotive engineer. Thoroughly understands railway equipment and requirements. Has held good positions, and also has had some experience as salesman. Best of references. Write as to ability and character. Address "M.," care Railway Master Mechanic.

RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor

EDWIN N. LEWIS, Manager.

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Mr. Chas. E. Tripler is claiming too much for his liquid air. He has built an engine which is run by liquefied air and uses it to produce the wonderful material. There is no doubt that the engine runs all right, but when he insists that with the power furnished by three gallons of the liquefied air he produces ten gallons of the fluid he proves himself to be, not a careful scientific experimenter, but a crank mastered by his own wild enthusiasm.

A welcome service has been performed by Mr. Wm. Garstang, superintendent of motive power of the Big Four, in giving us a thorough resume of the car coupler question to date. We give his report elsewhere in this issue in full. He takes up the early history of the adoption of the M. C. B. standard, and shows how instead of hastily adopting it without full consideration, as it has been alleged that it did, the Master Car Builders' Association really gave the matter the most thorough study for five years prior to formally adopting the vertical plane type. He then considers at length some of the prominent points of complaint against the type and shows them in every case to be either unfounded or not well taken. He then makes a series of assertions concerning the positive merits of the M. C. B. type—and these assertions, we feel free to state, can be fully substantiated on any road that uses a well designed, well made, and well cared for coupler of that type.

An application of Roentgen rays for manifold printing is claimed by a writer in the Electrical Engineer to be practical. If it be so it may be possible to adapt it to the production of a satisfactory substitute for our present blue printing process. The first aim of the Roentgen ray application appears to be to do away with press work in the production of printed matter. The idea is to prepare a copy sheet, in manuscript or in printed characters, and to superimpose this sheet upon a pile of say 100 sheets properly sensitized to the Roentgen rays. This pile is placed within the sphere of action of a Crookes tube. After 20 seconds' exposure the sensitive sheets are developed and washed. It is estimated that 20 piles can be simultaneously exposed to the tube and that thus one tube will produce 6000 sheets per minute—or with 10 men working 8 hours per day, 7,500,000 printed, developed, fixed, washed and dried copies can be produced per day. Of course these large figures are only interesting in connection with the development of a plan to replace methods of the typographic art; but if successful in this large way why should not the idea prove successful in giving us something better than our present blue prints, at least in our large railway and manufacturing shops, where electricity is at hand and where tubes would not be beyond reach? It is a well recognized fact that a really good blue print is not at all commonly met with. Nothing is said of the quality of the prints given by the Roentgen ray method; but if they average up with those given by the blue print method, the facility and rapidity with which it is said they can be produced should bring them into immediate favor.

The supreme court of Nebraska holds that a person or corporation using the cars or appliances of another person or corporation, as to its employes, uses such cars or appliances charged with the same duty as to inspection as if they were his or its own. An employe who, under the instructions of his master, uses the car or appliance in his master's possession belonging to some other person or corporation, thereby assumes only the same risk that he would if the car or appliance belonged to his employer. A brakeman who goes upon a car to set a brake thereof, knowing that the car has not been inspected, does not for that reason assume the risk of the brake being defective; he not knowing that the brake is out of order, the defect not being obvious, and it not being his duty to inspect cars or brakes, or to handle cars known or supposed to be defective. An employe assumes the risk arising from defective appliances used or to be used by him, or from the manner in which a business in which he is to take part is conducted, when such risks are known to him, or are apparent and obvious to persons of his experience and understanding. No defect being obvious, an employe has the right to assume that a tool or appliance furnished him by his employer is reasonably safe and fit for the purpose for which he is required to use it. To inspect a car brake, continues the court, in the case of Union Stock Yards Company against Goodwin, may require more than a single glance at it. Such a test must be applied as would probably reveal a defect if one existed; and the neglect of a car inspector to make such a test is evidence of negligence.

Another recent decision takes a common sense view of the foreign car question as connected with questions of inspection. In favor of his employes, according to this decision, a master is bound to exercise reasonable or ordinary care to see that the machinery and appliances furnished them for use are reasonably safe. He is not bound to use the highest or even a high degree of care. The same care required of the servant is required of the master; no more and no less. This doctrine is enunciated by the appellate court, second district, Illinois, in the recently decided case of the Wabash Railway Company against Fanny Farrell, administratrix. Here the railroad company was charged with negligence in having delivered to an employe, to be switched, a car which was crippled and defective in having a much lower drawbar and bumper than other cars standing upon the same tracks. It was a foreign car, which, the court emphasizes, was not *provided* by the company, but received by it for transportation over its road in the ordinary course of railroad business. Its duty in relation to such a car, the court goes on to state, was one of inspection only, and it was not to be held responsible for latent defects which could not be discovered by such inspection as the exigencies of traffic will permit in the exercise of reasonable care. From anything that appeared in the evidence, the fact that the drawbar of the foreign car was lower than on cars of this company, might not have been discoverable by a reasonably careful inspection, and might have become apparent only when the cars were brought in contact with each other, in which case, the court maintains, it would seem unreasonable to hold the company guilty of negligence in not having ascertained the fact prior to the accident. The duty of the company in relation to this foreign car being one of inspection only, the court further holds, it was not bound to apply such tests as are usual for the discovery of defects in manufacture, as might be proper or necessary in regard to its own cars. Moreover, inasmuch as it is the duty of a railroad company to receive from other companies cars for transportation over its road, to require it to apply all the known tests to ascertain whether such cars are properly made, of good material and skillful workmanship, and equipped with the best appliances, the court rightly says, would be to place upon it an insufferable burden. And it declares that the law makes no such requirement. When foreign cars appear to be in ordinarily safe and proper condition, railroad companies are obliged to transport them, and their duty as to such cars is that of inspection merely.

ABRASION AS THE CAUSE OF HEATED CAR BEARINGS.

As has been often pointed out, a study of a railroad company's scrap pile, with an intelligent interpretation of the lessons there taught, is the source of great profit to the officer responsible for the designs of equipment in use. Not only does the scrap pile reveal instances of weakness in design and faults in construction, but also instances where parts of equipment have received abuse and lack of proper attention in service. A study of the physical appearance of car bearings which have been run hot in service, for instance, is an interesting subject and one which has received from time to time careful consideration of railway mechanical officers.

There is considerable uniformity in the appearance of solid bearings removed from service on account of being run hot, but there is great diversity of opinion accounting for the causes which have led up to this undesirable result. The trouble has been variously attributed to lack of oil, to lack of sufficient packing, to improper packing, to improper preparation and manipulation of packing, to unsuitable material composing the bearing, to particles of waste working in between the bearing and journal, to improper physical qualities of the oil used and also to undesirable chemical qualities of the lubricant. No doubt, all of these causes have in times past contributed their share in swelling the number of hot box reports with their attendant expense and delay of traffic.

A good bearing, with proper care and under favorable conditions, should give a service of from 35,000 to 45,000 miles before wearing so thin as to become unsafe to run. If instead of running 40,000 miles a bearing runs 4000 miles, becomes heated and is removed, the bearing material has depreciated in value under M. C. B. rules 27 per cent and has rendered only one-tenth of its legitimate service. This fact, while of minor importance as compared to delay to traffic, is worth considering.

Let us return to the examination of the physical appearance of heated bearings. The bearings bear evidence of having been heated in some cases to red heat, in others to incipient fusion. On the bearing surface there is usually found a copper colored scale or coating, being the familiar "copper spot" so called; frequently there also appears a black or brownish coating, covering a part or whole of the bearing surface. The "copper spot," as heretofore described in these columns, has been found to be due to abrasion, incident to lack of lubrication. The character of the black coating on the surface of the bearing has been investigated by a prominent railway superintendent of machinery and, upon analysis, the coating has been found to be almost entirely oxide of iron, showing that the material which is abraded from the axle is oxidized and imbedded in the surface of the bearing. Thus it appears from systematic investigation that, though other causes may be co-ordinate and contributing, there is one pre-eminent cause of hot bearings, viz.: insufficient lubrication followed by abrasion and attendant heating.

Now the cause of insufficient lubrication is not hard to find. Lack of oil under car bearings is not necessarily due to the desire of railroads to economize unduly on quantity or quality of oil used, but rather to the lack of perfection in the system of inspection. Too often is it the case that when a train arrives at a division point, an inspector hurries down the train, feeling the temperature of the oil boxes with his hand. If the oil boxes are comparatively cold, the lubrication is assumed to be perfect, the oil box lid is not opened, and the box is allowed to run without further attention. Too often the only renewed packing or oiling a box receives is given after the bearing has started to heat. A strictly enforced system of opening and examining every box, and, if the packing has settled away from the journal, requiring the whole packing taken out and replaced by fresh well soaked waste, of discarding from further use the soggy, sand-permeated portion of the waste removed, of requiring all new waste to be soaked in oil for 48 hours and, when oiling is done, requiring that the oil be dis-

tributed throughout the length of the journal rather than permitting a small quantity of oil to be poured in at the outer end of the journal—if these precautions are taken a greater part of the cause of hot boxes will be removed.

THE FIRING OF LOCOMOTIVES.

There has of late been evidenced a renewed interest in the subject of the economical firing of locomotives, and incidentally the prevention of smoke. There is one particular point which does not seem to have been given the emphasis that it deserves, and that is in regard to the formation of clinkers, or, as in the case of grades of coal which do not form clinkers, an excessive accumulation of ashes. One of the important difficulties in the way of successful firing is that not enough attention is paid by the enginemen to the matter of keeping the grate bars free from clinkers and ashes. The result of such accumulations is the creation of an impediment to natural processes of combustion, thus causing a waste of fuel, and the formation of large quantities of black smoke.

One of the principal excuses offered by enginemen for more or less neglect in this particular is that they have not sufficient time to remove the obstruction. Regarding this excuse, it is doubtless with basis in many instances, especially on the heavy fast trains of the present day; but at the same time opportunities frequently occur where good work in this line can be accomplished if action is ready to be taken when the chance occurs.

Firemen frequently give as an excuse for not keeping a clean fire the statement that the engineer affords them no chance to do the necessary work, even though frequent opportunities occur during a trip. It is plainly to be seen, therefore, that the engineer and firemen should at all times work together, and thoroughly understand each other in order to accomplish the best results along these lines. This should be given particular emphasis, as there could be a great saving accomplished by following out the proper methods of co-operation. The engineer can, if he will, afford the fireman a great many opportunities to remove the clinkers from the fire while on the road. An example of an opportunity that can be taken advantage of for this work is, for instance, when a freight train is on a down grade, the fire having been prepared at the top of the grade, allowing the engine to be shut off when the train has been started down. The fire has been allowed to burn low enough for the clinkers to become visible. These are then removed and placed in the tender gangway until a proper place is reached where they may with safety be thrown off. The length of the grade in these instances should be borne in mind so that the fire may be governed accordingly and be in proper condition when the time comes for the engine to resume work.

It is claimed by expert firemen that it is not necessary to rake the full surface of the grates in such cases, but to remove only such clinkers as form the greatest obstruction to the draft, using a proper amount of judgment. Tests of this kind have been made successfully. As regards the amount of time which may be used for this purpose in other instances, as on fast freight and passenger trains where men are in service on regular divisions, it is generally known about how much time such trains will have at certain points where such opportunities can be taken advantage of; in all other service the work is easily accomplished.

The one-shovel method of firing is helpful in the matter of clinkers. This method proves to be a great fuel saver, and it does away with a certain percentage of clinkers. In this style of firing, the coal, being broken up into the proper size and delivered in small quantities at frequent intervals, is mostly all consumed; there is little or no loss of heat, the engine has the proper draft through the grates, and combustion is perfect. The adoption of the one-shovel method is sanctioned by expert firemen. Some of them, however, contend that while it is feasible under certain conditions, it becomes a very difficult, if not impossible, matter to obtain the desired results in the case of a heavy train making fast time and running against a strong head wind. On the other hand, stands the fact that this method is reported to be successfully followed on all classes of service and under all conditions on some roads—notably on the Southern Pacific, where a special fire door and special light shovel are used. This fire door we illustrate elsewhere in this issue and in this connection wish to direct attention to it.

It is conceded by the more thoughtful of the firemen that the one-shovel method is the proper one to follow, that it prevents smoke, saves fuel, and materially helps in the matter of clinkers through its tendency to the maintenance of a light fire.

Recurring to the subject of clean, clinkerless fires, it should be noted that the common methods of removing clinkers are defective. Careless use of the hook harmfully tears the fire; and dropping the drop grate means loss of fire and loss of time, and the pushing of the fire forward and putting in new, green coal, results in cold drafts on the sheets and consequent well recognized damage. Up-to-date firemen use better methods in handling their clinkers and come into stations after long runs with clean fires. As far as the matter of accumulation of ashes is concerned, there are but few grades of coal that cause any great amount of trouble, and frequent grate shaking seems to meet all the requirements of the case.

NOTES OF THE MONTH.

The rumored changes in the system of paying the employes of the Baltimore & Ohio Railroad took permanent shape recently at a meeting of the heads of the several departments and general superintendents, called by General Manager Underwood for the consideration of that matter. It was determined to replace the present dilatory process of running the pay cars over the entire system, involving an expenditure of three weeks time in distributing a large bulk of currency aggregating one million dollars per month, by a more convenient, expeditious and safer process of distributing through the hands of the station agents checks payable at any one of the 37 banks upon the line of the system and by any agent of the company. The new arrangement is effective May 1.

* * *

It is a pleasure to record the fact that the Employes relief organization on the Pennsylvania Railroad is prospering. The membership of the Employes' Relief Fund of the lines east of Pittsburg and Erie continue to increase, and aggregated 45,141 at the close of the year 1898, being the largest since its establishment, and an increase of over 1,400 members as compared with the previous year. During the year the members contributed $766,231.77, while the company and its affiliated lines, in addition to the payment of $108,869.53 for operating expenses, contributed $50,129.50 for extra benefits to members whose disability had continued for over 52 weeks, and who were, therefore, no longer entitled to regular benefits from the fund. The total receipts of the fund, including interest and other items, were $938,714.02, which, with $253,267.98, the balance on hand at the beginning of the year, made an aggregate of $1,191,982, out of which $274,070.46 were distributed as death benefits (being an average in each case of about $551), and $370,940.67 in cases of disability arising from sickness and accident. After meeting its obligations for the year, and providing for unadjusted claims of previous years, a balance of $324,236.55 remained to the credit of the fund, out of which must be paid unadjusted claims for benefits growing out of sickness or accident during the year 1898. In addition to this balance there is a surplus which has accumulated during the life of the fund, amounting to $635,970.29.

* * *

The number of depositors in the Employes' Saving Fund on the Pennsylvania Railroad at the end of the year was 5,845, an increase of 578. The amount received from depositors during 1898 was $609,838, and the balance in the fund at the close of the year was $2,303,328.15. Of this amount $2,250,000 has been invested in securities bearing interest at an average rate of about 4 per cent.

* * *

An interesting story of an old-time engineer is thus told by the Indianapolis Sentinel: "William Baugh, of Terre Haute, was the engineer of the first regular train that was moved over the Terre Haute & Indianapolis Railroad. Saturday, March 4, was the forty-seventh anniversary of the running of this train. It occurred in 1852. Engineer Baugh on Feb. 22 was 81 years old, and is still a hale and hearty gentleman. There is no more interesting character in the railway world than 'Billy' Baugh. After retiring as a Vandalia engineer in 1870 he was given a place in the Vandalia round house, but some time ago he was retired on a pension by the Vandalia people, which he regularly receives under the new management. He insists, however, on remaining at work, and does duty in the tool room at the Van shops at Terre Haute."

* * *

The largest hydraulic press now in the world is said to be that recently completed at the Parkhead forge, England. This press has been three years in construction and erection and is capable of a pressure of 12,000 tons. It is used in the manufacture of armor plate. The cylinder for the press is 72 inches in diameter. It is of nickel steel, the weight of the casting being 65 tons and the finished weight 42 tons. The width of the frame inside the columns is 15 ft., and the working hight under the crossbeam is 13 ft. The power is supplied by four sets of coupled compound condensing engines, with cylinders 21 ins. and 43 ins. and 18 ft. stroke. This steam pressure actuates 68 pumping rams, each 1 11-16 ins. diameter, which deliver the water to the main cylinder of the press. To lift the press-face, cross-beam and ram, two return cylinders of 15 ins. diameter are fitted, working at an accumulative pressure of 1,300 lbs. per sq. in. The foundation of the press is composed of 1,125 tons of brickwork and a bed of concrete weighing 330 tons. —American Machinist.

* * *

A loafer may be properly classified as being a part of "the scum of the earth." Every good man hates a loafer and loves to have him shown up in his true colors. A writer in the Age of Steel does this grateful service in a clever prose rhyme, as follows: "I own I ain't stuck on a job, and I never knew when I was, I've more concern in what I won't do, than I has in what I does. I'm sure I can't say how it is, but I guess my bones are so wired, that as soon as I gets a move on myself, I gets spontaneously tired. Some kind o' failing I 'spose, as is a cross-eye in a man, or a crack in the hoofs of a mule, or leak in a dinner can. Due p'raps to a crick in my back, p'raps something wrong with the marrow, but 'tis all the same when sawing wood, or in the shafts of a barrow. But 'tis snug as furs in winter, to squat by the stove in the store, while a man outside is sawing the wood, and snow piling up at the door. 'Tis sweet to the bones when sweating, and taint much o' that I can do, to sit in the shade and remember, another man's jumper 's wet through. But this loafing I tell you my boy, is not what 'tis cracked up to be, you feel like a kind o' scurvy dog, that's barking up of a tree. It don't seem to be natural like, for a man to do nuthin' at all, only to snap at the blue-bottled flies, and wear out your pants on a wall. And I get so lazy at times, the itch couldn't make me scratch, and when I've filled up my pipe, 'tis labor to strike a match. And somehow it seems that a man is apt to get rusty and blue, if there's nuthin' to stir him up, or nuthin' to think of or do. An oyster in Chesapeake Bay, some day will fatten a stew, but as I sometimes say to myself, 'what on earth is the use o' yon?' You kinder think o' some o' the chaps, as are on the hum and the buzz, and if it weren't for the sweat there's in it, why, you almost wish you was. For 'tis kind o' killing to think, you are feeding on bar room lunch, and so far as the genuine loafer goes, you are the biggest worm in the bunch. 'Tis a kind o' collapse and come down, from top o' the house to the sill, from a man to a spot o' jelly fish, minus a bone or a will. Going down at the heels, I know, the Lord only knows where I'll stop. 'Twill be the old tale of a loafer down, and honest hard work on the top." You surely have an acquaintance, possibly a friend, in your shop, before whose eyes you would like to have this paragraph lie. It might do him good.

* * *

Rudyard Kipling is well known by his admiring readers to have more than an insight into railroading in India, and it will, therefore, especially please his American friends to know that he is quite directly tied to our railway system. It seems that several years ago, Fred D. Underwood, now gen-

eral manager of the Baltimore & Ohio Railroad, named, while with the Soo Line, two stations in the upper peninsula of Michigan "Rudyard" and "Kipling," one being in an agricultural country and the other in an iron ore district. Sometime later a mutual friend informed Kipling of Mr. Underwood's action, and the celebrated anthor sent Mr. Underwood his photograph with the following lines on the back:

"RUDYARD" AND "KIPLING."

"Wise is the child who knows his sire,"
The ancient proverb ran,
But wiser far the man who knows
How, where and when his offspring grows,
For who the mischief would suppose
I've sons in Michigan.

Yet am I saved from mid-night ills,
That warp the soul of man;
They do not make me walk the floor,
Nor hammer at the doctor's door,
They deal in wheat and iron ore,
My sons in Michigan.

Oh, tourist in the Pullman car
(By Cook's or Raymond's plan),
Forgive a parent's partial view;
But, maybe, you have children, too—
So let me introduce to you
My sons in Michigan.

—Rudyard Kipling.

* * *

Columbia University now has the full sized locomotive, built and presented to it by the Baldwin Locomotive Works. It has been placed in the laboratory of mechanical engineering and will be used to give the students proper instruction in the construction and operation of locomotives after the manner that the Schenectady locomotive at Purdue University has been used.

* * *

Electricity has been successfully used for thawing out frozen water pipes during the past winter. The current is passed through the frozen section of piping, and the consequent heating disposes of the ice. No trouble is experienced from electrolysis, according to report.

* * *

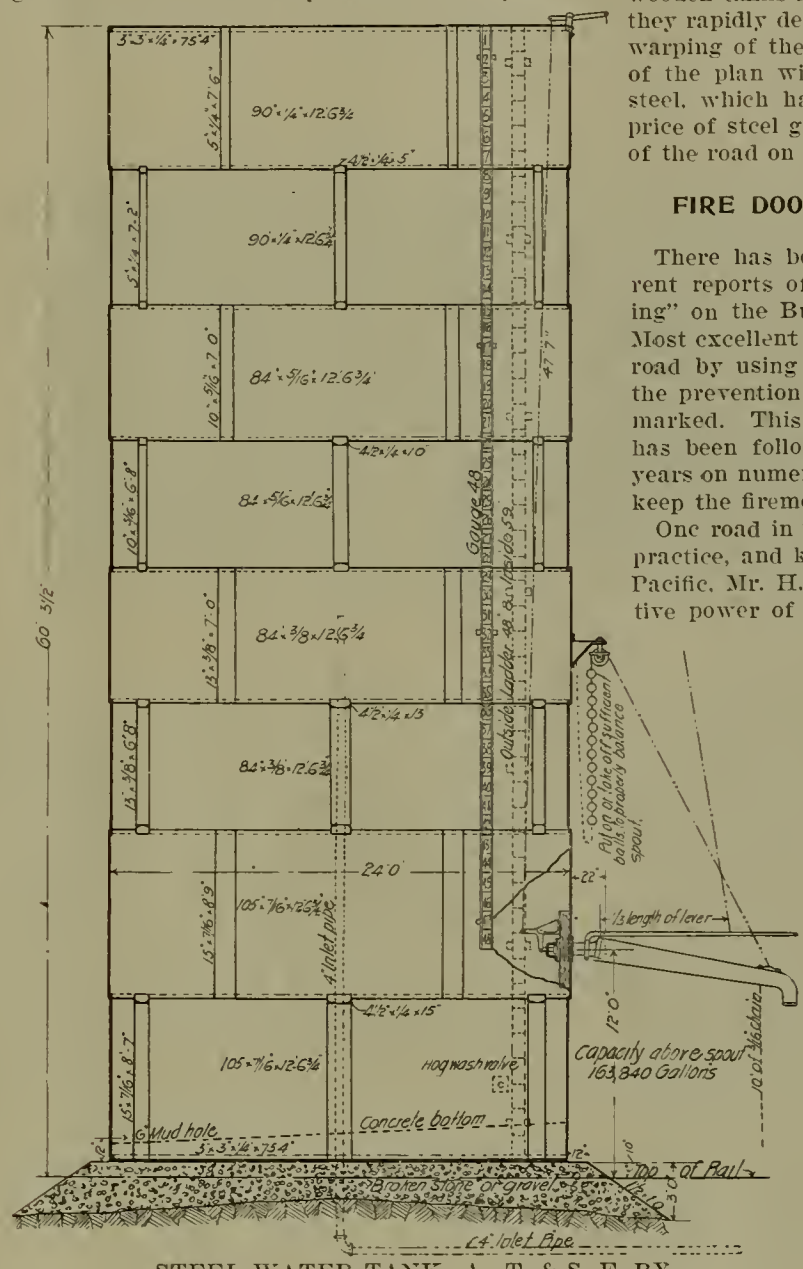
A locomotive boiler explosion occurred a few weeks ago on the Norfolk & Western, the engineer being killed and the fireman and a train man being injured. The engine was a consolidation. The force of the explosion, says the Railway Review in describing the accident, was so great as to tear the boiler loose from the engine and hurl it forward over four box cars at a distance of about 200 ft. from where the engine was standing. Evidence of low water was very clear, the color of the crown sheet and top of side sheets plainly indicating that the water line was 4 ins. below the top of the crown sheet. Further evidence of a hot crown sheet was that the edges of the fractures in the sheet were drawn to a knife-edge, representing a reduction of area not possible with steel in its normal condition. About two hours previous to the explosion the water glass bursted. The boiler, which was of the Belpaire type, was provided with two sets of gage cocks, one set for the engineer and one for the fireman. Just prior to the accident the engineer, it is stated, asserted that there were two gages of water in the boiler, but it is thought he failed to detect the difference in the sound between water and steam. The fireman made no use of the gage cocks provided for the purpose and gives as his reason the fact that the engineman was sensitive about such matters and did not like to have the fireman try the water.

* * *

Locomotive coaling stations were treated in a paper before the February meeting of the Civil Engineers' Society of St. Paul by Mr. H. H. Hogeland. The author illustrated, by drawings and photographs, the evolution of coal handling for locomotive use on the Great Northern Ry. Beginning with the primitive derrick and bucket system, which was worked at an expense of 17 cts. per ton, he advanced through various stages: (1) shoveling into chute pockets; (2) dumping and chain conveying to chutes; (3) dumping directly into chute, coal car being raised by 15 h. p. gasoline engine. The Great Northern moves 750,000 tons annually through chute pockets of five or six tons' capacity at an average cost of 3 cts. per ton by measurement.

STEEL WATER TANK, A. T. & S. F. RY.

On the Atchison, Topeka & Santa Fe the practice of building steel water tanks has been successfully followed for some time. The tanks are of the form shown in our engraving, and they possess advantages in form and durability over the old style tank



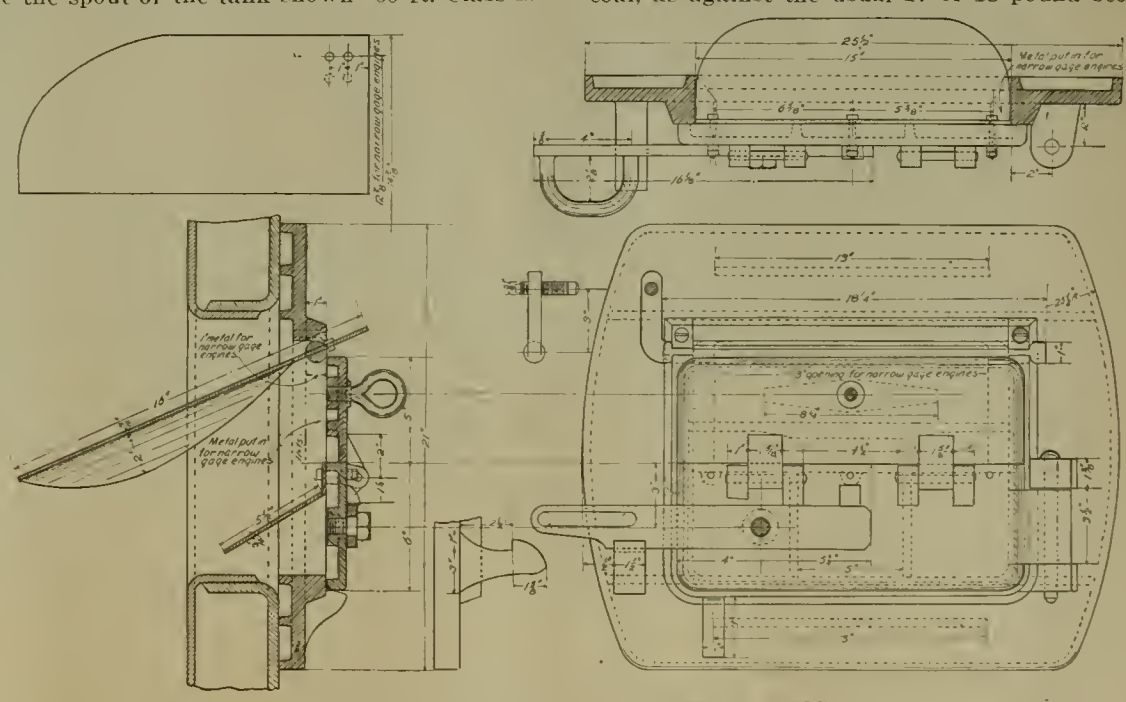
STEEL WATER TANK—A., T. & S. F. RY.

carried on posts that have strongly commended them to the Santa Fe road. It will be noted that the water is drawn from a point 12 ft. above the bottom, which makes ample provision for settlings; and moreover would permit of effective tank treatment of waters if such were desired. The capacity above the spout of the tank shown—60 ft. Class A—is 163,840 gallons. The estimated weight of the structure is 81,850 lbs. The load on the foundation is figured at 3750 lbs. per sq. ft. These tanks are made as shown 60 ft. high, and also 43 ft. and 29 ft. high, according to requirements of various points. Well designed tank fittings, valve, spout, counterbalance, etc., are used, as indicated in our illustration. The Santa Fe is replacing its worn-out wooden tanks with these steel tanks, mainly for the reason that it believes them to be more durable, particularly in the dry climate of the west, where, unless wooden tanks are kept constantly filled with water, they rapidly deteriorate, owing to the shrinking and warping of the wood. Of course the real economy of the plan will depend largely upon the price of steel, which has heretofore been low. Should the price of steel go up we are informed that the views of the road on this subject might change.

FIRE DOOR FOR ONE-SHOVEL FIRING.

There has been considerable interest in the current reports of the success of the "one-shovel firing" on the Burlington, Cedar Rapids & Northern. Most excellent results have been obtained upon that road by using this method, the fuel economy and the prevention of smoke, thus effected, being quite marked. This practice is, of course, not new. It has been followed to a greater or less extent for years on numerous roads, but it has been difficult to keep the firemen up to the art for obvious reasons.

One road in particular, that long ago adopted the practice, and kept at it religiously, is the Southern Pacific, Mr. H. J. Small, the superintendent of motive power of that road, being a firm believer not only in the economy of one-shovel firing but in the practicability of keeping his men right up to taw in the practice of it. A very great aid in the successful practice of one-shovel firing was developed a number of years ago on this road, in the shape of the fire door shown in our engraving. This door has been a standard on the Southern Pacific since 1892. Its characteristic feature is the small door, placed in the main door, and which drops down on hinges, as shown. This drop-door is left open all the time while the engine is working. It affords an opening of 5x15 inches. This admits a desirable supply of air over the fire, the air being kept from harming the sheets by the deflector plate shown, and moreover greatly facilitates the frequent one-shovel firing by reason of its being kept constantly open. A special shovel, or scoop, is used in firing; it is very small, holding only about seven pounds of coal, as against the usual 17 or 18 pound scoopful.



FIRE DOOR FOR ONE-SHOVEL FIRING.

The firemen on this road readily fire all classes of locomotives in all classes of service with the light one-shovel method and have become very expert in "spotting" their coal on the firebed of the largest fire-boxes.

NEW CAR SHOPS, M., K. & T. RY., AT SEDALIA, MO.

The Missouri, Kansas & Texas Ry. Co. has recently completed and occupied new car shops at Sedalia, Mo. These shops are quite extensive, and complete in detail, and will handle practically all the car work for the system. We give a general ground plan, a perspective sketch and floor plans of the wood mill. The shops, it will be seen, comprise the following main buildings—A passenger and upholster shop, 146x100 feet in size; a wood mill, 80x150 feet; an engine and boiler room, 100x50 feet; a blacksmith and machine shop, combined, 200x60 feet; a passenger paint shop, 150x164 feet, and a freight shop, 110x244 feet. The smaller buildings are an office and store-house 80x40 feet, and an oil house, a lumber shed and a dry kiln.

NEW CAR SHOPS, M., K. & T. RY., AT SEDALIA, MO.
Perspective Sketch.

All the structures are of brick, and all are one story in height, except the wood mill and the store-house. The roofs are of tarred paper covered with gravel, with cornices of galvanized iron. Originally clere-stories were planned for all structures where needed, but these were subsequently dispensed with on all buildings but the boiler shop. One result of this is that the lighting of the shops as a whole is not all that might be desired.

The shops are well grouped, and thoroughly served by an extensive track system. The cars are brought in from the east and are handled according to class and to the nature of repairs, about as follows—For light repairs they are run out from the main track onto the repair tracks alongside the blacksmith and machine shop, and when finished may be switched back or carried on across the transfer table to the delivery tracks, which lead to a gravity yard (which has a 2 per cent. grade) extending down to the main track again. For heavy repairs they are passed to the tracks between the blacksmith shop and the boiler room, where they are stripped. The scrap wood is thus right at the door of the boiler room for the fuel pile. They are then sent over the transfer table to the freight repair shop and when rebuilt are passed over into the gravity yard. The passenger car tracks are properly placed the farthest away from the main track, and after the coaches are handled in repair and paint shop they in due course also find themselves in the gravity yard, or if desired may be switched back over the entering track.

The transfer table figuring in these operations is a modern electric table, trolley connected, of the Industrial Works (Bay City) make. The table runs in a pit 725 feet long and 80 feet wide and is guaranteed to carry 100,000 pounds at a speed of 300 feet per minute.

Power for the shops is provided by a 275 horse power engine built by the Erie City Iron Works. There is also an Erie high-speed engine for the dynamos, which are two in number. The dynamos are Westinghouse 30 k. w.; one is intended to supply current for the transfer table and one for the electric light system. Practically, one is held in reserve, and either one will in emergency handle both the lights and the table for a short period. The electric light plant comprises 600 incandescent lamps. The lamp installation and trolley connections for the transfer table, etc., were put in by the Eclipse Electric Co., of St. Louis. Electric power will be transmitted to the freight house for use on two grind stones and two rip saws.

In the engine room there is also a Rand air compressor capable of compressing 900 cubic feet of air per minute. The shops are well piped for air in the usual way; but there will be, for the present at least, but slight use made of air for special purposes; there will be a few air hoists, however, an air operated derrick for unloading wrecked cars, and an air bull-dozer.

The boiler room, which is 50x50 feet in size, is furnished with four 125 horse power boilers, installed by John O'Brien, of St. Louis. These boilers are supplied, when the shops are in full operation, with almost enough fuel from the shavings exhaust system to keep them well fired. This supply, with the wood scrap from stripped cars, leaves but little demand upon the coal pile.

The shavings exhaust system feeding these boilers is very complete. It was installed by Allington & Curtis, of Saginaw, Mich. It serves practically every tool in the wood mill. There is one large fan and "cyclone" for the smaller tools, and besides this there are eight independent fans and "cyclones" for the larger four-sided machines. The "cyclone" separates the air from the shavings and saw dust and thus passes the warm air back from the exhauster system to the shop interior.

The buildings are heated by steam throughout, and exhaust steam from the engines is used for heating in the shop buildings immediately adjacent to the engine room, and in the dry kiln.

Steel shafting, ground, supplied by Jones & Laughlin, of Chicago, is used and the ring oilers for shafting are also supplied by that firm. Split pulleys (Dodge) and Hoyt belting are used on everything throughout the shops. The shafting in the wood mill is hung to the heavy I beams which support the second floor laden with the smaller tools, and the shafting in the machine shop is hung to light I beams bolted to the wooden cross beams of the ceiling.

The blacksmith shop, a roomy, well lighted structure, 123x60 feet in size, is well equipped with 18 forges served by a Buffalo No. 11 blower, an 800 pound steam hammer of Bement & Miles' make, an Ajax 1¼ inch bolt header, and a Hilles & Jones' punch and shear combined, with 14-inch stroke.

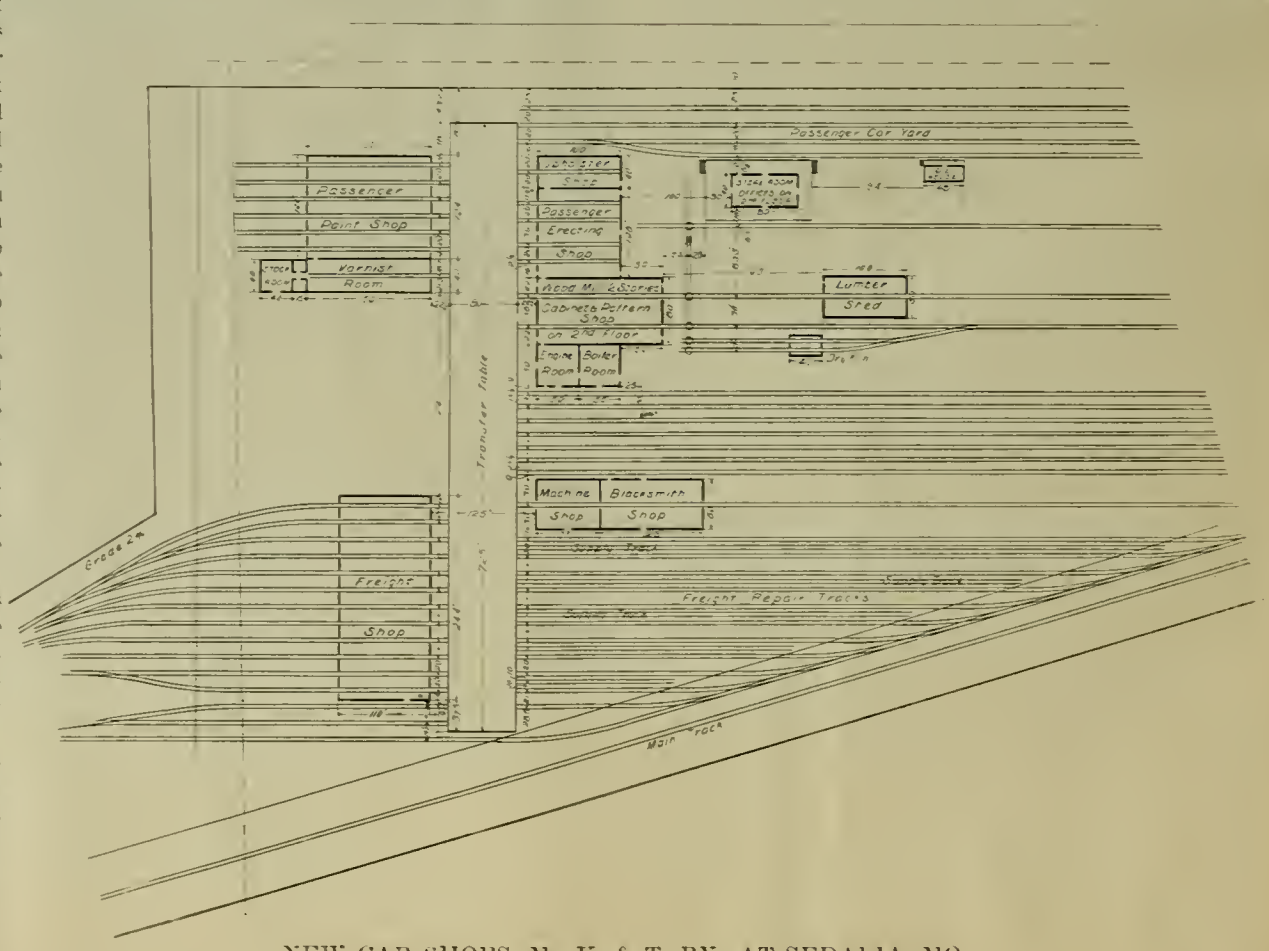
The locomotive shops of this road are at Parsons, Kan., about 100 miles beyond Sedalia, and consequently the machine shop at this point is a minor feature. Still it is a neat little shop, 77x60 feet in size, and meets all requirements at this point. Among its equipments are a six-spindle nut-tapper and a two-inch double bolt-cutter, both from the National Machinery Co., of Tiffin, O.

The wood mill, which is 80x150 feet in size, is well fitted out on both its floors. On the lower floor there is the usual equipment, the location, nature and make of which is shown in the floor plan which we give. Restrictions as to expenditure in building kept this shop from being all that the mechanical department wished. For instance, the material cannot be handled in the ideal way of entering at one end in the raw state and emerging at the other finished. It will be noted that the heavy material—sills, etc.—doubles in its path, making one turn.

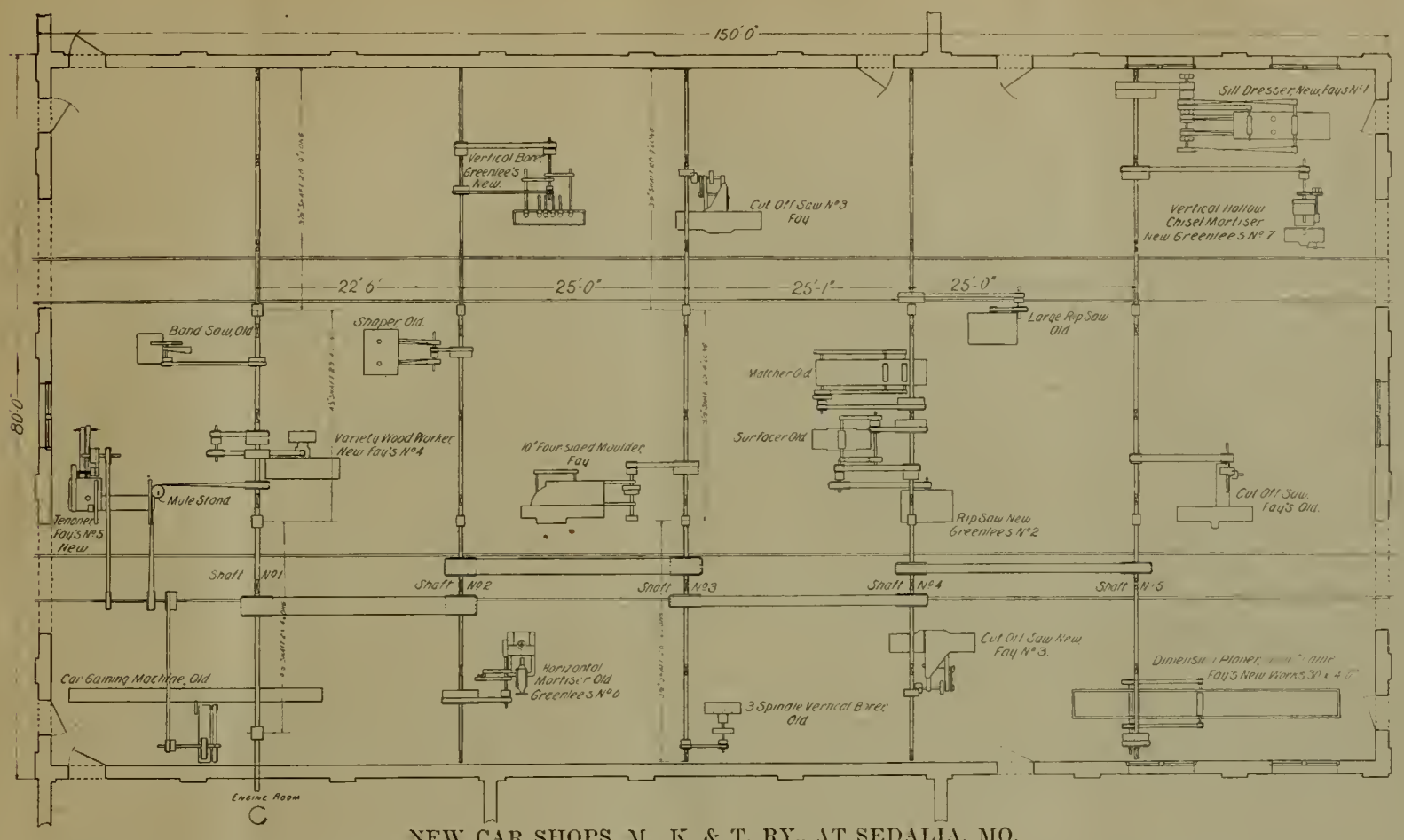
On the upper floor of this building are the lighter tools for cabinet work, etc., and ranged around the centrally grouped tools is ample space for the cabinet workers, who are given plenty of light. Elevators are placed as indicated in the second floor plan, to facilitate the receipt of material and its delivery to the passenger shop. Power is belted from shaft No. 1 in the lower floor to the main shaft upstairs.

These shops have a capacity of about eight cars per day in freight repair work, and about 200 cars per year in passenger car work. They will employ about 200 men; but when worked to full capacity will give employment to 600 or 700 men. The shops are kept almost exclusively on repair work, the building of the new cars being confined to the filling of vacant numbers.

The cost of the shops—including the buildings



NEW CAR SHOPS, M., K. & T. RY., AT SEDALIA, MO.
General Ground Plan.



NEW CAR SHOPS, M., K. & T. RY., AT SEDALIA, MO.
Wood Mill—First Floor.

and grading—was about $100,000; the machinery cost about $30,000; the total cost, including the track system, yard grading, etc., was about $200,000.

Mr. Wm. O. Herin, superintendent of machinery and equipment of this road, is located at Parsons, Kan., and is represented at the Sedalia shops by Mr. J. L. Wigton, master car builder, Mr. A. Hunicke, master car painter, and Mr. Floyd, chief draftsman.

THE M. C. B. COUPLER--ITS HISTORY AND ITS PERFORMANCE IN SERVICE.

(Wm. Garstang in the Railroad Gazette.)

In answer to some of the criticisms that have been published regarding the M. C. B. coupler, I have been requested to make a report, giving my opinion and experience with the device as it now is and the possibilities of improvement.

In 1882 there were in the United States some hundreds of thousand freight cars of all descriptions; these cars were equipped with what we will call the old style drawbar. The failures caused from this class of couplers and the loss of life and limb were sufficient cause to demand some better coupling, both to reduce breakages of the cars and decrease the loss of life. About that time there were some two hundred or more different classes or kinds of drawbars in use, most of which had some standard features regarding size of link and pin and length and size of shank. This feature had been agitated for some time with considerable success, so at the first effort to meet legislation in the different states and provide a coupler that would be safer, stronger, and at the same time automatic, what was the result? There were thousands of schemes for converting the old drawbar into an automatic coupler, and it is safe to say that every railroad in the country tried or witnessed some of them, with the result that not one proved satisfactory, or could be made to operate at all automatically, when cars had any considerable difference in height, were on a curve or had to be coupled with any other class of drawhead.

We will now pass out of the individual effort in trying to accomplish the desired result and take the matter from where it was first presented to the M. C. B. Convention for action, which was in 1883. The time spent and the discussions that followed by the railroads represented was probably far in excess of any other matter ever presented to the railroad associations. The first committee appointed made their report at Saratoga, in June, 1884. They had at that time sent out circulars of inquiry to all roads represented. The labors of the committee included the examination of all the models presented and the working test, when possible, with the result that the findings showed so many models of practically the same and conflicting designs that they were unable to make any recommendation, further than to classify as worthy of special mention some seven or eight couplers and as meritorious as many more.

During this meeting the coupler question was the principal subject for discussion, and brought out many facts showing the necessity for the adoption of an automatic coupler both from a railroad standpoint and to come in line with the requirements of the laws then being enacted. It was the opinion of this early meeting that the only coupler that could be a mechanical success and couple to cars of varying heights and conditions would have to be made on the vertical plane line and one that would do away with the link and pin.

We pass the vast amount of work done by this association and the railroad companies in trying to decide what coupler or what kind of coupler would meet all requirements and would be the best to adopt which time included the tests at Burlington and Buffalo, where so much information was gained between the meeting in 1884 and the meeting in Minneapolis, in 1887. We all know that the time and money spent were great and the trials and tests made during these three years were exhaustive. The Railroad Commissioners in many states had threatened time and time again to take the matter out of the hands of the railroads and name a coupler or a lot of couplers themselves some one of which they would adopt and require applied if the matter was not hurried more. And they did, in some cases, complicate the matter by opening the door for various devices with a certain official recognition. The M. C. B. committees still continued to hang on and experiment in their effort to have the coupler finally adopted as nearly perfect as possible.

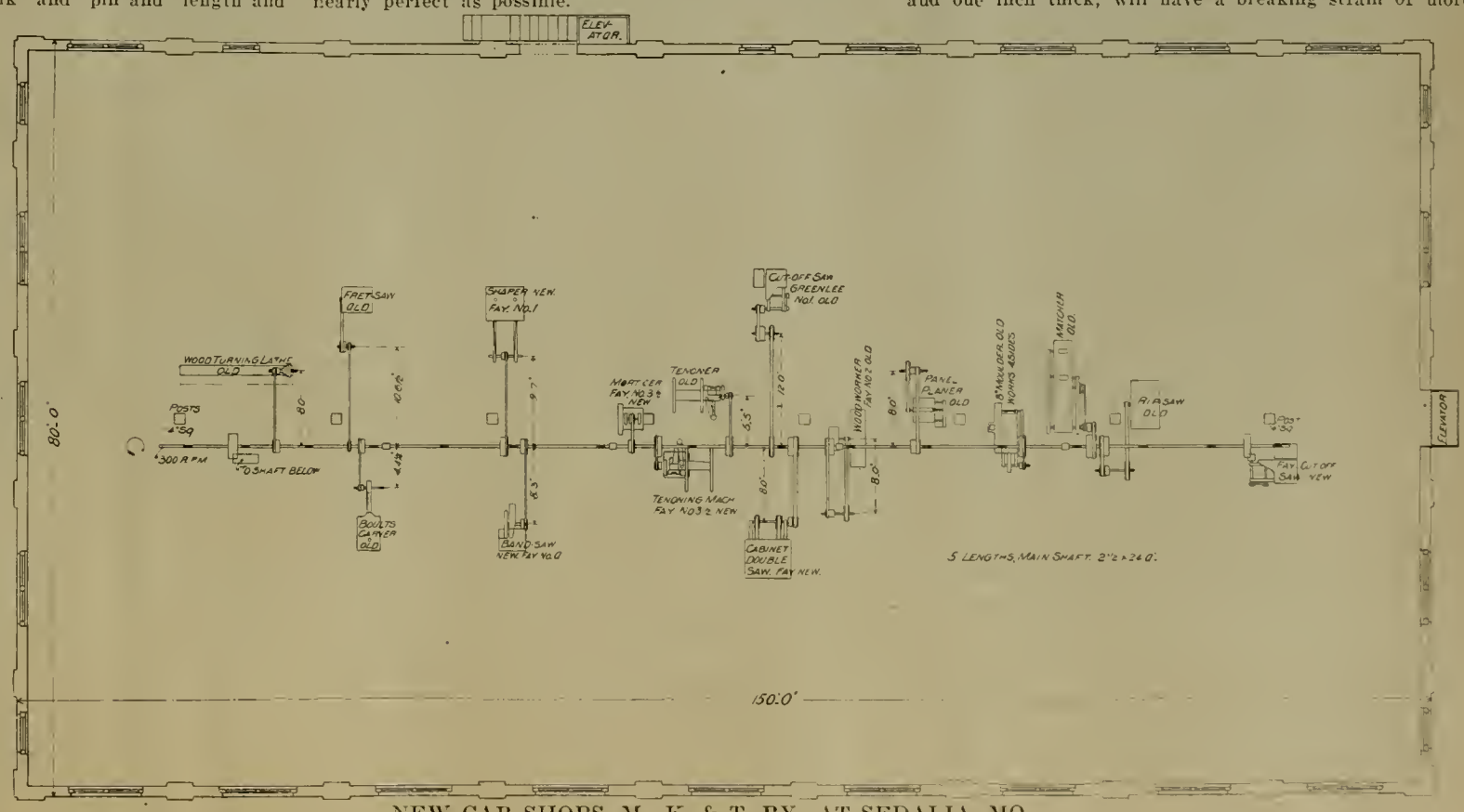
We find at the meeting of 1887 the committee ready to make a final report. The association had been severely criticised on account of the time spent in consideration of the subject, but time has proved that the time was well spent and that disastrous mistakes were avoided. The problems the committee had to deal with were very knotty ones; over 4,000 so-called automatic couplers had been recorded in the Patent Office and every individual demanded consideration. It was realized that the strength had necessitated searching investigations, and it was predicted that the metal used would have to be strengthened and improved as the service became heavier, and further that an entirely different metal would have to be used—one possessing greater strength than anything then made into couplers.

During the years of trials, opinions had altered regarding automatic couplers, and roads no longer expected to get automatic couplers for the same price as the old bull nose, but were prepared to pay for improvements that cut down their operating expenses

The form of coupler being decided on at this meeting, the question was submitted to letter ballot and declared carried and adopted at Alexandria Bay, June, 1888. Can any one conscientiously say that this matter did not receive all the consideration that was at the disposal of the railroad companies to give it.

The lines finally adopted and the patents presented to the railroads were the contour lines belonging to the Janney Coupler Co., which had been used on passenger cars since 1876 and were no experiment. Now, after the labors of this association were completed and the contour lines adopted—which was only done after the surrender of the patents held by the Janney Company, which enabled all makers and all roads to use them—there was another step necessary in the line of advancement of standards, which was to regulate the size and length of shank, size and position of holes and the bearing and connecting points, so that couplers, wherever made or applied, could be repaired or replaced on any road on which the owner's cars should happen to be when such parts became inoperative.

In adopting a coupler which in itself was going to be a source of large outlay to the roads, it was essential to keep the changes necessary on the cars down to a minimum to prevent the expense of application being more than our companies would stand, provided this could be done without prejudice to the coupler for present or future requirements. A shank as nearly like the best practice then prevailing as possible was adopted, but not until its strength and possible increase were taken fully into account. There was a reasonable allowance left for future strength to meet the increase in weights of cars, and the shanks of couplers to-day when made of the best materials, will stand any demands made upon them at that point by the heaviest equipment, and have a breaking strain far in excess of the combined power of any three or four locomotives ever built. There is a possibility yet of making the thickness of the material in these shanks greater and better to stand any increasing demands. For instance, the shank of an M. C. B. coupler, made of steel and one inch thick, will have a breaking strain of more



NEW CAR SHOPS, M., K. & T. RY., AT SEDALIA, MO.
Wood Mill—Second Floor.

than 1,000,000 ponnds, which is a force that can never be exerted in fair usage. It is, therefore, no more than fair to the design and size of that part of the coupler to say it can always be made to meet the requirements, under fair usage, which is something that cannot he said about any other part of the car.

Now, in regard to the other end. There can he no fair critlcism advanced against its practicahillty to couple automatically under all reasonahle conditions and to reunain coupled unless defective, either from wear or the locking pin not doing its duty. There is some question regarding the shape of the inner or wearing side of the knuckle being of the best design to prevent wear, or, rather, to confine the wear to the hook shape. This is accomplished by some of the couplers now on the market, and does not affect the contour lines or wearing points of the coupler as adopted. It is a matter that will no doubt have due consideration at the next convention.

The coupler as made to-day, without changing any of the important lines, is from 15 to 25 per cent. heavier and stronger than when first made for cars of lighter capacity, and there is abundant possihillty to still increase its weight and strength by the adoption and bettermeut of material.

The statement has been made by some writers that the M. C. B. coupler did not give a center line of draft and that the blow when coming together was not on central lines. While this would appear to be the case while looking at a single coupler, it is not the case when two couplers are pulled or bunted together. Hook two couplers and suspend them from one end (this only refers to couplers made strictly to M. C. B. lines), then suspend a plumb line by them. The line will prove the couplers to maintain a straight line from end to end of shank. Or repeat the experiment often tried of fitting up two cars without side chafing irons, or make the iron very wide, and notice the draft line when the cars are being hauled on a straight track. The space between the chafing irons will be found to remain evenly divided, showing a direct pnll carried back to the end of the couplers. In bnffing the severe strain is to be absorbed hy the buffer hlocks, hut hefore they come in contact the couplers, in coming together and locking, make a very direct strain on the center of the car and almost entirely prevent the side strains usual with the bevel faces of the old style drawhead moving sideways.

It has again been contended that the couplers were not flexihle. With regard to that matter it has been recognized by the larger part of our railroad management that one of the great features of the M. C. B. coupler was to eliminate the slack in the train and to prevent to considerable extent the swaying of cars from side to side while running on a straight track, which is injurious to the cars as well as dangerous to the men who have to pass over them. Probably no one feature contributed more largely to the adoption of the hook coupler than the results obtained by the close and spring coupling at the Burlington hrake tests and subsequent trials made specially for this pnrpose. It had long been thought absolutely necessary that there should be a considerable amount of loose slack in the conplings of cars to ease the starting of trains, and, while it had been admitted that there were some disadvantages incident to the presence of slack, such as hreaking drawhars and draft rigging, in starting and stopping, pulling through sags and hollows in the track, it was never realized until these tests what an enormous evil the presence of slack was in long trains and how terrific the shock.

During these tests it was found absolutely necessary to block the links; without blocking it was found impossible to live in the rear car; stock could not have stood on their feet or freight been prevented from shifting. Since it has heen abundantly proved that a locomotive will start and haul as many cars with the close couplings as with the slack link, and haul the train without the shock, making it possible to use airhrakes on freight trains, we think the foresight in adopting a coupler eliminating this part of the flexibility of the old drawhead the most commendable; and had any device containing this feature been adopted we would now be ready to discard it.

There is still another feature in its favor. Cars of varying height can be readily coupled, and the difference in height or the difference in spring action has no tendency to throw the load of the low car on to the high, which was formerly the cause of hreaking so many links and causing trains to part.

If couplers do not couple it is hecause of defects in their manufacture, and not in the lines adopted hy the M. C. B. Association. In all the tests made for years, the question of coupling was raised and tested and it was found that the M. C. B. coupler coupled readily on curves up to 20°. There are some couplers made without any regard for the location of the hinge for the knuckle that will not do this.

When the M. C. B. coupler was adopted the roads were entirely equipped with the link-and-pin drawhar, therefore the automatic coupler had to be constructed so that it would conple with these cars until they were changed. To accomplish this, the knuckle—already the weakest part—had to he further weakened temporarily to admit of the link-and-pin connection. Now, as 90 per cent. of the breakages occur to the knuckle on account of this weakness, it is safe to pass this matter hy, saying that in a very short time all couplers will be made with solid knuckles, therehy increasing the strength and wearing surface of this part more than 50 per cent. In further proof of this some of the roads are now getting their couplers with solid knuckles, and report practically no trouble from knnckles failing.

There has been complaint made of accidents caused by couplers pulling out and falling on the track. When we consider the thousands of couplers put in old cars with light and insecure draft rigging and think of these cars heing run in trains with the modern, heavy car of to-day, with the powerful engines in use, it is only a matter of surprise that there are not more fallures, and we do not think the fault should be charged to the coupler, but to the car.

Now, regarding construction. When the M. C. B. Association adopted the automatic coupler they also adopted a fastening for the rear end and a huffer for the front of cars, and it is the opinion of this committee that one feature is as essential as the other, and that the buffer is an ahsolute necessity to protect the draft rigging and coupler from the numerous shocks when cars are being switched, and it is not until these precautions are taken that we can expect to get all of the benefits that the coupler is able to give us.

When it is remembered our cars have increased from 50,000 to 100,000 lbs. capacity and our engines from 130,000 to 200,000 lbs. in weight, and that all our present cars have stronger draft rigging, stronger couplers and adequate huffer blocks for their protection, but that we do not separate these cars in our trains, but couple them, probably, to a car of ten years ago, with lighter draft rigging, light couplers and no huffer blocks, we must expect failures; not in the new cars, hut in the old ones and we find on careful inquiry that that is where the failures do to a large extent occur. We can to a certain extent remedy this by sorting out our trains,but, if less expensive, take the failures caused hy not doing so.

The result of the researches and our opinion is that the M. C. B. coupler, as adopted, is the best device for the purpose that has heen presented to the railroad companies from any source, that the coupler, made strictly to the contour lines adopted, will couple under all ordinary conditions; that it admits of beiug strengtheued to meet the requirements of heavier service; that the line of pulling and buffing is as central as any coupler of its same leugth; that it is ahle to stand the shocks of switching when protected by huffers; that the coupler admits of the successful running of long traius of heavy cars and the use of air-brakes on such trains; that the saving in repairs hy its nse amounts to something like $1.50 per car per year; that the present cost of links and pins will more than double the cost of repairs to couplers, and that it is as strong and long-lived as other parts of the car.

Now, in conclusion, we wish to emphasize the fact that this report is based on that class of couplers that embody good workmanship and material, and is in no way a defence for some couplers in the market that have been used hy various railroads for other reasons than their mechanical worth. That couplers of this description would prove failures has heen fully predicted. On the other hand, there are couplers costing but very little more that can be relied upon to give satisfaction, and the purchaser can get good couplers by paying for them.

Regarding strength: Couplers can he purchased to-day that the makers will guarantee to stand from five to eight hlows of 1,640 lhs. with 5-ft. drop on the guard arm and will stand a pulling strain of from 175,000 to 200,000 lbs. without injury to the knuckle or locking device. We do not think it necessary to requre snch strength as this for any cars or engines yet constructed, but those who do can he supplied.

We do not think it will be amiss to again compliment the gentlemen comprising the coupler committee on the successful result of their lahors, helieving that they adopted the only device that could have accomplished the results that have heen obtained, nor can we refrain from suggesting tnat the severest critics have heen those who had the fewest couplers in use, and we helieve, for that reason, would be least likely to know their merits.

Let us all remember that the present automatic coupler is a piece of machinery, and, like our air-brakes and trucks, requires a little attention and occasionally a drop of oil.

A LOCOMOTIVE FRAME BRACE.

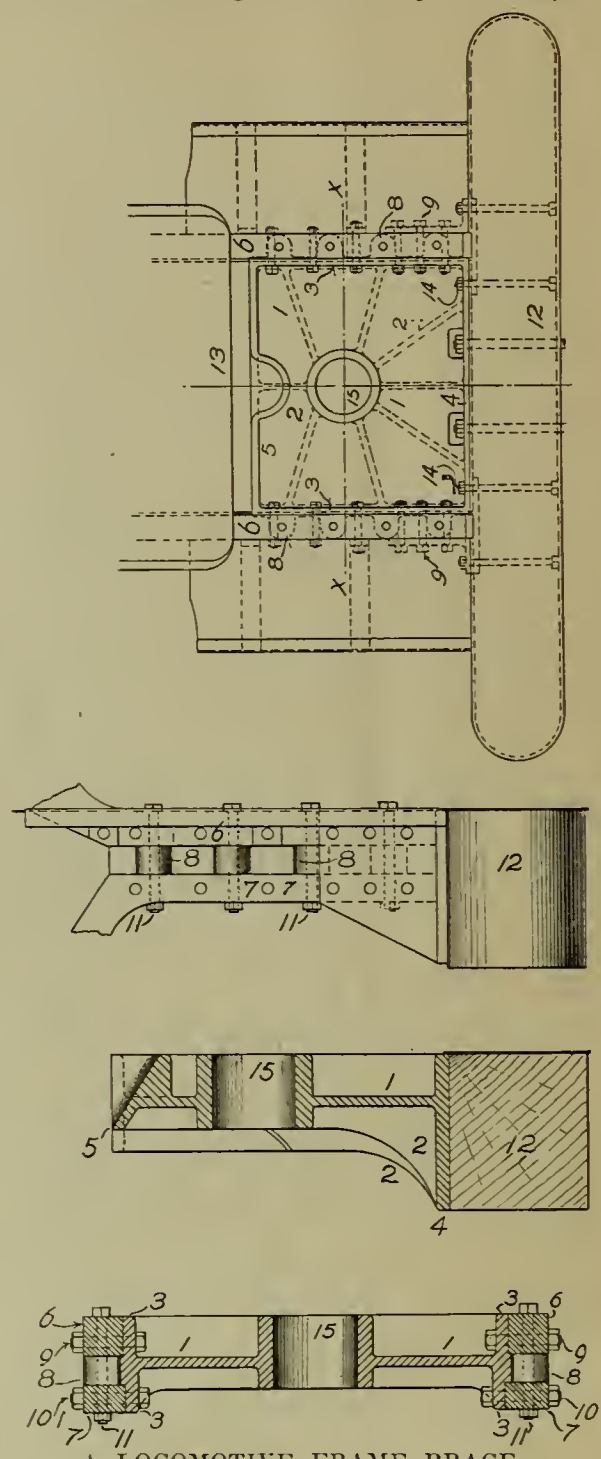
The Pittsburg Locomotive Works has been using for some time a locomotive frame braee designed and patented by Mr. D. A. Wightman, superintendent of those works. This frame brace has proven, in extended service, that it fully meets the severe requirements of the ease which it was designed to meet. There has been mueh difficulty experienced, particularly in comparatively large locomotives where long foot plates cannot be used, by reason of the exeessive strains brought upon the saddle castings. Mr. Wightman's design is intended to relieve the saddles from the injurious action of these strains, and it has done so in extended praetical service without involving any substantial expense in application, and without interfering with essential features of the usual types of loeomotives.

The brace, which is shown in quite eomplete detail in our illnstrations, consists essentially of a cast iron or steel plate fitting in transversely between the engine frames and longitudinally between the saddle eastings and the bumper. Our upper fignre gives a plan view of the brace; the next a side elevation; the third a longitudinal central section, and the bottom fignre a cross section on the line XX of the upper figure. Referring to the engravings, in all of which like parts are given like numbers, it will be seen that the frame brace is formed of a stout horizontal plate or body 1, stiffened by ribs 2 on its lower side, and carrying lateral flanges 3, and front and rear flanges 4 and 5. The lateral flanges are machined, and the width of the brace is sueh that they fit elosely against the inner sides of the upper and lower rails or bars, 6 and 7, of the front ends of the engine-frame. Lugs 8, the upper and lower faces of which are finished, are formed on the outer sides of the lateral flanges and fit elosely between, and act as distauce-pieces for, the upper and lower rails of each of the side members of the locomotive frame.

The brace is rigidly secured to the frame-rails by horizontal bolts 9 and 10, passing through the lateral flanges and through the upper and lower rails, respectively, and by vertical bolts 11, passing through the lugs 8 and through both the upper and lower rails.

The brace is made of such length as to extend substantially throughout the distance between the bumper 12 and the saddle-castings or cylinder bedplate 13 of the engine, but it is ordinarily stopped a few inches from the saddle, as shown in the upper figure, this of course being a matter within the discretion and design of the constructor. To obtain the most effective results, the front flange 4 should be in line with the front ends of the frame-rails and abut against the bumper 12, so as to act as a backing therefor as well as a brace for the frame. In such case it is better that the front flange 4 be made, as shown, of substantially the same depth as the bumper and secured thereto by the bolts 14.

When applied to locomotives having a two-wheeled forward truck, the center-pin tube or socket 15 for holding the cradle in position may be



A LOCOMOTIVE FRAME BRACE.

cast upon the plate 1, as shown, or, if preferred, may be made separate and secured by bolts to the plate, the former, however, having been found to be the more desirable and economical construction.

It will be seen that this braee renders the front portion of the engine-frame a rigid and practieally unitary structure from the bumper to the saddle-castings, and a speeial feature of praetieal valne is presented in its capaeity to effectively resist diagonal strains, as in shocks of contaet applied near the corners of the bumper or against the end of one side member of the frame, or otherwise out of the longitudinal plane of the engine.

TESTS OF MATERIALS AND THEIR PURCHASE UNDER SPECIFICATIONS.*

Specifications properly compiled are advantageous to the buyer in avoiding lengthy descriptions when placing orders, and in the assurance that what is bought will be what is desired, or need not be paid for. They are advantageous to the seller in giving him the knowledge at the outset of just what is desired and in the assurance that if he furnishes what is specified it will be satisfactory. They are mutually advantageous in ex-

*Extracts from a paper by Mr. Alfred Lovell, assistant superintendent of motive power, Northern Pacific Ry., read before the Northwest Railway Club.

pediting business transactions and in avoiding misunderstandings and unpleasant disputes.

There are, however, other points to be considered. It is frequently stated by buyers of railroad material and others in a position to know, that when no specifications and tests are made use of, goods can in general be bought cheaper than when these are employed. There is undoubtedly, many times, much truth in this statement, for frequently specifications are not clearly drawn up, leaving many points in doubt, or more often are explicit, but are not prepared with a careful consideration of the uses to which the article is to be put, and specify a higher quality and require more severe tests than is necessary. In the first case, the bidder will take advantage of the doubt by giving high prices and delivering poor goods just in proportion to the element of doubt; in the other case, specifications and tests being severe, if adhered to something will be secured more costly than is required for the service. Where there are no specifications, the exact article required is not defined, and there is always an open chance for the dishonest bidder to figure on supplying something inferior to what the honest bidder is intending to give. The result of this is that we get a low price, but we do not get what we originally intended to buy, and, having had no specifications, have no redress.

A specification is simply a minute description or enumeration of particulars, and a test when used in this connection is simply some method of determining whether the article in question fulfills this enumeration of particulars. It is impossible to conceive that any reliable manufacturer would make any difference in price because the article described was described minutely, and if reliable, he would not object to applying a reasonable test to show that the finished article corresponded to this description. I say reasonable test, for some specfications include tests that are not reasonable, and which would, without question, increase the cost of the article as above noted.

Drawings are specifications of form and assembling of parts, and the dimensions thereon are the tests to be applied to the finished article. No mechanic would think of questioning the utility of drawings in describing material or a machine, nor does any manufacturer object to this form of specification, or think of raising his price because drawings are used, but unfortunately drawings cannot be made to represent the inherent composition or strength of materials or the character of the workmanship. If we are particular about the quality, we must resort to other means, viz.: Description by words called a specification accompanied by prescribed tests to assure us that the requirements are fulfilled.

There are men who claim that a guarantee is a cure for all evils, and that where this can be obtained no test of material is required. What does a guarantee usually consist of even when made by responsible parties? Simply a promise to supply a new part for any one that fails within a definite period of time. This, in itself, is good as far as it goes, and has done much to improve the quality of certain articles of manufacture, such as the wearing capacity of iron car wheels. But a guarantee is not sufficient. A railroad company wants assurance not only that the wheels it buys will, in general, not wear out in five or six years, but it wants assurance that in all reasonable probability no wheel will break before it wears out, and thus cause a wreck. If a wheel wears out or breaks within the specified time, the wheel company loses the value of the wheel, nearly $5, but if the wheel breaks and causes a wreck, the railroad company loses possibly as many thousands. The guarantee is of little value in this case. We want the assurance furnished by some positive test that the wheel will not break. So, too, with air brake hose.

A large part of railroad material is such that its unexpected and premature failure means loss of life, loss of property, delay to train service, or rolling stock laid up for repair; in any event meaning loss of money to the company. To avoid this we should know to a certainty the quality of the material we use and its ability to resist the service it will receive. This can only be surely known by specifying the quality required and testing the material before use. It is then fair to conclude that, with important railroad material, specifications and tests are essential to insure the quality being that which is required. The quality being thus guaranteed, calculations may be based upon working the material to its fullest capacity, thus saving quantity, less accidents and delays will occur, and the cost being little if any greater than material of a doubtful character, the result will be largely on the side of economy.

1. Specifications are mutually advantageous to the buyer and to the reliable seller in expediting business and avoiding misunderstandings.

2. For all important material it is essential for safety and economy to purchase under specification, and that all details and tests prescribed should be insisted upon in order to maintain the standard of quality desired.

3. For unimportant material it is in general economy to purchase under specification, and all particulars specified should be required fulfilled, but with such articles occasional tests at unstated intervals, with thorough inspection, will generally be sufficient to maintain the quality.

4. The character of the specification and the nature of the tests prescribed should be adapted to insure the qualities requisite for the service in which the article is to be used, and qualities not essential should not be required.

5. The severity of the tests should be in accordance with the importance of the article in case of failure, viz.: More severe than actual service conditions on material in which a failure would be disastrous, but as light as the conditions will allow in other cases.

6. The manufacturers' methods and possibilities must be considered, and tests must only be prescribed that can be met with certainty when proper care is exercised without unnecessarily increasing cost of manufacture.

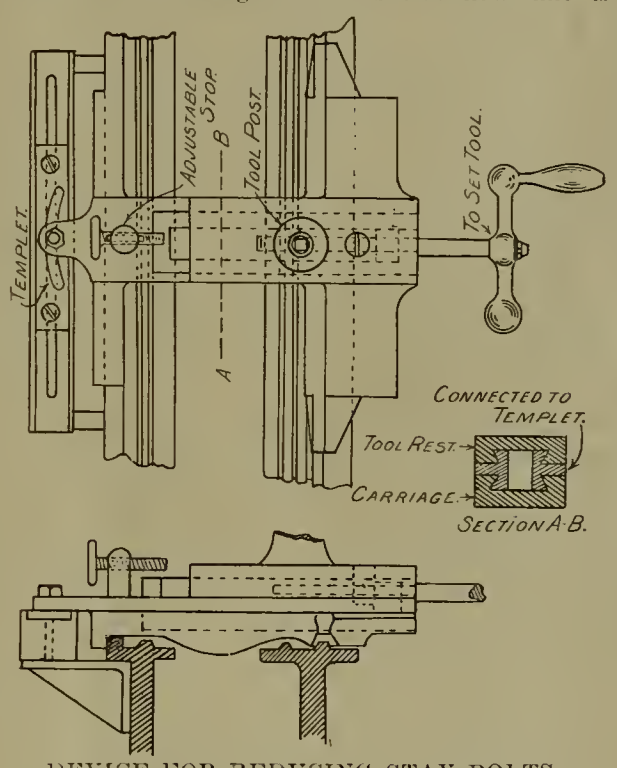
7. Destroy as limited a quantity of finished material as is necessary to establish the quality.

8. A guarantee is an excellent supplement to a specification, but cannot in general forego the necessity of tests.

9. Specifications thus prepared should not increase the cost for any standard of quality, and the quality desired is assured.

REDUCING STAY BOLTS ON THE BURLINGTON ROAD.

All stay bolts are reduced in the center by a lathe cut, at the West Burlington shops of the Chicago, Burlington & Quincy Railroad. A very neat lathe appliance designed at these shops permits the work to be done rapidly and cheaply, and with exactitude. Our rough sketch shows how this is



DEVICE FOR REDUCING STAY BOLTS.

accomplished. A cross piece connects the tool rest and tool post with a slotted templet. This cross-piece carries a pin which rides in the slot, which, as shown, is curved to the required radius. It will be readily understood that as the carriage moves in its normal direction the templet, through the cross-piece mentioned, pulls the cutting tool into the stay bolt and then pushes it out, forming a cut for the reduction of the center of the stay bolt that has a perfect and unvarying radius. The templet is quickly changed for stay bolts of different lengths or diameters, providing a different radius of cut; but when once selected and fixed in place for a given lot of bolts no further attention is needed. With this device thirty bolts are turned out in one hour at a cost of one-half cent per bolt.

Acetylene gas has proven itself useful for torch work and we understand that acetylene hand lamps are being tried on the Columbus, Hocking Valley & Toledo. This beautiful illuminant has also been adapted for locomotive headlight purposes.

The number of locomotives upon the twenty-one principal railways of England, Wales and Ireland at the close of last year is said to be 15,602. Of these the London & Northwestern had 2405, the Midland 2360 and the Northeastern 1994—these being by far the greatest apportionments.

The delicacy of modern measuring instruments is strikingly shown in Professor Vernon Boys' determination of the density of the earth. The force which he has measured was, according to London Engineering, equivalent to a weight of 1-12,000,000 of a grain acting at the end of a lever 1 in. long.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.

MARCH MEETING

The regular meeting of the Car Foremen's Association of Chicago was held at the Briggs House, Chicago, March 9. President Morris called the meeting to order at 8 p. m. Among those present were:

Alderson, A. S.	Kuhlman, H. V.
Baikie, J. B.	Krump, M.
Blohm, T.	Litts, E. C.
Cervin, Jno.	Manthey, H. H.
Coleman, Jas.	Morris, T. R.
Cook, W. C.	Mercatoris, M.
Carlisle, Jno.	Martin, J.
Constant, J.	Miller, Wm.
Canfield, L. T.	Northam, F. R.
Depue, Jas.	Olsen, Louis.
Davies, K.	Prickett, J.
Deen, Chas.	Rewald, C.
Davies, W. O., Jr.	Rickhoff, C.
Earle, Ralph R.	Sharp, W. E.
Fritz, Chas.	Stagg, C. S.
Frenk, Wm.	Smith, R. G.
Goehrs, Henry.	Saum, G. N.
Goehrs, Wm. H.	Schultz, Aug.
Guthenberg, B.	Saum, C. L.
Grieb, J. C.	Swift, C. E.
Gehrke, Wm.	Silvus, W.
Gruhlke, E.	Smith, E. B.
Godfrey, J.	Schoeneberg, C.
Hunt, T. B.	Stocks, Jas.
Hansen, Andrew.	Senger, Wm.
Hagge, W.	Wensley, W. H.
Johannes, A.	Wentsel, Geo.
Jones, W. E.	Warren, Wm.
Johnson, Gus.	Wolfe, Chas.
Kramer, Wm.	Weaverson, Fred.
Kamen, Fred.	

President Morris: If there are no objections the minutes of the previous meeting, as published in the Railway Master Mechanic, will stand approved.

Secretary Cook: The following names have been submitted to the executive committee and approved, and the gentlemen will be enrolled as members.

W. E. Jones, Canda Cattle Car Co.; C. E. Swift, M. Mercatoris and E. C. Litts, Chicago & Erie; E. Godfrey, C. M. & St. P.

President Morris called for the report of the committee appointed at a previous meeting to look into the matter of parting of trains and suggest remedies therefor, but none of the members of said committee were present.

Discussion of Disputed Cases.

President Morris: The first subject for discussion will be case No. 1. This case was submitted by one of the members.

Case No. 1.—"A" received a car from the builders' shops and after hauling it a short distance, delivered it to "B" ("B" is not the owner). "B" discovered a hot box and examination developed the fact the brass was cut and spoiled—journal was not cut but was rough on account of not being properly finished off by builders. "B" smoothed off journal and applied new brass. Who should be held responsible for brass and journal?

Mr. Stagg: I think the owner of the car is responsible. From the fact that it was delivered by the builders, the supposition naturally is that the owner had an inspector at the works, and if that inspector passes a car O. K., A certainly is not responsible for it. If they had no inspector at the place (I presume it was a new car) it really, in my estimation, is owner's concern, also, and they are responsible for the car.

Mr. Hunt: Ordinarily the road that delivers a car with a cut journal is responsible. But it appears this journal was not cut; the brass was cut and spoiled; but the journal was rough on account of not being properly finished off by builders. It seems to me that under these circumstances the owner would be responsible. It was an inherent defect, so to speak, and I think if the matter were taken up with the owner he would stand the expense.

President Morris: How do you think this should be treated; in what way should a settlement be arrived at?

Mr. Hunt: Well, I don't know, unless it would be for B to take it up with the owners—B to make proper repairs and take the matter up. I don't think he should bill for repairs to journal on sight, because it is a little bit out of the ordinary according to the M. C. B. rules. I think the better plan would be for him to make proper repairs and allow car to go on and take the matter up with the owner, who I think would settle for it. I think that would be the proper procedure.

Mr. Kuhlman: I rather believe that Mr. A also has an inspector; the car owner has an inspector, or is supposed to have; I don't know whether he has or not. But Mr. A, who receives the car, has an inspector who is supposed to be competent to look over the car,

and if he receives car in that condition it makes him responsible. I think A should have discovered this error before turning it over to B. When he turned it over to B he was responsible for the builders. Remember, I am only speaking from my interpretation of the rules.

Mr. Gehrke: I believe this case ought to be settled between the owner and the builders. I think the owners should be billed on, and the defect be stated by B before making repairs, and he fall back on the owners, if he thinks he has a right to. I do not think that A is supposed to discover a defect of this kind when he received car, because it is a hidden defect. He would have to take off the oil box and examine the journal in order to find it. The car is new and has just come out of shops and journal is not supposed to be hot at that time.

Mr. Sharp: I think we all agree that the owner is the responsible party; but the question at issue is not exactly who is responsible so much as how such a case would be handled. As I understand the case. A did issue a card for the journal, but declined to issue a card for the brass, which was also damaged. But it seems to me, inasmuch as the company who are buying cars are represented by an inspector, it is that inspector's duty to see that the journals are properly turned, and if they are not properly turned, it is hardly right to ask a railroad company to make an inspection to determine such a defect. They will run car out on the line before they will discover the hot box, and the damage is already done to the brass. When they delivered car to B, as was done in this case, B discovered what was wrong and made repairs. It seems to me that the proper way of handling such a case would be for B to render bill against owner, stating the facts in the case and procure a joint evidence statement, if necessary, and the owner could take the matter up with the car builders and adjust the damages.

Mr. Jones: I would like to know if A is the owner of the car?

President Morris: No; not according to this statement.

Mr. Jones: Then I should think B should ask a card from A for the rough journal and the brass, and A take it up with the builders. That would be my way of doing it.

Mr. Shaunon: I think Mr. Sharp is right in the matter—that B should render bill direct against car owner, and the owner of the car in turn render bill against the builders. I have had several cases like that myself and that is the best way to handle it.

Mr. Prickett: I think that B would be the responsible party. A received it from the shop. Evidently it had a rough spot in the brass or a rough spot in the journal—rust or something or other. He hauls it and turns it over to B. B finds this out; and I think the proper way would be for B to go for A and A to go for the builder of the car and there render his bill. That would be a kind of a round-about way of getting at it. A, I do not think, should go direct to B. He would have to go to B first and then fall back on the owner. A, as I understand it, is not the car owner.

President Morris: Neither A nor B. What claim has A on the builders? The builders are not a party to the M. C. B. rules. This is supposed to be settled by the M. C. B. rules. The builders are not bound in any way by the rules, and if they should refuse to issue a card or be responsible for it, what redress would A have?

Mr. Prickett: Well, that is a question I don't know exactly how you would get at. The owner should have an inspector at the shop when these journals are put in and see that they are all right—no flaws in them, no flange cuts in. Sometimes a flange cuts in journal and makes a rough place. That will cause a cut brass. Probably that was the case with this brass. It looks to me that B did the damage and ought to be held responsible for hauling the car.

Mr. Greib: It seems to me that this question is one between the party making the repairs and the car owner. I do not think there is anybody that will deny that the party making repairs is authorized under the rules to bill against car owner for the brass, it being the first brass renewed. Aside from the rough journal there may be other questions that enter into consideration. Possibly the packing was burnt and had to be removed and some new oil used on that particular box as well as the others under the same car, and if you are guided strictly by the rules, you can charge for the replacement of the brass only. Still, if you had a great deal of trouble on that account, I think an adjustment direct could be made between the man making repairs and the owners.

Mr. Cramer: My judgment tells me that the owner of the car should pay for that cut journal and burnt brass, because the owner of the car has somebody at the shops where the work was done and he neglected his duty in examining these journals. I have seen cases, a good many cases, where new cars came out of the shop where they put brasses on which were not bored, and we only hauled them four miles when we had to side track them. The owner was called and he had to renew them. That is my experience.

Mr. Greib: Can you tell us whether car was loaded or empty?

President Morris: There is nothing to show that.

Mr. Smith: If this was an old car and A had delivered it to B and B had not discovered brass was cut when it was delivered to him, B would be responsible under the rules. I do not see where you can hold A responsible at all.

Mr. Hunt: Is there not a ruling that you can charge the first brass to the owner? Is it not directly against the rules to hold anyone else for this brass? The journal is not cut, only the brass. You can wear a brass out and charge it to owners, but you cannot immediately wear another out on the same journal and charge the owner for it. But the first brass you can charge owner for, there is no question about that. It appears that this journal was rough turned. After thinking the matter over I believe it would be in order to charge the owner at once for this brass.

President Morris: How would you dispose of the journal?

Mr. Hunt: This journal was not damaged in service. It should be trued up. B did not damage the journal, nor did any railroad company damage it according to the argument put forth. Now possibly the proper thing to do in the case would be to turn up the journal and put it in proper shape and if you did not want to stand it yourself, to communicate with the owner.

Mr. Showers: From the printed statement, I am under the impression that the journal in itself would have an appearance of what has been termed "faulty construction," and no doubt the owner of the car, no matter who he may be, is responsible for the damage. If the party for whom the cars were being built had an inspector at the shop at the time cars were turned over, the cars would become the property of the party for whom they were built; if they had no inspector, they would be the property of the car company. If they had been received by the party for whom they were constructed he should be responsible.

President Morris: For the brass and journal?

Mr. Showers: For the brass and journal.

Mr. Deen: I do not see that there is any question about the journal at all. The case says journal was not touched, but was rough when leaving the shop, and my idea is that the owner is responsible and should be billed for the brass, and he could take it up with the builders. Possibly he might get something out of them; but I am a little doubtful about that. I think the owner should be billed for the brass; there is nothing to be done with the journal according to the statement here.

President Morris: It was found necessary to true up the journal afterwards.

Mr. Deen: The paper says journal was not cut.

President Morris: Was not cut; but was not properly finished off.

Mr. Deen: A should not be responsible for that. The proper way would be to bill the owner for the full amount and let the owner go back on the builder.

Mr. Miller: I fail to agree with what Mr. Deen has said. I think the owner ought to be responsible for the work that is necessary to put the journal in proper running order.

Mr. Sharp: I would like to ask Mr. Miller if the owner should be responsible, and stop at that. Should not the owner get redress from the builders?

Mr. Miller: That is the owner's business to see that he gets redress from the builders. If the owner's inspector did not see that the journals were properly turned up before putting them in under the car, of course the owner is responsible. He ought to have an inspector there to look after such things. I think the owner is responsible, and if he gets anything out of the builders he is that much ahead.

Mr. Sharp: The reason why I asked that question was, Mr. Hunt made the assertion that the owner should be billed for the brass regardless of whether B was going to ask anybody to pay for smoothing up the journal or not. I do not think that would be a fair way of handling it. If you bill the owner and stop at that, he will pay the bill and stop at that; where if you give him this additional information that the journal was improperly turned and bill him for the journal and brass, he has got evidence against the builders that will help him to render bill.

Mr. Hunt: The only thing damaged was the brass. I think that the journal should be trued up. But the only part damaged by a railroad company was the brass. Now, really, that is the only point at issue with the railroad company. But what to do with the journal is another thing. The sense of the meeting seems to be, from what has been said, that the owner is responsible for this damage. If you believe that the owner is responsible, the next thing, as Mr. Sharp has pointed out, and which should be important, is, what is the proper procedure: should we bill direct for the brass without further ceremony, and ask owners to furnish a defect card for the journal?

Mr. H. Goehrs: I would naturally put a brass in there and charge the owner for it; and if the journal was rough, smooth it up as best I could. I would not trouble the journal if it was not cut. If it was cut, I would assume responsibility, if it was done on my road.

Mr. Kuhlmann: I think there is a good deal of common sense in that. You do not know where the car comes to you from; it may be a new car; you are not supposed to know whether car comes from the factory; it may come from a delivering line. I do not think you are supposed to know anything about that. You are there to protect yourself, and that protection is furnished to you under the rules of interchange. I say the owner ought to pay for that brass.

Mr. Deen: There are very few companies getting new cars built that have not an inspector at the plant while this work is going on, and it is their duty to look after this work to see that it is properly done, and if they overlook such matters as turning up journals, I think it places the responsibility upon the owners, if they allow such material to go into a car, the same in the construction of the trucks as in the body. I have been at car shops making an inspection of cars, and I never knew of a company having cars built that did not have a representative there precisely for that purpose. But in order to get it right before them, so that they understand the matter, they should be given the facts, so they in turn could get redress from the builders.

Mr. Showers: From the statement given here, the only point at issue is as to the facts. If it were vice versa, the question would be quite different.

President Morris: In what way, Mr. Showers?

Mr. Showers: It is stated here that the journal was improperly turned (new car) and in view of these facts the question is asked, "who is responsible?"

Mr. Wentsel: I think that B should make the repairs and write the case up to the owners and make out bill and there is no doubt but that the owner would pay it and fall back on the builders. I know we have had several cases with new cars. They ran a good ways and then came and renewed the brasses.

President Morris: What would they do in case of an unfinished journal?

Mr. Wentsel: We never had a case of an unfinished journal; it was on account of the small amount of packing in the boxes. I know they renewed thirty or forty brasses in new cars. I would like to say that delivering line should furnish card for the journal, but not for the bearing.

Mr. Gradl: It seems to me in this case we have not the information that we should have. We do not know whether this car was loaded or not. In case of a new car, and the load exceeded the capacity of the journal—any new car will run hot, not only one box, but perhaps more. I think we should look into that.

Mr Showers: I move that the owner of the car be responsible for both brass and journal.

The motion prevailed.

President Morris: We will now take up the second case. This is a question in regard to wrong repairs, and it hinges on whether the owner should pay for replacing a wrong brass with standard material, or not.

Case 2.—"A" delivered to "B" a car foreign to both. After "B" had run the car some distance a more rigid inspection shows that there is a 7 in. brass on one journal. Car is equipped with standard 60,000 capacity axles, with 4½x8 journals. Wrong brass did not run hot. "B" removes the 7 inch brass and applies a standard 8 inch brass, billing owner for same. Is this right according to the rules of 1898?

Mr. Wensley: I would say it is an owner's defect.

Mr. Wentsel: I think there is a decision on this case: that is on the question of a wrong brass, by the Master Car Builders' Arbitration Committee.

President Morris: Do you know the number of the case?

Mr. Grieb: Four hundred and three.

Mr. Wentsel: It is not really a case. It is a pamphlet that was issued in April, just after they adopted the Chicago interchange (Mr. Grieb: March 23. Pamphlet No. 1) and they decided it was a concealed part of a car; and if it is a concealed part of a car, it is chargeable to owners.

Mr. Deen: Why didn't he allow it to go until it reached the owner and let him run it? There should be no charge.

President Morris: The party who had it in possession may have thought it was unsafe.

A Member: It had been running that way and had not run hot, and it would probably continue to do so. I would let it go until it run hot.

Mr. Prickett: As Mr. Wentsel says, a brass is a concealed part of a car. This being a 60,000 capacity car and having a brass in for a 40 or 50,000 capacity, I think that the party who removed that brass was justified in so doing, because the brass was not large enough for the capacity of the car, and he should bill the owner for the brass, giving proper credit for scrap.

Mr. Showers: In view of that case, if we consider a brass a concealed part of a car at one point, why is it not a concealed part at another point? The inspector who received the car did not discover the brass was wrong and prior to that some other line had applied the brass, deeming it was absolutely safe. It passed off their line, passed one inspector, run hundreds of miles in safety, and then through a rigid inspection it was discovered—which would tend to

show that it was not a concealed part. It appears that the brass was safe, and inasmuch as the case states that the brass did not fail, under the present rules, what right had he to tamper with the property of some one else?

Mr. Hunt: This case is just like many others that come up in the course of inspection. In answer to Mr. Showers I will say that the inspector had a perfect right to inspect the car, and each railroad is its own judge as to safety. I do not think there is any doubt about that fact—it is a point brought out often and demonstrated that the party who is going to run the car is the judge of what is safe and what is not safe, and if a person finds a part of a car wrong and considers it unsafe, he has a perfect right to remove it if he sees fit. If he thinks that a certain brass which is wrong is not safe, he has a right to remove it. In this case it evidently was a brass of smaller capacity than 60,000 lbs. I think the party was justified in removing it and should charge the owner for the new brass according to the present M. C. B. rules. But as the song goes, all coons look alike to me. I should like any brass to pass muster that would bring a car safely home without journal being cut or journal box damaged.

Mr. Showers: For the benefit of the association, I would like to make one explanation in regard to the case as originally presented. This was not a 60,000 capacity car, yet was equipped with 4¼x8 journals. The car was stenciled 40,000 capacity. The cars are not allowed to be loaded over 45,000. Taking that view of it, I can see no reason why a 7-in. brass would not be safe; furthermore, is there anyone here that has ever seen any serious accident caused by a short brass, or a 7-in. brass being applied to an 8-in. journal? As long as the brass does not run hot or cause any damage by running hot or cutting the journal, is there any reason why it is not safe?

Mr. Wensley: I would like to know who claims a car fitted with 4¼x8 journals is a 40,000 capacity car? If that is the case there must have been a wrong pair of wheels under.

A Member: In answer to that I will say that owners have a right to put in 5x9 journals if they feel disposed and their trucks are so constructed.

Mr. Wensley: Can you put a pair of wheels under like that, under a 40,000 capacity car?

Mr. Stagg: Was it stenciled on the truck the size of the journal?

Mr. Showers: Stenciled on the sill and also on the truck.

A Member: It is very poor policy for anybody to put a 7-in. brass on a 4¼x8-in. journal. According to the case presented here B is responsible.

Mr. Showers: I would like to hear from Mr. Grieb.

Mr. Grieb: The fact that Mr. Showers calls on me makes me think that possibly it is a question that the lines which we represent are interested in. We had a Canda cattle car that was received at one of our western terminals with a load of stock. We run the car 152 miles to La Crosse and there it was discovered that the car had a brass that was 7 ins. long. There is one distinction here that I would like to make—that is, the brass we removed was hot. The journal was 4¼x8 and the brass was designed for either a 3¾x7 or 4x7 journal. Of course with the condition in which this box was discovered at La Crosse we had no alternative of allowing it to go through or replacing the brass, we had to in fact remove the brass, and the peculiar part of the story is that we actually made a bill for the brass and it went through to owners undiscovered. When our attention was called to it we took the position that we had no right under the M. C. B. rules to charge anybody for replacing wrong material on their car. In fact while the owners were willing to pay, and thought they ought to pay, yet, from a point of justice and acting strictly under the M. C. B. rules, we felt that we had exceeded the bounds in presenting our bill and authorized a rebuttal bill.

Mr. Showers: I would like it understood that that is not the case under discussion. The reason I called on Mr. Grieb was because he is so well posted on similar subjects.

Mr. Canfield: My understanding is that B had car in his possession when the brass was removed.

President Morris: Yes; B removed the brass.

Mr. Canfield: I think that section 34, of rule 3, covers that case. It is a question of wrong repairs. (Reads Sec. 34.) Now if he received the car, he did not find the defect card. He should have found the defect card or had card put on. As long as he did not do that and they run it several hundred miles, it devolves on B to prove that he did not put it in himself, and consequently makes B responsible for it.

Mr. Sharp: I agree with Mr. Canfield that B is responsible; but under the present M. C. B. rules I would like to ask how B could exact an M. C. B. defect card from A? Section 34 of the rules reads: (Quotes rule.) This car was foreign to both A and B, and B should have rejected car on account of it not being safe to run and required that standard repairs be made. But inasmuch as he did not discover that the wrong brass had been applied prior to the time he received it and adjust the difficulty before car was received on their line, it seems to me, as Mr. Canfield says, it is their duty now to prove that some of their trainmen did not apply this wrong bearing, and I am of the opinion that B is responsible and should replace this bearing with an 8 in. bearing without making charge.

Mr. Stagg: I move that it is the sense of this meeting that B is responsible for the brass.

The motion being seconded was carried by a rising vote of 50 to 10.

RECESS.

President Morris: There is one question that was left over from last meeting that we should have taken up this evening, but it was overlooked. It refers to the case of sills—two sills being broken and afterwards two more being broken. It was stated at the last meeting that there was an arbitration decision on the way and this decision has now been rendered. The committee met January 24, '99. The case is No. 534. The defects were old and as a consequence of these old defects additional defects occurred. It is practically a parallel case with the one of broken sills. Two broken sills following two original broken sills. The decision of the committee was that in their opinion there must have been some further damage done to the draft timbers requiring their renewal and therefore the Lake Shore & Michigan Southern Railway is responsible and should cancel its bill. It means that the Lake Shore & Michigan Southern attempted to bill against the owner for broken draft timbers and defects that occurred as a result of these broken draft timbers, and the arbitration committee decision is that the Lake Shore cannot bill against the owners for the defects.

Mr. H. Goehrs: The way I understand it, there were two broken sills in the first place, when it was received, and the road afterwards—the receiving road—broke two more. I should think that the receiving road was responsible. Why did they not go to work and repair these two sills when they found they were broken? That is the way I understand the rules.

President Morris: For your information I will say that this case was held over from last meeting until the decision was rendered, and the decision carries out the idea that the receiving company, in the case just cited, was responsible for the four broken sills; the two original ones and the two that followed.

Mr. Goehrs: I do not think the car was safe to handle without damaging further. He should either have rejected it or, I hold, make repairs and charge owners with the repairs. According to the rules I think it is right.

Mr. Wensley: The question, I believe, was the same as our neighbor has stated, but the decision adds draft timbers. That makes a different question altogether.

President Morris: No; practically not. The draft timbers broken were owners' defects the same as the two sills were owners' defects. In the case decided, other damage followed as a result of the broken draft timbers, and it was held that the company that had the car in its possession was responsible for all the defects, both the broken draft timbers and the defects that followed as a result. It is a parallel case with the one that we discussed.

Mr. Showers: I believe that when the case was presented before the association it was with a question asked: "Does this association concur with the decision of the Joint Inspectors of East St. Louis," was it not? Then, inasmuch as the case has been pretty thoroughly discussed and we have a decision by the arbitration committee, I would make the motion that the association concurs with the decision of the arbitration committee on this question and disagrees with the decision of the St. Louis joint inspectors.

The motion was carried by a rising vote of 41 to 2.

Renewing and Charging for Dust Guards.

President Morris: The next topic for discussion reads as follows: "What is the current practice in renewing dust guards and charging same to owners?"

A member: We do not pay much attention to dust guards on old boxes on foreign cars. We put the old box back again as we found it. If we put a new box on we put on a dust guard. I have never made a charge.

Mr. H. Goehrs: I would like to ask how many inspectors ever put dust guards on a foreign car unless they remove the box to put on a pair of wheels?

Mr. Stagg: I do not believe we renew them very often unless we put on a pair of wheels or a new oil box.

Mr. Deen: I would like to ask how many oil boxes they find when they remove them that have dust guards at all or look as though they ever did have?

Mr. Miller: I think that at any time a railroad company applies wheels they ought to see that proper fitting dust guards are on boxes.

Mr. H. Goehrs: I think the question was whether they were to be charged or not.

Mr. Prickett: If I put on a new box I either put the old dust guard back or have a new one made. I do not know what the practice down at the main shop is, but I do not think they are taking off oil boxes on foreign cars and putting new dust guards on. I do not think any one is doing that; I know I am not.

President Morris: The question, of course, implies renewing the oil box.

Mr. Prickett: We always put the old one in. If we cannot get the old one out, we have a new one made. It is but a short time ago since I had a case of replacing a pair of trucks under a C. & E. I. car, and in taking off the oil boxes I found there was not a dust guard on.

Mr. H. Goehrs: I do not think we are answering the question. The question is whether we charge for them or not. I never have charged for one in my life.

Mr. Coleman: We usually put in dust guards on our own cars; I would not swear to putting them in foreign cars.

A Member: We put dust guards in foreign cars when we put in oil boxes, but we do not charge for them. It is too small an item.

Mr. Jones: Was there an oil box applied to this car—a new one—or was it just simply a pair of wheels applied, or a dust guard?

President Morris: We do not cite any particular case: we asked what is the practice of renewing and charging for dust guards.

Mr. Jones: In applying new oil boxes you cannot bill unless you put in dust guards, inasmuch as the oil box is not complete without the dust guards.

President Morris: It seems to be the general practice to put new dust guards in when you are changing wheels on your own cars; and as you are supposed to treat foreign cars the same as your own, is it doing right not to put them in foreign cars? I think the foreign car company will be willing to pay for them.

Mr. H. Goehrs: We put them in, but I say we never charge.

Mr. Grieb: I do not think that any charge ought to be made for dust guards on account of the small intrinsic value.

Mr. Hunt: Is it not the general practice when changing wheels in foreign cars to put the box on just as you find it. If you put in a new oil box you put in a dust guard. Is that not the practice?

A Member: Yes.

Mr. Showers: In view of what Mr. Hunt has said and also what Mr. Grieb has said, if we find it necessary to replace an oil box we quite frequently find it necessary to replace a column bolt. The necessity for replacing the oil box necessitates the replacement of the column bolt and the removal of the dust guard would necessitate the replacement of the dust guard. Why are not owners responsible for the entire replacement.

Mr. Stagg: In renewing a pair of wheels or in renewing an oil box it is customary to renew the oil box bolts, providing the bolts are worn out or become damaged in getting them out of the arch bars. If the bolts are all right we never renew them, but if we have to renew the bolts we charge for them as well as the oil box.

Mr. Hunt: The point is not so much that as what is the practice. All boxes are supposed to have dust guards, but thousands of old cars are running that have not had dust guards on, I will venture, for five years.

President: Morris: Do you renew dust guards in your own cars if they are worn or broken?

Mr. Hunt: If there are none in at all. If there is one in there we still let it remain in. There are none of them too good.

Mr. Wensley: I have not put one in in a year.

Mr. Sharp: There seems to be two very important questions here. The first one, as stated, is whether they put them in; the second is, whether they bill the owners. It seems from the discussion here that there are no bills rendered from the fact that there are no dust guards put in. It seems to me that the dust guard is a very important part and should be looked after when wheels are applied. True it is a small amount to render a bill for and yet I think that if the party making the change in wheels cannot afford to do it, the owners would be willing to pay the bill for putting in the new dust guards. For my part, I will say that we put in new dust guards whenever the old ones are worn out and wheels are being changed, and always charge them to the owner.

Mr. Hunt: If railroad companies are putting in dust guards on foreign cars on old boxes, I think they are putting them in at their own expense; because I do not believe anybody bills for dust guards.

Mr. Grieb: I move you that it is the sense of this meeting that no charges are being made for dust guards.

The motion being seconded was carried.

Joint Evidence Cards.

President Morris: Mr. Grieb, I believe you had a question you wanted to bring up.

Mr. Grieb: There is one portion of Rule 5 that I would like to direct attention to which does not seem to be right. It is that portion requiring that after securing joint evidence card for wrong repairs you must send it to the owner and request a defect card before making any charge. I look upon this from an office standpoint and it strikes me pretty forcibly. I have a great many requests of that nature to make which

involve a large amount of clerical labor. I think we have made, since I kept tab, something like 179 permits. I kept track for the month of January and we made 38 requests. In analyzing the schedule as to whom we had addressed these requests, I found that out of a total of 38 there were 28 on roads with whom we interchange at Chicago; and I would very much like to have this association put itself on record that it will not, amongst ourselves, require this routine when making bills on joint evidence cards. It seems to me that the demands of this rule are entirely uncalled for, because there is no recourse after a joint evidence card has been secured. That card in itself is the final and absolute judge in the case, and this matter of securing a defect card as authority for bill simply creates office work. It does not save money, but expends everybody's money in trying to get the cards. I find it involves considerable labor to procure them—double requests and keeping the cases on file for several months—and I do not see any good reason for the existence of this rule. I would therefore like to suggest, if it is agreeable to the members, that the roads represented here that interchange at Chicago waive that portion of the rule and furnish with the joint evidence card a defect card for bill when the accompanying wrong repairs are made on their line, always having a repair card showing they made wrong repairs.

President Morris: I think the question will resolve itself into whether the foremen in Chicago have authority from their superior officers to issue a card in this way. I would like to hear from some of the members how far their authority extends in this line. Speaking for the C., M. & St. P., Mr. Grieb's remarks will tend to show that we would be willing to issue defect cards whenever we sign a joint evidence card, providing everything is all right.

Mr. Sharp: It seems to me that Section 34 of Rule 3 covers that. It says: [Reads rule.] Would not that give the inspector at the delivering point authority to remove the repair card if he chooses to do so and give the owner the proper defect card?

Mr. Showers: I think we have some roads in the city that are doing that. I have had a number of cases in the last three or four months where we have had cars come home with wrong repairs. I took the regular card to the company that delivered the car, and when they found they had made repairs they took up the repair card and delivered a defect card at once. The Wabash is one of the roads that has done that.

President Morris: Would it not be well to make a motion that the general foremen of connecting lines at Chicago take it up with their superior officers and get permission from them to handle these joint evidence cards in this way. There are probably very few who would want to do it on their own responsibility; but it seems to me that if the matter were brought before their superior officers in a proper way they would allow this to be done. It certainly would save a great deal of unnecessary writing.

Mr. Wensley: If we make wrong repairs, we will issue an M. C. B. card without further instructions.

Mr. Deen: Whenever we make wrong repairs to a car and know it—sometimes they are made on the outer line—and their joint evidence card comes in, I issue a defect card without any instruction from any of my superior officers, and send it to the owner.

Mr. Stuckie: Would not Rule 34 cover that. It says [reads rule]. That would avoid all this. Why don't they live up to that. I think the best way would be for the members of this association to take it up with their respective master mechanics. I think it would have gone through quicker had it been taken up when the rule originally went into effect.

Mr. Grieb: I would like to say in reply to the gentleman that spoke last, that the St. Paul did issue such instructions at the time this went into effect. Now as we are put to a good deal of extra work to meet the requirements of Section 3 of Rule 5, it seems to me it would be more proper to obtain consent of the superior officers of the lines here interested and instead of compelling one to go to the superintendent of motive power to get a defect card in order to make bill, to get it direct from the party that signs the joint evidence card. I would move that it is the sense of the car foreman's association that in cases where joint evidence cards are furnished for wrong repairs made by lines interested in delivering cars to owners, that in order to expedite matters and reduce the amount of clerical labor, a defect card accompany the joint evidence card.

The motion prevailed.

Knocking Cars off Centers.

President Morris: The next topic for discussion reads as follows: "Is the owner properly chargeable for repairs to defects that follow knocking a car off center?" This refers to damage to truss rods, longitudinal sills and cross-ties split by wheels. At the present time I believe it is the practice to charge only for center pins.

Mr. Wensley: We had a case two weeks ago last Sunday of a C. B. & Q. car knocked off center in our yard. The cross ties were broken. We put car back on center and allowed it to go home.

President Morris: Did you consider yourself responsible for those cross-ties?

Mr. Wensley: Yes, sir.

President Morris: Was there any possibility of getting around that additional damage? Could it have been avoided?

Mr. Wensley: The center pin is an owner's defect, but we knocked the car back to the second cross-tie and it certainly must have been rough usage.

President Morris: I think that would be rough usage, knocking a car back to the second cross-tie.

A Member: But there are cases where it is proper to bill for center plates. If a center plate is broken it is easy to knock a car off center, not doing any more damage, and I think if the owner is responsible for the pin he ought to be responsible for that; but I don't mean smashing a whole car to pieces. I think when there is any more damage than that done—still merely knocking it off the center—the one doing it ought to make repairs. I do not think you can hit a car hard enough to knock trucks far enough to break sills and cross-ties without hitting it pretty hard, and I do not call it fair usage.

Mr. Davies, Jr.: If we knocked a car off center and bent the body truss rods and damaged the draft timbers, we would bill only for the center pin and stand all the rest that followed the breaking of the center pin.

Mr. Deen: One day last week we received a car loaded with coal, knocked it off center, no other damage done. We dug down through the coal; center pin went through the floor; there was no center pin in car and I do not think there has been, probably not since the car was built. The center pin hole was filled up with coal. When I made out bill, according to the rules, I had to allow for scrap. I billed for two hours' labor. They objected to two hours' labor saying it was only one-half hour's labor to apply a center pin.

President Morris: The current practice seems to be not to charge the owner for additional damage; but what we want to get at is whether it is right or not—whether the owner should or should not be charged.

Mr. Wensley: Did you explain that car was loaded?

Mr. Deen: I did not state on bill that car was loaded.

Mr. Grieb: According to the M. C. B. rules you had a right to charge three hours' labor.

A member: I think the rules confine you to certain parts that you can make bill for. If you break more than that you make a combination. If you go beyond that you have to pay for all of it. I would treat that case the same way.

Mr. Sharp: Mr. Davies says if they knock a car off center and break the center pin and do further damage they would bill the owner for the center pin only. Do you assume that the center pin was broken or that you broke center pin in knocking car off center?

Mr. Davies, Jr.: Whether we broke it or it was broken.

Mr. Sharp: I do not agree with him. If the center pin is broken it is chargable to owners; but if you knock a car off center and break a cross-tie timber, it is a combination of defects.

President Morris: I would like to ask Mr. Sharp what he means by a combination? Is there anything in the rules that makes it a combination?

Mr. Sharp: No.

President Morris: It specifies what is unfair usage in combinations, but it does not specify it is a combination breaking center pin and a cross-tie.

Mr. Sharp: But it would be termed in my estimation unfair usage.

President Morris: A strict construction of the rules would not make it a combination.

Mr. Sharp: The rules do not name these particular parts; but how would you charge owner with a center pin if you knocked car off center and bent the truss rods and did further damage? You admit in not billing owner for the further damage that it is unfair usage, and the rules say plainly you cannot bill owner for part of the damage when done by unfair usage.

Mr. Davies, Jr.: I would say that it is seldom a car is knocked off center and the truck reaches the cross-ties. It is breaking the center pin and bringing the car to repair track or switching around the yard that breaks the cross-ties. The original defect is breaking the center pin, which owner is responsible for. In switching car you do the further damage.

Mr. Sharp: We got that point from the St. Louis Railway Club in breaking sills, consequential damage. If center pin is broken you have a right to charge it to owners. If you do not make the repairs and do further damage you become responsible.

Mr. Showers: In case a center pin is broken and in hauling car to repair track, as Mr. Davies has said, additional or consequential damage is done, I think the owners would be responsible for it; but if all the damage was done at the same time, I think it would come under the rules, and therefore the handling company would be responsible.

President Morris: It seems to me that nothing is unfair usage unless it is specified so by the rules or by arbitration committee decisions. The only way that this could be reached is by calling it consequential damage.

Mr. Showers: The preface states: [Recites preface.] Can we consistently say that we have knocked car off center, broke the center pin, smashed the truss rods and did other damage and then call it fair usage? This preface governs the entire rules.

Mr. Hunt: I do not think that we can look at it as other than pretty rough usage. Of course there are cases where it is not rough usage. In some cases the center pin is broken and has been broken for years, and by reason of the center pin being broken you knock the car off center, where if everything had been in good order you might not have done so. I do not know whether it would be well to distinguish between the two. I am rather inclined to believe that it is rough usage.

Mr. Sharp: I move that it is the sense of this meeting that owners are not chargeable for repairs for defects caused by car being knocked off center if such damage exceeds the breaking of center pin.

The motion prevailed.

The meeting then adjourned.

The next regular monthly meeting of Car Foremen's Association will be held in the rooms of the Western Society of Engineers, Room 1741 Monadnock building, Dearborn and Van Buren streets, Thursday evening, April 13, 1899, at 8 o'clock. Building should be entered on Dearborn street, at the second entrance south of Jackson boulevard.

The program for the meeting is as follows:

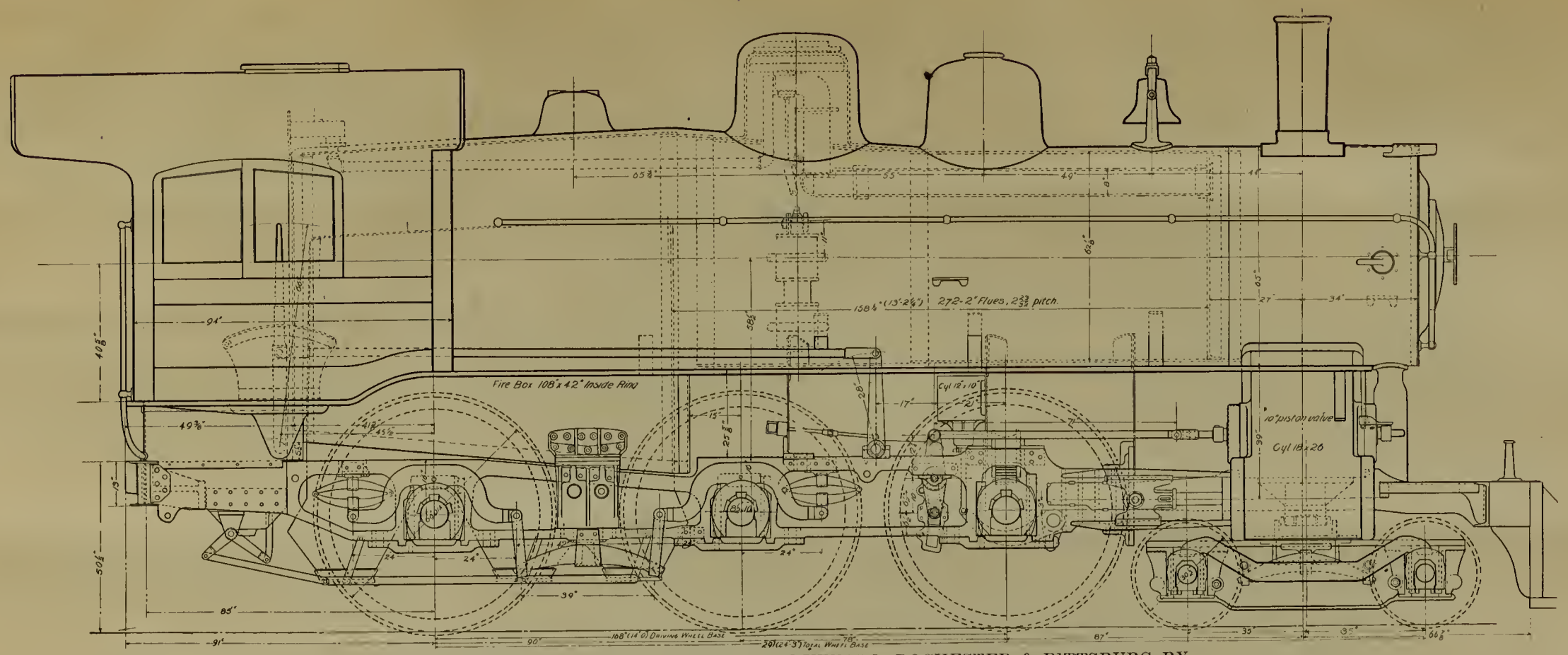
The report of the committee on recommendations for changes in M. C. B. rules to be presented to the next meeting of the M. C. B. association will be discussed.

Other questions of interest to members will be presented for discussion.

TEN-WHEEL PASSENGER LOCOMOTIVE, BUFFALO, ROCHESTER & PITTSBURG RAILWAY
Built by the Brooks Locomotive Works.

TEN-WHEEL PASSENGER LOCOMOTIVE—BUFFALO, ROCHESTER & PITTSBURG RY.

The Brooks Locomotive Works recently built five 10-wheel passenger locomotives for the Buffalo, Rochester & Pittsburg Ry, and we present herewith a perspective view of one of these engines, together with considerable detail drawing, comprising side, front and rear elevations and one cross section. This engine is equipped with the Brooks design of piston valve, and has 18x26-in. cylinders. It has 69 inch drivers; the Player improved Belpaire boiler, which is 62 inches in diameter and is designed to carry 200 pounds of steam pressure; a fire-box, 108x42 inches; a grate area of 30.6 square feet, and a total heating surface of 2028 square feet.



TEN-WHEEL PASSENGER LOCOMOTIVE, BUFFALO, ROCHESTER & PITTSBURG RY.
Built by the Brooks Locomotive Works.

The engine weighs 142,000 pounds, of which 108,000 pounds are on the drivers. It will be noted that the injector is placed on the boiler head and that the check is also so placed. Complete details are appended as follows:

The principal dimensions are given in the following tabulation:

GENERAL DIMENSIONS.

Wheel base, total, of engine	24 ft. 3 ins.
Wheel base, driving	14 ft.
Wheel base, total, engine and tender	51 ft. 10¾ ins.
Length over all, engine	37 ft. 2⅜ ins.
Length over all, engine and tender	61 ft. 5⅜ ins.
Hight, center of boiler above rails	9 ft. 1 in.
Hight of stack above rails	14 ft. 11½ ins.
Heating surface, firebox	166 sq. ft.
Heating surface, tubes	1862 sq. ft.
Heating surface, total	2028 sq. ft.
Grate area	30.6 sq. ft.

WHEELS AND JOURNALS.

Drivers, No.	Six.
Drivers, diameter	69 ins.
Drivers, material of centers	Cast steel.
Truck wheels, diameter	30½ ins.
Journals, driving axle	8½ ins.x10 ins.
Journals, truck	5½ ins.x10 ins.
Main crank pin, size	6 ins.x5½ ins.

CYLINDERS.

Cylinders, diameter	18 ins.
Piston, stroke	26 ins.
Piston rod, diameter	3½ ins.
Piston rod packing	United States.
Main rod, length center to center	116 ins.
Steam ports, length	21 ins.
Steam ports, width	2 ins.
Exhaust ports, least area	50 sq. ins.
Bridge, width	3¼ ins.

VALVES.

Valves, kind of	Improved piston.
Valves, greatest travel	7 ins.
Valves, steam lap (inside)	1⅛ ins.
Valves, exhaust lap or clearance (outside)	1⅛ ins.
Lead in full gear	1-16 in. negative.
Lead	Variable.

BOILER.

Boiler, working steam pressure	200 lbs.
Boiler, material in barrel	Steel.
Boiler, thickness of material in barrel	⅝ ins.
Boiler, thickness of tube sheet	¾ ins.
Boiler, diameter of barrel	62 ins.
Seams, kind of horizontal	Quintuple.
Seams, kind of circumferential	Double and triple.
Crown sheet, stayed with	Direct stays.
Dome, diameter	30 ins.

FIRE-BOX.

Fire-box, type	Long, over frames.
Fire-box, length	108 ins.
Fire-box, width	42 ins.
Fire-box, depth, front	75 ins.
Fire-box, depth, back	60 ins.
Fire-box, material	Steel.
Fire-box, thickness or sheets	crown, ⅜ ins., tube ⅝ ins., side & back ⅜ ins.
Fire-box, brick arch	On studs.
Fire-box, mud ring, width	Back, 3½ ins.; sides, 3½ ins.; front, 4 ins.
Fire-box, water space at top	Back, 4½ ins.; sides, 6 ins.; front, 4 ins.
Grates, kind of	Cast iron rocking.
Tubes, number of	272
Tubes, material	Charcoal iron.
Tubes, outside diameter	2 ins.
Tubes, thickness	No. 12 B. W. G.
Tubes, length over tube sheets	13 ft. 2¼ ins.

OTHER PARTS.

Exhaust nozzle	Single.
Exhaust nozzle, diameter	4⅛ ins.; 4¾ ins.; 5 ins.
Exhaust nozzle, distance of tip above center of boiler	3 ins.
Stack, straight or taper	Steel taper.
Stack, least diameter	14¼ ins.
Stack, greatest diameter	15¾ ins.

TENDER.

Type	8-wheel steel frame.
Tank, capacity for water	4,500 gal.
Tank, capacity for coal	10 tons.
Tank, material	Steel.
Type of under frame	Steel channel.
Type of springs	Double elliptic.
Diameter of wheels	33½ ins.
Diameter and length of journals	4¼ ins.x8 ins.
Length of tank	19 ft. 6 ins.
Width of tank	9 ft. 10 ins.

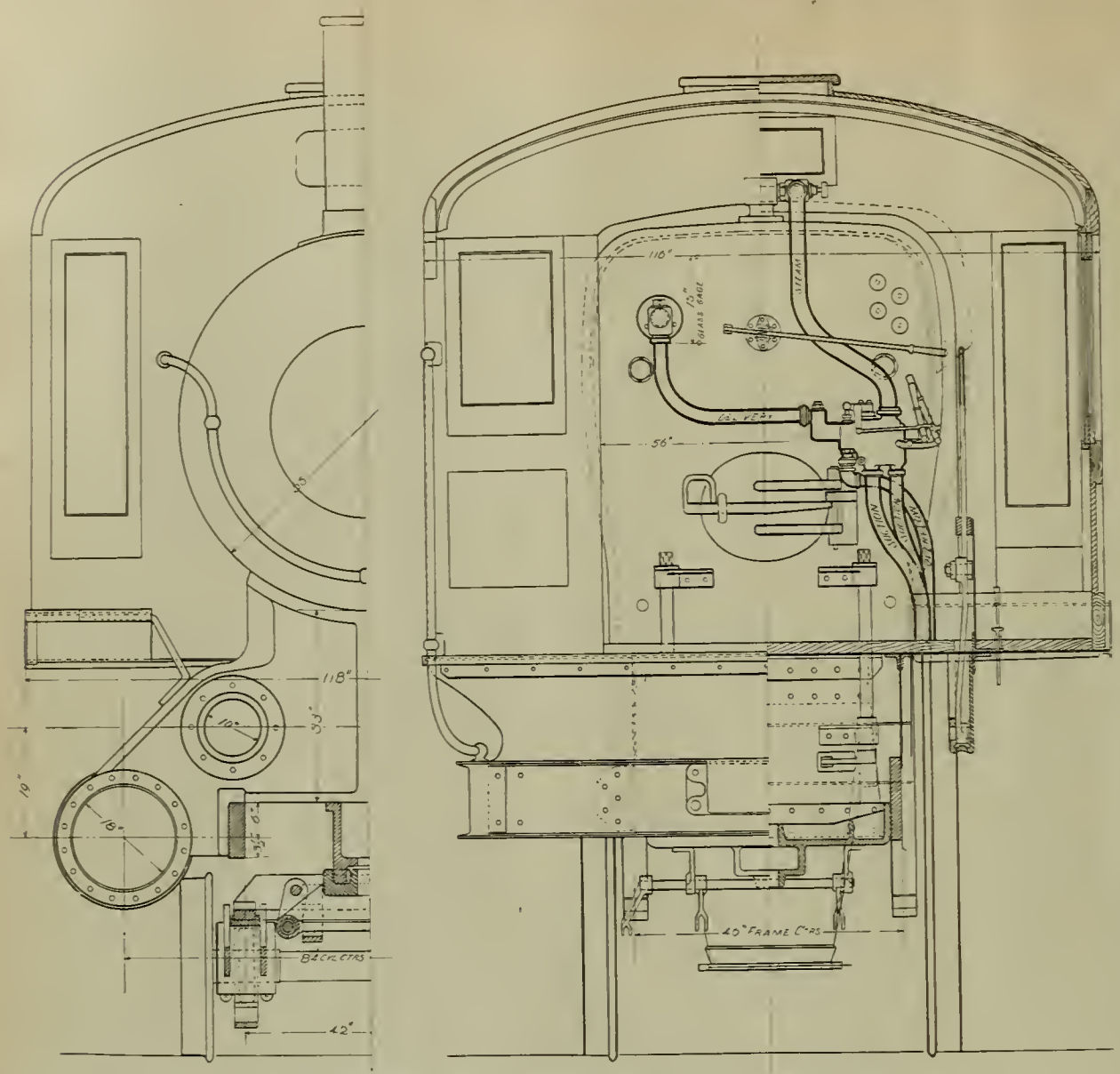
SPECIAL EQUIPMENT.

Brakes	B. L. W., outside equalized for drivers and engine truck. Westinghouse Automatic for tender and train service
Pump	9½ in.
Sight feed lubricators	Michigan.
Safety valves	Kunkle.
Injectors	Hancock Composite.
Springs	French.
Metallic packing	United States.
Spark arrester	Bell.

THE FUTURE OF THE GAS ENGINE.

The gas engine was the topic of a suggestive paper presented some time ago before the Technical Society of Pittsburgh by Mr. Edwin Ruud. At the close of his paper Mr. Ruud dwells upon the future of the gas engine as follows:

Until recently the gas engine has been made in comparatively small sizes only, and only for what you may call rough work; that is, when steadiness of speed was not essential. The largest engine in this country, made commercially, was only 100 horse-power, having two cylinders, and of the "hit and miss" type. The public looked upon the gas engine as a sort of freak and did not take very kindly to it. The hard times, however, which we have experienced during the past five years or so have done much toward introducing the gas engines. The keen competition and small margin of profit caused manufacturers and business men to look around for some spot where a saving could be effected in their establishments; an investigation followed which was favorable to the gas engine. The introduction of electricity, calling for prime movers, also stimulated demand for a cheap and convenient motor, and this more than anything else has brought the gas engine forward. I know for a fact that when Mr. Westinghouse, about five years ago, commenced experiments in the gas-engine field, he did so because he foresaw a large future demand for the gas engine in the electrical field, if it could be made to give the service that its brother, the steam engine, was doing. Experiments on a fairly large scale followed, both on compound and single-expansion engines. The work was hard and try-



B. R. & P. PASSENGER LOCOMOTIVE—HALF ELEVATIONS.

ing, as the obstacles to overcome were numerous, but the results have been gratifyiug. In the early part of the spring of 1898 au engine of about 650 brake horsepower was completed in the works of the Westinghouse Machine Company. This engine is of the three-cylinder type and has a speed of 150 revolutions per minute. After it was thoroughly tested on the testing foundation, it was erected in the power-house of the Westinghouse Electric & Manufacturing Company, where it is running in regular commercial service of a severe character. The eugine is direct connected to a suitable electric generator and runs in conjunction with one or two steam engines, according to the call on these units for electric currents. This engine is by far the largest gas engine in the world, and it is pleasing to record that this large gas engine was built in Pittsburg. But this engine will not long eujoy the distinction of being the largest one. The Westinghousee Machine Company are now making drawings and patterns for a 1500 brake horse-power gas engine. This engine is also of the three-cylinder type, and it is designed to ruu 100 revolutions per minnte. Remarkable ecouomy is expected from this engine, as every possible care is being taken to make it a model of modern gas engine engineering. It would not be surprising if this engine developed a brake horse-power for every 8½ cubic feet of natural gas consumed per hour, or 8500 British thermal units per brake horse-power-hour. This would

$$\text{give a heat efficiency of } \frac{2564}{8500} = 30 \text{ per cent at the shaft.}$$

When gas engines can be made of such efficiency in large units, they will uudoubtedly compete successfully with the most modern steam engine. A gas engine of snch size and efficiency will run day in and day out on less than 1 lb. of coal, burned in a good produce gas plant per brake horse-power. This includes banking of fires and the like losses. It would have to be a high-grade steam engiue and boiler plant if it should regularly be able to produce a brake horse-power for 2 lb. of coal per brake horse-power hour, twice the amount of fuel required by the gas engine under similar conditions. From the foregoing you will see that the gas engine is no longer limited to special power purposes. It can hold its own as a prime mover, and can be used for almost all purposes for which the steam engine can be used. But all this has not been accomplished in a day. It is now 108 years since the first patent on an explosive motor was taken out by John Barber, and from that time on it may be seen that great improvements have been made.

"U. S. TIN," SOMETHING NEW.

Paying tin mines are as scarce in this country as snakes in Ireland, and the money that has been sunk in efforts to develop them would make many men rich. But the Ajax Metal Company, of Philadelphia, has been putting out "Ajax tin" at a profit for 18 years, although it is true that it does not d'g the metal out of the ground. This "Ajax tin" is one of the components of the well-known "Ajax bearing metal," which is extensively used for locomotive and car journal bearings.

Now, however, the company announces a new and different "tin" which it calls the "U. S." The history aud standing of the company is snch as to predispose those interested to believe in any claims it may make for any of its product, no matter how strong those claims may be. And the fact that the output of the concern is under the close supervision of a skilled metallnrgist, who has all the resources of both scientific and practical knowledge at his command, would naturally lead to the development of new products, for the possibilities of combining metals into uew and useful alloys has certainly not been exhausted hitherto.

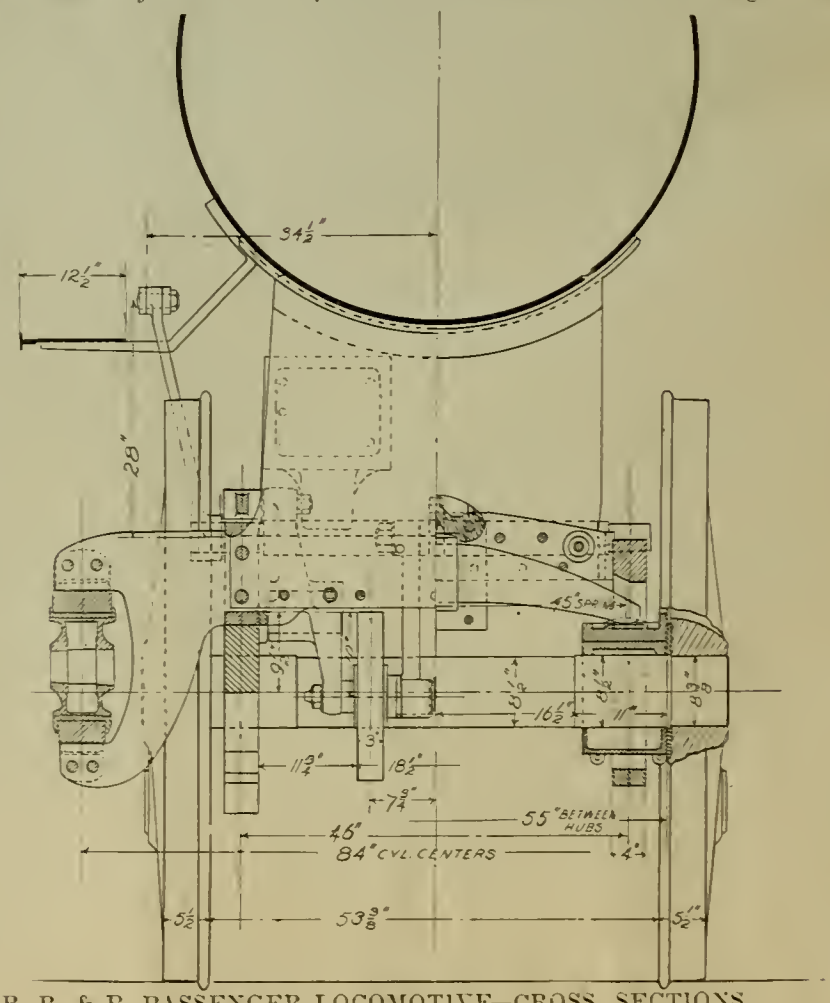
The claims concerniug the new "tin" are so clearly and strongly stated by the company in a circular letter that we quote largely in its own words: "Having been successfnl in marketing our Ajax tin for bearing metal, we conceived the idea of placing on the market a 'tin' that could be used in place of imported tin, and now offer to the users of composition metals our 'U. S. tin' for making all manner of castings into the composition of which tin enters. We propose offering the U. S. tin at a figure so much lower than the imported tin that it will be attractive in price. It will make a much superior metal, and sonnder castings—a metal more homogeneous in structure, of greater tensile strength, and better wearing in every way. The composition made of the U. S. tin is much richer in color, takes a higher lnstrons polish, and does not tarnish when exposed, like alloys made of imported tin. Its working qnalities are of the highest excellence, turning much better, and affording a cleaner cnt; in fact, it is far snperior in every way. The 'U. S. tin' can be nsed iu same proportions as the imported tin."

The company, in a word, claims that this new "U. S. tin" is superior to imported tin for composition metals. Fnrthermore, it offers to send small lots of it on approval.

AN IMPROVEMENT IN TAPS

The system of taps designed by Mr. F. G. Echols, of the Pratt & Whitney Co., or Hartford, Conn., has met with a most gratifying reception and is in approved use in many railway shops. The principle of the Echols' patent is shown by a comparison of figures 1 and 2 of the engravings. These figures show the Echols tap, and the old style, as they appear in actual work. The principle may be thus described. It consists essentially in the omission of each alternate tooth, as shown in figure 1, the organization being so carried out that each of the cnttiug teeth is followed by a space, and vice versa. This arrangement gives a freedom of action to each cntting tooth that is imposible in the old style, as in the latter the teeth of the tap and threads being formed, make a solid mass with no possibilty of relief from the side pressure that is obtained in the Echols patent. In tapping holes in material such as copper, and boiler sheets, the tendency is to tear the threads that are being formed, owing to the wedging action of the cutting teeth (see Fig. 2) and the little resistance offered by the metal to the pressure of the continuous row of cutting edges; the chips are carried forward in a mass in front of the cutting teeth, and unless the tap is frequently reversed and this mass of chips broken off, the thread will either be mutilated or the tap itself broken.

It will be observed by referring to Figure 1 that only one side of the thread that is being formed is



B. R. & P. PASSENGER LOCOMOTIVE—CROSS SECTIONS.

operated upon at once. It is thus relieved of one-half of the pressure and wholly of the wedging action, as in Figure 2, and owing to the absence of the next adjacent threads (Figure 1) it is possible for a slightly lateral movement of the thread being formed, owing to the mobility of the metal. It will

Fig. 1.

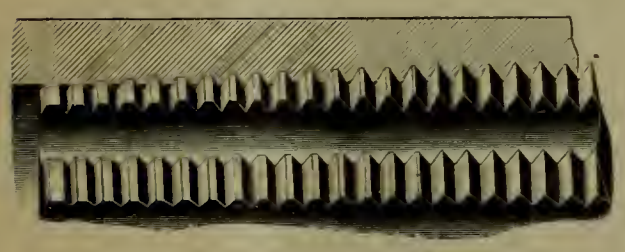


Fig. 2.

be noted that in the use of either tap the same amount of stock is removed in tapping out any given size hole, but actual practice shows that the resistance is from 30 per cent to 50 per cent less than the old style taps, proving conclusively that the excess resistance in the old tap is caused by friction, which is more destructive to the tap in its work than the resistance in the actual cutting operation. The new tap is of especial value in tapping tough steel.

This new principle is applied to hand stay bolt and boiler taps. In Figure 3 is shown the stay bolt tap for boilermakers, the straight, threading, taper and reamer portions being indicated. In Figure 4 is shown the straight and taper boiler taps; here the straight tap has a reamer point to size the hole and to serve as a gauge in selecting a drill to precede the tap. In Fig. 5 is shown the pipe tap. In Figure 6 the mud or washout tap is shown. This is used in locomotive work for plugging washout holes. It is made in sets of four, each 6½ inches long over all, having same size shank square. The thread is cut a length of 3 inches, 12 threads to the inch, tapering 1¼ inches per foot. The smallest tap is 1¾ inches diameter at the small end, and the largest tap 3 inches diameter at the large end. Each tap is marked with three figures, 1-3, 4-6, 7-9 or 10-12, representing sizes of three plugs having threads cut 1 inch in length, each plug having the same number as the section of the tap it corresponds with in diameter and number. The smallest tap when run into the hole so that the figure 1 is flush with the outside of the plate will thread it to receive the No. 1 plug, and so on for the other sizes.

BOOK NOTES.

THE STORY OF THE RAILROAD. By Cy Warman. Author of Tales of an Engineer, the Express Messenger, Snow on the Headlight, the White Mail, Paper Talk, etc. Illustrated. New York: D. Appleton & Co. Price $1.50.

The railroad would appear at first thought to be rather a difficult theme upon which to base a story, but Mr. Warman happily thought differently and has given us a book which by its easy flow and vivid interest would indicate that the task was not only easy but even pleasurable to him. He treats of western railroads, because his book is one of the "Story of the West Series." There is doubtless more romantic and picturesque material, for the historian of the railway, to be found in the records and traditions of the west than in those of the east; at all events, Mr. Warman has found a plenty of rich material in his field and has worked it up in more than ordinarily attractive shape. The main source of his inspiration is the early history of the Atchison, Topeka & Santa Fe, and to this he devotes perhaps the larger part of his space; but stirring chapters are given to the Union Pacific, Northern Pacific, Denver & Rio Grande, and Canadian Pacific. Mr. Warman deftly avoids the dry records and details of his theme; he even successfully avoids the "plain narrative" form which many writers might have chosen in approaching the task. He rapidly sketches the life, the spirit, of the men, things and events connected with the early transcontinental lines, and so vividly is this done that the portrayals stand out before our mind's eye as strongly as though we were using a mental stereoscope. We have thus given us, as the editor of the Story of the West series—Ripley Hitchcock—says in his appreciative preface to Mr. Warman's work, "a general view of characteristic phases of the life of railroad builders which has a completeness, from the standpoint of human interest, not realized before, and impossible of realization either in the orthodox railroad histories or in fugitive anecdotes of construction camp life." Mr. Warman's book is thoroughly good; it is always entertaining and frequently stirring; and it reveals to the railroad man the existence of a not generally suspected vein of romance in the earlier history of his vocation.

* * *

The Chicago, Milwaukee & St. Paul Ry. passenger department has published a book of maps that is the most convenient and useful, in its size and arrangement, that we have seen. It comprises the following maps: United States, Puerto Rico, Hawaii, Philippine Islands, Greater Antilles, and the World. These are all finely executed and on an amply large scale. The population, area and capitals of the United States, Alaska, Cuba, Puerto Rico, Hawaiian Islands and Philippine Islands are given in one table, and elsewhere are given the area and population of all the countries of the world. Several pages are devoted to descriptions of Cuba, Puerto Rico, Hawaii and the Philippine Islands. This book is of convenient size for the desk, so that the maps are readily available for ready reference. It will be sent free to any address for six cents in postage. Application should be made to Geo. H. Heafford, general passenger agent, Old Colony Bldg., Chicago.

* * *

CALIFORNIA. Brief glimpses of her valleys, mountains, lakes and famous places. By Jas. W. Steele. Profusely Illustrated. Chicago: Burlington Route Passenger Department.

This is a beautiful 72-page paper covered booklet that far outranks the usual railway "resort" publications. It is not a dry compilation, nor yet on the other hand, a fulsome laudation, as so many booklets published by railways are, but it is a carefully written story of California that is so attractive in style and interesting in statement that one feels held to its pages after starting until the last sentence is read—this at least was our experience. Mr. J. R. Griffits, the advertising manager of the Burlington Route, has evidently a keen appreciation of the fact that if a thing is worth doing at all it is worth doing well. Accordingly, when he wanted something on California to send out with the compliments of his road he engaged the services of a good writer, one who could and did handle an interesting theme in an interesting way; and then he clothed Mr. Steele's story as daintily as might be asked for by those who are over-particular in matters typographical. The result is a booklet that interests one in California as well as in the Burlington Route.

* * *

CATALOG.

The title page says "Catalog" but that means just as much as "catalogue," if not more. Anyhow the one now referred to, that of the Ball Bearing Company, Watson St., Boston, is one of the very highest class. The flexible cloth cover is fine cover paper on the outside so that the cut and printing show up perfectly. The different anti-friction bearings are fully illustrated and they and the price lists cover the entire field. We believe that this is the first complete catalogue and price list ever issued by a concern which makes ball and roller bearings its sole line of manufacture. With the exception of foreigners and a few people living in remote districts in this country all who see this publication will recognize the healthy, alert and handsome yearling on the first page of the cover as a descendant of W. S. Rogers, the general manager and treasurer of the company. This is, unquestionably, the first picture of a ball bearing baby ever printed on a catalogue. It is like a patch of sunshine in a shady place.

The Panhandle is experimenting with steel underframe cars built after the design submitted at the last Old Point Comfort convention by R. P. C. Sanderson.

It is not long since wise men explained that the sixty ton engine and the twenty ton capacity car was the maximum weight to be allowed on rails and bridges that could be provided within economical limits, yet the evolution continued, engines and cars grew larger, forcing the engineers to provide stronger bridges and heavier rails until a railroad that will carry the one hundred ton locomotive and fifty ton capacity car will soon be among the necessities. These changes are being brought about by the irresistible force of commercial interests, assisted by the unfavorable legislation of western states and the paralleling of trunk lines (in many cases uncalled for by traffic requirements), lowering rates year after year until only by the most thrifty methods of operating could the best managed roads meet their obligations.—Wm. McIntosh, before the Northwest Railway Club.

Compressed air, as a means of power transmission and distribution, has, in the past few years, become an almost indispensable adjunct of a railroad shop. Its extreme flexibility and ease of general adaptation has opened up to the shopman a remarkably wide field of invention, which he has not been slow to recognize, and to make use of. The lessening of the expense of operation, and the eliminating of the necessity of manual force, has in many cases been the result of the general adoption of air power. The air hoist, of all sizes and lifting powers, was one of the first ideas to be experimented with. With a properly designed and arranged hoist, one man can accomplish as easily and speedily, what a gang of men was formerly required to do.—J. W. Fitzgibbon, before the Western Railway Club.

PERSONAL.

Mr. Milton H. Geyer has resigned as general storekeeper of Toledo, St. Louis & Kansas City.

Mr. J. L. Mohun has been appointed assistant master mechanic of the Juniata shop of the Pennsylvania railroad.

Mr. W. N. Cox has been appointed acting master mechanic of the Alabama Great Southern, vice C. Skinner, resigned.

Mr. A. C. Beckwith has been appointed division master mechanic of the Illinois Central, with headquarters at East St. Louis, Ill.

Traveling Engineer A. H. Polhemus, of the Pennsyl-

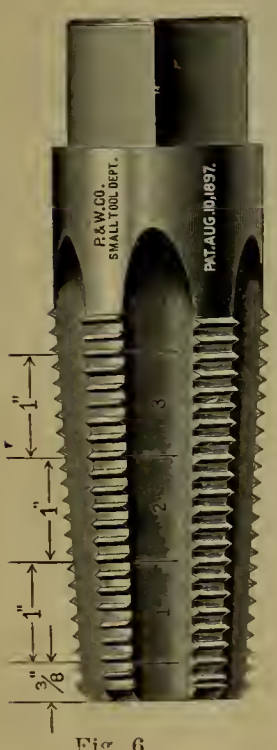


Fig. 6.

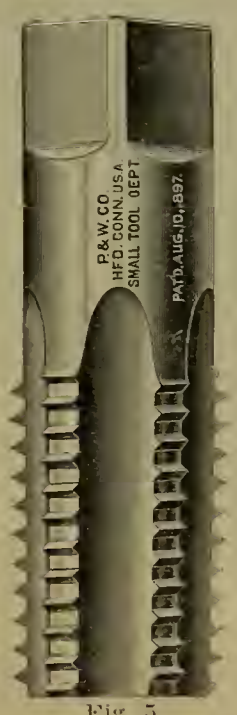


Fig. 5.

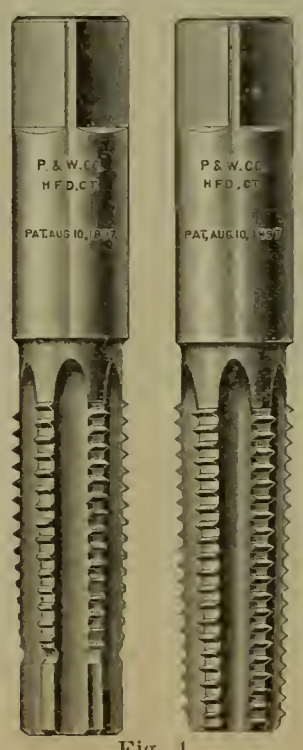


Fig. 4.

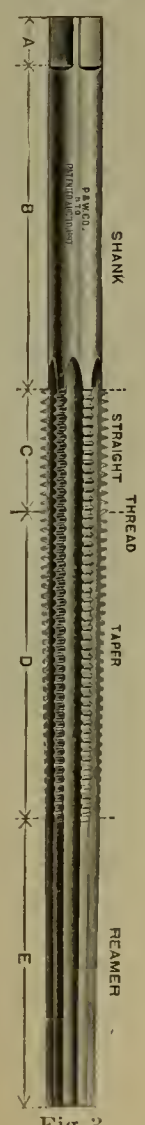


Fig 3.

AN IMPROVEMENT IN TAPS.

vania Lines, with headquarters at Fort Wayne, died March 13, aged 73 years.

Mr. F. C. Thomas has been appointed acting road foreman of engines on the Cleveland & Pittsburg, vice S. D. Noragen, furloughed.

It is stated that the jurisdiction of W. E. Symons, superintendent of motive power of the Plant System, is to be extended over the car department.

Mr. G. J. De Vilbis, general foreman of the Wabash, with headquarters at Peru, has resigned to accept a position on the Grand Trunk at Battle Creek, Mich.

Mr. G. U. Biser has been appointed foreman of the car department of the Fort Worth & Denver City at Fort Worth, Texas, in place of Mr. B. T. McClellan, resigned.

Mr. Frank Rearden, superintendent of locomotive and car department of the Missouri Pacific, has been granted leave of absence and will seek health on the Pacific coast.

The Kentucky & Indiana Bridge Company has abolished the office of master mechanic, and John Newhouse, by whom it has been held, has been appointed shop foreman.

Mr. John Milliken, assistant engineer of motive power of the Philadelphia, Wilmington & Baltimore, has been appointed to a similar position on the United Railroads of New Jersey.

Mr. N. L. Mewhinney has been appointed general foreman of the Alabama Great Southern at Birmingham, Ala., vice Mr. W. Smitley, resigned to go to the Toledo, St. Louis & Kansas City.

Mr. Alexander Kearney has been appointed assistant to General Superintendent of Motive Power F. D. Casanave, of the Pennsylvania railroad, with the title of assistant engineer of motive power.

Mr. A. C. Deverell has been appointed superintendent of the car and machine shops of the Great Northern, vice S. F. Forbes who, as previously noted, has been appointed purchasing agent of that road.

Mr. B. T. McClellan has resigned as foreman of the car department of the Fort Worth & Denver City at Fort Worth, Texas, to accept the position of general foreman of the Illinois Central at New Orleans, La.

Mr. P. N. Hyden, who for the past year has been with the car department of the Lake Shore & Michigan Southern, has been appointed superintendent of the Anniston works of the Illinois Car & Equipment Co.

Mr. John King has been appointed master mechanic of the Virginia & Southwestern, which company has assumed possession of the Bristol, Elizabethtown & North Carolina and of the South Atlantic & Ohio roads.

Mr. J. E. Button, division master mechanic of the Chicago, Burlington & Quincy at Ottumwa, Iowa, died March 13. Mr. Button was greatly esteemed by his co-workers on the Burlington and by the high officials of that road.

Mr. W. C. Pennock, master mechanic of the Pittsburg, Cincinnati, Chicago & St. Louis at Logansport, Ind., has been granted leave of absence and his duties will be temporarily performed by Mr. T. W. Demarest, general foreman at Indianapolis.

Mr. John Forster, formerly master mechanic of the Atchison, Topeka & Santa Fe at La Junta, Colo., has been appointed division master mechanic of the Colorado & Southern, with headquarters at Denver, Colo., vice Mr. J. J. Cavenaugh, resigned.

Mr. E. T. White, master mechanic of the Baltimore & Ohio at Riverside, Baltimore, has been appointed superintendent of motive power of the lines east of the Ohio river, with headquarters at Baltimore, vice Mr. I. N. Kalbaugh, transferred to Newark, O.

Mr. O. J. Kelly, general foreman of the Baltimore & Ohio at Piedmont, W. Va., has been appointed division master mechanic of the Philadelphia, Baltimore and Valley divisions of that road, with office at Riverside, Baltimore, vice Mr. E. T. White, promoted.

Mr. John Player, for many years chief draftsman in the Brooks Locomotive Works, has been promoted to the position of mechanical engineer. Mr. Gurry, foreman of the drawing-room, has been made a chief draftsman and J. G. Blunt has been assigned as foreman of the drawing-room.

Mr. I. N. Kalbaugh, superintendent of motive power of the Baltimore & Ohio lines east of the Ohio river, has been appointed superintendent of motive power of the lines west of the river, with headquarters at Newark, O., vice Mr. W. H. Harrison, whose resignation we have heretofore noted.

On the Grand Trunk Mr. B. Stimson has been appointed locomotive foreman, with headquarters at Stratford, succeeding C. F. Neild, resigned. J. R. Donnelly succeeds Mr. Stimson. J. Hodgson, Fort Gratiot, Mich.; F. Sutherland, Montreal, Que., and S. King, London, Ont., have been appointed master car builders.

Mr. G. R. Henderson has resigned as mechanical engineer of the Norfolk & Western to go to the Schenectady Locomotive Works. Here he will be engaged in locomotive designing. Mr. Henderson's attainments are of an unusually high order and the locomotive works to which he goes are to be congratulated upon securing his services.

Prof. W. F. M. Goss, of Purdue University, has been granted a leave of absence, beginning April 1. During his absence his office will be in charge of Professor Richard A. Smart. Professor Goss will leave New York some time during the first week in April with the expectation of enjoying a vacation of several months in England and on the continent.

Mr. E. B. Thompson, who was formerly for many years chief draftsman and mechanical engineer of the Chicago & Northwestern, and who was lately mechanical engineer of the Northern Pacific, has returned to his old road, and is now on the staff of Mr. C. A. Schroyer, superintendent of car department of the Northwestern, being engaged upon special detail work. Mr. Thompson's many friends will welcome him back to Chicago.

Mr. J. E. Parmelee, of the Q & C Co., is dead. In connection with his work he was recently summoned to Kittanning, Pa. While there he was taken with a congestive chill which developed into complications from which he died at noon March 2. President C. F. Quincy pays this tribute to Mr. Parmelee: "Mr. Parmelee was with us for several years and we can all say that he was most faithful in his work, and endearing to us all in his kind manner."

Mr. Hiram W. Kimball, of the Cleveland City Forge & Iron Company, died in Cleveland, O., March 9. Mr. Kimball was also president of the Chapman Jack Company and was interested in the Butler Draw-Bar Attachment Co. He was a man of unusual mechanical ability and excellent business judgment, and his business life was a successful one. He had many charming social qualities, and his death will be felt as a personal loss by all who knew him intimately. He was born in Randolph, Vt., and was 54 years old.

Mr. Jno. S. McCrum, who was for many years prior to 1895 superintendent of motive power of the Kansas City, Fort Scott & Memphis, died at his home in Kansas City March 20, aged 61 years. Mr. McCrum had long been in ill health, even before he resigned the position above noted in 1895. His first railway work was on the Pennsylvania, as a machinist. He later saw railway service in Cuba and war service during our Civil war, having charge, in the latter, of the mechanical work on the government's military railways. It was in 1869 that he went to the Kansas City, Fort Scott & Memphis.

On the Chicago, Rock Island & Pacific important changes in the mechanical department have been made, as follows: Mr. J. W. FitzGibbon, assistant superintendent motive power and equipment on lines west of the Missouri river, having resigned to become superintendent of motive power of the Delaware, Lackawanna & Western, Mr. A. L. Studer is appointed assistant superintendent of motive power and equipment on lines west of the Missouri river, with headquarters at Horton, Kan. Mr. W. H. Stocks is appointed master mechanic of the Illinois division, with headquarters at Chicago, vice Mr. A. L. Studer, transferred. Mr. R. D. Fiddler, hitherto general foreman at Herrington, Kan., is appointed master mechanic of the Eastern Iowa division, with headquarters at Rock Island, vice Mr. W. H. Stocks, transferred.

Sir Douglas Galton, one of England's most prominent scientists, died March 10, aged 77 years. His active connection with the world-famous Galton-Westinghouse air brake experiments is fresh in the memory of all students of train braking. He was the leading factor in the development of life-saving methods in railroading in England. But aside from his railway work—during which he for a long term was government inspector of railways and secretary of the railroad department of the English Board of Trade—he achieved a lasting fame as a sanitary engineer. The likeness of Sir Douglas which we present is reproduced from London Engineering.

Mr. Fred C. Weir, the founder of the Weir Frog Company, of Cincinnati, died, March 1, after a long siege of pneumonia. "Mr. Weir," says the Inquirer, "was one of the best known manufacturers in Cincinnati. He was 67 years old and leaves quite a large estate. He was born at New Haven, Conn., and began life a poor boy. He learned the railway business thoroughly, and in 1855 was appointed to a position on the Russian Railway, with headquarters in St. Petersburg. In 1863 Mr. Weir, who was then the superintendent of a branch of this great road running between Moscow and St. Petersburg, resigned and returned to America. He came to Cincinnati in 1867, and soon began the manufacture of railway supplies. In 1880 Mr. Weir founded the Weir Frog Company, being the inventor of the widely known railway frogs and crossings. He also invented many special machines for the manufacturing of these articles, and his business has grown to immense proportions."

SUPPLY TRADE NOTES.

—Mr. Edward S. Taber, president and treasurer of the Morse Twist Drill & Machine Co., died March 10, aged 73 years.

—The A. French Spring Co. has removed its New York office from the Boreel Bldg. to the Empire Bldg., 71 Broadway.

—M. C. Hammett, Troy, N. Y., has just shipped an air compressor to Honolulu. He is now very busy on Richardson valves and other special work.

—Williams, White & Co., of Moline, Ill., have recently received three orders from Pennsylvania for their No. 7 bulldozers which weigh 25 tons each.

—Manning, Maxwell & Moore have opened a branch office at 26 South Water street, Cleveland, O., which they have placed in charge of Frank B. Ward.

—The Standard Pneumatic Tool Company, of Chicago, has opened an office in New York, at 141 Broadway, and placed it in charge of Mr. John D. Hurley.

—The Standard Coupler Company has removed its New York office from the Havemeyer building, 26 Cortlandt street, to Room 18, fourth floor, 160 Broadway.

—The Boston & Lockport Block Co. has found its increasing business to necessitate an increase in manufacturing facilities and has accordingly made extensive additions to its East Boston plant.

—The Chicago office of the Magnolia Metal Co., whose main office is at 266 and 267 West street, New York, has been removed from the Traders' Building to the Fisher Building, 281 Dearborn street.

—The Chas. Scott Spring Co., of Philadelphia, has engaged the services of Mr. T. J. Harahan, Jr., to represent it in connection with Mr. Wm. V. Kelly, at Chicago, with offices in the Fischer building.

—The Shoenberger Steel Co.'s properties have been bought by the American Steel & Wire Co. The price paid was about $3,000,000, of which part was cash and part stock in the consolidated company.

—The Dearborn Railway Equipment Company of Chicago has been incorporated to manufacture railway equipment. The incorporators are: Thos. F. Sheridan, Thomas B. McGregor and B. W. Barry.

—The Sanford Mills of Sanford, Me., have brought suit against the Massachusetts Mohair Plush Co. for infringement of patents owned by the Sanford Mills relative to the manufacture of frieze mohair plush.

—The Pearson Jack Co. has had a large export business during the past year. Among its home orders we may mention equipment of the wrecking cars on the International & Great Northern and on the Norfolk & Western.

—Mr. A. F. McClatchey, widely known in railway circles as a mechanical engineer, has accepted the position of mechanical superintendent of the Hawley Down Draft Furnace Co. Mr. McClatchey's headquarters are in Chicago.

—The air pump exhaust feed water heater and cylinder lubricator attachment, made by Wallace & Kellogg of Sioux City, Iowa, were specified for the locomotives recently ordered by the Eastern Ry. of Minnesota from the Rogers Locomotive Works.

—The Rhode Island Locomotive Works' plant at Providence, R. I., has been sold to the International Power Co. Joseph H. Hoadley of New York is president of the company, and Joseph Lythgoe is second vice-president and manager of the works.

—Mr. T. W. Snow, manager of the Chicago office of the Otto Gas Engine Company and of the railway department of the U. S. Wind Engine & Pump Company, has just installed a 100,000-gallon tank, on an 80-ft. elevation, at the Oelwein shops of the Chicago Great Western.

—Mr. William B. Middleton, general manager of the Taylor Iron & Steel Co., of High Bridge, N. J., died recently from the results of a severe surgical operation for intestinal trouble. Mr. Middleton was formerly connected with the Edge Moor Iron Works and with the Allison Mfg. Co.

—The Falk Mfg. Co. of Michigan has changed its title to the Falk Company. This concern has absorbed the Western Gear Co. of Milwaukee. Among other lines it will manufacture switches, frogs, crossings, gears and pinions, and has control of the cast-welded rail joint patents. The company is building an open hearth steel casting plant.

—The Cleveland Crane & Car Co., of Clevelaud, O., has been incorporated with $50,000 capital stock. The company will engage in manufacturing cranes of all kinds, hand and power hoisting machines and general machinery. George A. Armstrong, E. I. Leighton,

Charles E. Thomas, J. M. Hirschelman and A. L. Assmus are the incorporators.

—The Q & C Company on March 4 voluntarily advanced the wages of their entire factory force by an amount equalling a 10 per cent advance. It is to be hoped that the example set by this company, and by several others, who are taking this step voluntarily, will lead many others to do the same and thus allow labor to enjoy its share of the present prosperity.

—A decision was rendered in the United States court at Portland, Me., March 22, by Judge Putnam, in favor of the Adams & Westlake Co., of Chicago, in a suit that has been pending for three years. The defendant in the suit was the E. T. Burrowes Co., of Portland, and the action related to an alleged infringement of the plaintiffs' patent on a car shade.

—The Pittsburgh Steel Casting Co. has been organized with a capital of $75,000. It will build a plant to be in operation by July 1. The stockholders are Charles D. Marshall, Uriah Tinker, C. C. Smith and Howard Fisher. Mr. Smith has been connected with the Reliance Steel Casting Co. and Mr. Fisher has been with the McConway & Torley Co.

—The Westinghouse Machine Company has placed orders for $250,000 worth of machine tools for the addition to its plant which is in course of construction at East Pittsburg. Between 130 and 140 large tools were ordered. They were divided principally between the Niles Tool Works Company, Manning, Maxwell & Moore, Bement, Miles & Co., William Sellers & Co., the Pond Machine Tool Company and the E. P. Bullard Company.

—The Dayton Malleable Iron Co. have just issued a series of leaflets illustrating and describing their malleable iron door fasteners, wrenches, shop and engine torches, coal picks, brake wheels, brake forks, fire shovels and drinking cups, and roof saddle for running boards. Each specialty is given a leaf, and this method of publication provides excellently for classified filing in catalogue cases. Considerable pains have been taken, in their preparation, to make them attractive typographically.

—The Chas. Scott Spring Co., whose works in Philadelphia were almost completely destroyed by fire March 13, announces that it has already made preparations to rebuild. During the construction of the new building the company will fit up temporarily to take care of all orders now on its books as well as all other orders it may receive. The company wishes to assure its customers that there will be practically no delay whatever in filling orders.

—The Standard Car Truck Company, Old Colony building, Chicago, reports orders for the Barber truck during the past four months aggregating something over nine thousand trucks. These are all second or third orders from roads which have been using the truck for from one to four years. The cars are from seventy to eighty thousand pounds capacity. Several roads are applying the Barber truck to locomotive tenders because of the excellent qualities it has shown under their cars.

—The business of the C. H. Haeseler Co. of Philadelphia has been purchased by the National Pneumatic Tool Co. of Philadelphia. Mr. Haeseler remains with the new company, in the capacity of general manager. The increase in this company's business, which comprises a full line of compressed air tools and machinery, has been such as to necessitate the doubling of the capacity of its shop, and it is now installing machinery to that end. The company's city offices, which will have entire charge of the product of the business, are now located at 18 South Fifteenth street, Philadelphia. The officers of the new company are: W. Barklie Henry, president; Winthrop Sargent, treasurer; Glenn B. Harris, secretary, and C. H. Haeseler, general manager.

—The Eastern Granite Roofing Co. of Jersey City, N. J., is the oldest and most successful, as well as by far the largest, concern in this country in its special line. Its asphalt granite roofing is in use in all parts of the United States and is extensively used by railroads for buildings, sheds, etc. In the spring of 1898 the company doubled its capital stock, and has since then doubled its producing capacity and nearly quadrupled the area of ground which it owns. The storage capacity of its warehouse has also been greatly increased, so that a very large stock of manufactured product is now carried and orders, no matter how large, can be filled without any delay. It has also perfected important improvements in asphalts by which the value of its roofings has been greatly increased. The business reputation and rating of the company are first-class.

—All who have rifles, shot guns or revolvers to keep in good order will be interested in the advertisement of the Gun Bore Treatment Co. which appears in this issue. This company began business only a few months ago, but its process has been tested for several years. The treatment hardens and darkens the surface of the bore of the gun and produces such a chemical change that the gases set free by powders of any kind cannot produce corrosion; and the treatment is equally efficient against rust from dampness. A gun treated by this process may be fired hundreds of times and then set away without wiping for months, and it will be absolutely free from corrosion when used again. The treatment also hardens the metal and makes the surface so smooth that all possibility of "leading" is avoided. The surface of gun barrels can also be submitted to this process and it is believed that it can be successfully applied to the treatment of other metallic surfaces which would be benefited by being made hard, smooth and rust proof. The offices of the company are at 5 and 7 Warren St., New York city.

—Reports concerning new shops and shop additions were made during the month as follows: The Gulf, Beaumont & Kansas City will erect a machine shop in Beaumont, Tex.—The Atlantic, Valdosta & Western proposes to build shops at Jacksonville, Fla.—The Pittsburg & Lake Erie will build a new round house at McKee's Rocks.—The Louisville, Evansville & St. Louis will build a roundhouse and machine shop in East St. Louis.—The Central Branch will erect a new car shop building at Atchison, Kan.—The Chicago & Northwestern is contemplating erecting extensive additions to its shops at West Fortieth street, Chicago. Plans are now being prepared.—The Houston & Texas Central roundhouse at Eunis, Tex., will be completed about May 1.—It is reported that the Ohio & Southern will build new shops at Springfield, O.—The Texas & Pacific is building a roundhouse and shops at Fort Worth, Tex.—The contract for the erection of a new car repair shop for the Philadelphia & Reading at Schuylkill Haven, Pa., has been awarded to Armstrong & Printzenhoff.—Work on the construction of the Pennsylvania Railroad Co.'s new boiler shops at Altoona has been started.—It is stated that the Baltimore & Ohio Southwestern will build a substantial addition to its boiler shop, at the Chillicothe shops.—The Cleveland & Pittsburg is to improve its shops at Wellsville, O.—The old M. K. & T. shops in East Sedalia closed down Feb. 25 and the machinery was moved into the new shops in Southwest Sedalia. Practically all of the new machinery is in position. These shops are described in this issue.—The Chicago, Peoria & St. Louis car shops at Springfield, Ill., were destroyed by fire March 3.—The Texas Central contemplates moving its machine shops from Walnut Springs to Dublin, Tex.—There is rumor that the Southern Pacific will build new shops at San Antonio.—The roundhouse in Louisville, Ky., occupied jointly by the Illinois Central and the Louisville, Henderson & St. Louis, was destroyed by fire Feb. 28.—The roundhouse of the Southern Pacific at El Paso, Tex., was destroyed by fire Feb. 28.

—The new steel car works at McKee's Rocks, Pa., to be erected by the Pressed Steel Car Company, will occupy about 120 acres. Already orders have been placed for $700,000 worth of large machine tools, and the buildings will cost $250,000. About 3000 men will be employed. The property will be directly opposite the Allegheny plant of the company. Four main buildings, each 1000 ft. long and 70 ft. wide, will be erected for the erecting and painting departments, and three buildings, each 650 ft. long and 70 ft. wide, will be built for the shearing, pressing, punching, riveting and assembling departments. A large power house will also be erected at the water's edge. A machine shop will be added. Six hydraulic presses, ranging in size from 700 to 1200 tons each, have been ordered from Mackintosh, Hemphill & Co. of Pittsburg, and two of 800 tons from Bement, Miles & Co. of Philadelphia. Fifteen riveting machines, each with 9 ft. 2 ins. gap, have been ordered from the Chambersburg Engineering Company of Chambersburg, Pa.; Bement, Miles & Co. and William Sellers & Co., Incorporated, of Philadelphia. Twenty riveters have also been divided among the same firms. Fifty punching machines were divided between the Hilles & Jones Company of Wilmington, Del., and the Long & Allstatter Company of Hamilton, O. Twelve shears, capable of cutting plates 9 ft. 2 ins. wide and ¾-in. thick, were also ordered from the same firms. Twelve heavy axle lathes were ordered from Manning, Maxwell & Moore of New York and two from Bement, Miles & Co. of Philadelphia. Three wheel borers were also ordered from Manning, Maxwell & Moore and two wheel presses will be made by Bement, Miles & Co. The Shaw Electric Crane Company of Muskegon, Mich., were awarded the contract for 16 electric cranes, each with a span of 70 ft. and capable of lifting 15,000 lbs. Five batteries of boilers, with an aggregate capacity of 1400 horse-power, have been ordered from the Cahall Sales Department of Pittsburg. The plant will be the most complete of its kind in the world and will have a daily capacity of 40 of the largest steel cars now being made. It is the intention of the Pressed Steel Car Company to operate the present works in Lower Allegheny and this plant, in connection with the new works at McKee's Rocks, Pa., will give the company an output of from 70 to 80 steel cars per day. As there are about 12 tons of plates and shapes to each car, it means a daily consumption of close to 1000 tons, all of which will be furnished by the Carnegie Steel Company, Limited, under the terms of the contract recently made between the two concerns. It is expected to have the works at McKee's Rocks in operation in about six months.—Iron Age.

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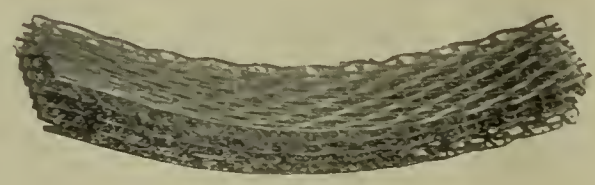

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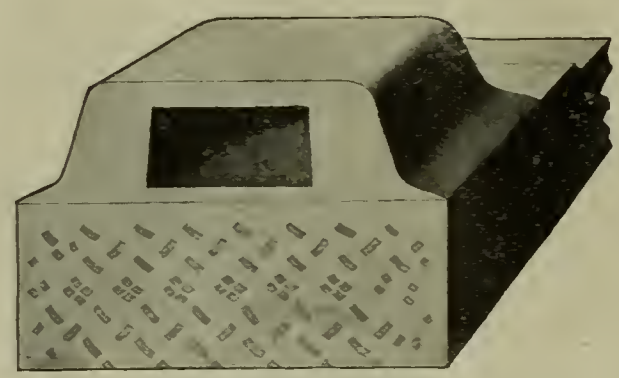

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RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor

EDWIN N. LEWIS, Manager.

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THE London correspondent of "Railways," a weekly paper published in Calcutta, India, referring to the policy of the governmental management of the railways of India, says in the issue of March 8: "Your government does not encourage the meetings of railway superintendents; read the Railway Master Mechanic journal, and compare this fatuous policy with the American practice!" But if the railways of this country were owned and managed by the government, would not that spirit which now causes railway officials and employes to form associations and discuss matters relating to improvement and progress in railway practice, soon die out and disappear?

THE combination of several of the car journal bearing manufacturing companies into one organization seems likely to be effected. Embraced in it are said to be the Damascus Bronze Co., Pittsburg; Buffalo Brass Co., Buffalo; U. S. Bronze Co., Cleveland; Milwaukee Brass & Copper Co., Milwaukee; More, Jones & Co., St. Louis; Fulton Iron & Engine Works, Detroit; Paul S. Reeves & Son, Philadelphia; Hewitt Mfg. Co., Chicago, and the Hunt Mfg. Co., Newark, N. J. What proportion of the car journal bearings used in this country are made by these companies we do not know, but it must be a considerable one. Every one who reads this list of names will notice at once that the Ajax Metal Company is not in it. The Ajax people announce that they will not join this combination nor any other, but will go on doing business at the old stand in the old way. Probably they are wise in this. Those who are outside such combinations usually do a good deal of business besides having a lot of fun. They can raise the "anti-trust" and "anti-monopoly" cries for all they are worth and they are worth a good deal in a business way. The scheme of compelling the railroads to buy of one concern by destroying all competition, is an "irridescent dream" and many of these combinations of manufacturing concerns are simply clearing the ground for new and competing companies which will divide the business and keep prices about where they ought to be. In the case of this journal-bearing combination, with the Ajax Metal Company (and also, it is said, the Brady Metal Company), left out, there will be strong competition from the start and anything approaching monopoly will be impossible. But those of our friends who have got their price in actual cash for their brass foundries will not have to walk the floor at night.

"ONE shovel" firing is referred to by "Subscriber" in another column of this issue. Light firing at very frequent intervals is an old practice, but one which, we must confess, has been very slightly followed, valuable though it was years ago well known to be. In our last issue we dwelt at some length upon this subject, and in that issue we also gave an illustration of the special fire door which is used on the Southern Pacific to facilitate the one-shovel method of firing. In our article just referred to, we touched upon the need of the thorough understanding between engineer and fireman needed to insure the best, or even good, results in the way of economical firing. Some further thoughts in this line may not be amiss. There are several conditions which must be fulfilled to produce the most economical firing, but one of the most important of these is a mutual understanding between the engine man and the fireman as to which is the responsible one, and as to the manner in which the engine is to be run. For instance, the fireman should handle both the water and the coal and he should know the profile of the road thoroughly so that he may fire in a way to insure meeting all changing rate of demand for steam. The fireman's knowledge of the profile will be sufficient for his guidance when making a usual run over the road, but for information concerning unusual stops or slow-downs he must, in many cases, depend upon receiving warning from the engineer so that the fire may be manipulated accordingly. The engineer and fireman must work together if the best results are to be obtained; but it happens too frequently that the engineer will keep his head out of the window during an entire trip and not notice how the fireman is succeeding with his duties; indeed, the fireman is ever guessing what the demand for steam will be. This condition is not wholly the fault of either: the engineer is glad to be rid of the responsibility and the fireman insists that it is he who is doing the firing. As has been said in these columns before, one man should have the entire responsibility of the machine and the best results will not be obtained until this is so or until the members of each crew understand each other thoroughly.

WRECKS OF HEAVY STEEL CARS.

It has frequently been asked how seriously the new type of steel cars of from 80,000 to 100,000 pounds capacity would be injured in a wreck, and what provisions the railroads would need to make to keep such cars in repair. But while the prospects of the necessity of repairing wrecked metal cars appeared more or less visionary, serious attention was not given the question. However, the question was recently placed squarely before one of our large railroads. While the railroad officials interested worked earnestly to solve it, they felt entirely free to call in the assistance of the builders and insist that the latter use their experience gained in building as a guide to the solution of the problem of repair.

A number of these metal cars were in a very serious wreck recently, and several of the cars were very badly damaged; on some all the sills were bent upward at the bolster, the ends were jammed inward, the sides twisted and the general appearance was such as to suggest the ruins of the metal-frame buildings of the World's Fair after the fire. We have not as yet been informed as to what means were adopted to make the needed repairs, nor, in fact, that such means have as yet been decided upon. Undoubtedly, however, experiments have been or will be made to learn if the twisted parts can be straightened without cutting the rivets which secure such members to others, which do not need repair. For some time following the wreck in question, however, men whose experience make them competent to give valuable opinions, doubted seriously whether such a course could be followed with satisfaction. Should it be found necessary in such cases to cut the rivets and separate the members of the car, these same experienced men have stated that they would not be surprised if it be found cheaper to put such seriously wrecked cars through the rolling mills again and build them entirely new.

It is probable, and certainly to be hoped, that such accidents will not happen frequently; nevertheless there is always the same possibility for accidents to trains of these cars as to trains of wooden cars, and accidents to the former are very apt to occur with much more force, and therefore, with much more seriousness, than with other cars. A word will explain this: It is usual to use 70 per cent of the weight of the light car for braking power; but let us assume that with these metal cars the braking power is 90 per cent of the weight of the empty car. Metal cars weighing 28,000 pounds empty, are offered with a guaranteed capacity of 100,000 pounds and if stenciled this capacity are supposed to carry 110,000; then using 90 per cent of the light weight there is available for braking power 25,200 pounds and the loaded car weighs 138,000 pounds; the braking power available, therefore, on a loaded car is only 18 per cent. Using 100 per cent of the weight of the empty car for braking power, the percentage for the loaded car is increased only to 20 per cent.

Assuming then, that with trains of cars of 100,000 pounds capacity, the danger signals are visible at no greater distance than when other trains are handled, it is very easy to understand not only why collisions with trains of these heavier cars, with 20 per cent braking power, must be more serious in force, if not in effect, but also why such collisions should be more frequent. Of course, means will be provided gradually to mitigate these evils and some of these means at once available are: greater precaution, if possible, in handling such trains both by dispatchers and engine and train crews and, at approaches to crossings and stations, an increased distance to the distant signal.

BRAKING LONG TRAINS.

The recent Detroit meeting of the Association of Railroad Air Brakemen was one of the most successful that has been held in the history of the organization, both in attendance and in point of interest shown by those who were present. The regular business of the Association in its sessions was given the closest attention and the discussions were active and profitable. The paper, with its subsequent discussion, bearing upon the breaking in two of trains and the causes thereof, was one of the most exhaustive and valuable of those presented to the meeting, and it calls to our mind some thoughts, relating more particularly to braking problems, which it may be desirable to present.

Is it not possible that the American railway world has about reached the practical limit in length of trains?

It is all very well to say this question has been brought up from time to time for many years past, and that nevertheless the number of cars in a train has constantly increased. It is true, for instance, that at the time of the celebrated Burlington brake tests, a train of fifty cars was regarded as being as about the outside limit, and that now it is not uncommon to hear of trains of considerably greater length. But it must not be overlooked that the weight, carrying capacity and length of the cars has also constantly increased and yet there has been no change in the gage of track and consequently no improvement in the available opportunity for the railroad service to keep pace with the demands made upon it, except by an increase in the train length. It will, we think, be admitted by all careful observers that recent years have witnessed considerable trouble due to difficulties with the draw gear. It will also, we think, be freely admitted, that the excessive length of trains now sometimes hauled on some of our main lines increases many fold the difficulty of properly handling the air brake.

As far as speed of operation of the brake in emergency action is concerned, there is not so much trouble. It has been found by experiment that it takes a certain length of time for the slack to run in on fifty cars, say somewhere between three and five seconds, depending upon the speed and other conditions. Test has demonstrated that the quick action operation of the brake will take place upon a fifty-car train in a less time, say two and one-half seconds, and numerous tests on the road have shown that no serious damage from shock results when the quick action has been fully applied before the slack runs in. The same would hold true on trains of 100 cars. In view of this fact no reason is seen why any increased difficulty as to emergency stopping on long trains should be feared, even though their length be doubled or trebled within the next few years.

But it must be expected that difficulty will be encountered in the handling of brakes on long trains in service stops and in connection with the troubles arising out of the draw-bar problem, and these difficulties must necessarily increase continually as the length of the trains is further increased. The size of the pipe, which carries the air, as well as the dimensions of the various port openings in

the apparatus, the capacity of the main reservoir and pump, and other things of a like kind will have to receive considerable attention if there is not soon a halt called in the increase of the number of cars which one engine is required to haul.

COMPOUND LOCOMOTIVES.

The paper presented at the March, 1899, meeting of the Western Railway Club by Mr. Edwin M. Herr on the subject of "Compound Locomotives on the Northern Pacific Railway," is undoubtedly the most important paper of a similar nature which has appeared for a number of years. That it is receiving much attention from both mechanical and operating officials of the railroads is indicated by the requests for copies of the paper, which requests, we understand, have been very heavy.

There are those who have considered the question of the use of compound locomotives as being settled, in a way decidedly favorable to such use; there are those who have considered, and who now consider the question as open if indeed not already decided against the use of the compound; again, there are those who consider compounds better than simples for freight service alone, and those who prefer the compounds for both passenger and freight service. From each and all of these varying classes the paper merits, and is receiving, much attention.

It must be said at the outset that the paper bears every stamp of being entirely impartial; and it will be duly appreciated on this account. Mr. Herr seems to be thoroughly alive to the advantages to be obtained from the use of compound locomotives, and very enthusiastic in urging their assignment to proper service; but he undeniably appreciates that there are certain conditions of service in which the simple locomotive will render returns as favorable as, and even more favorable than, those possible from the use of compound locomotives. His paper must be read, too, with the understanding that Mr. Herr had at hand the best means possible from which to obtain his information; there was under his observation, freight service in level, rolling and mountainous districts, and passenger service under the same varying conditions, and he had at his disposal most of the better known types of the American systems of compounding. A better equipment and location for a thorough study of the relative merits of the simple and compound types of locomotives would be very difficult to find. His statements and conclusions are, therefore—especially when taking into consideration Mr. Herr's well-recognized powers of critical observation—sure to be classed as the most authoritative data extant on practical work with compounds. The discussions of the paper were very able, and, taken as a whole, it is felt by everyone that the status of the compound locomotive must be, since this paper and its discussion have been made public, more thoroughly understood today than ever before. It is also somewhat gratifying to note that many of the declarations made and conclusions to be drawn from the same corroborate opinions expressed, from time to time, in the columns of the Railway Master Mechanic.

The idea expressed that, too frequently, a locomotive is considered a locomotive regardless of its size, shows a true conception of the situation, because it is a fact that the overrating of the power of the early compound locomotives operated most seriously to the advantage of the compound in the minds of the operating officials and in the minds, also, of those mechanical officers who did not give the subject the attention it required and deserved; indeed, it required considerable time for those most interested in the success of the compound to grasp the situation. There are many railroad officials who do not yet appreciate the fact that the size of the cylinders and the available tractive power do not always determine the maximum rating for a locomotive; in other words, that the boiler may limit the maximum load. On long "drags" a locomotive with a certain size of boiler and cylinders may handle a heavier load than another locomotive with the same capacity boiler and larger cylinders. The demand on the boiler for steam must be considered sometimes and when the demand is greater than the boiler can supply a larger boiler must be provided or the demand from the cylinders must be reduced by compounding the cylinders, or in some other way.

It may be appropriate, in this connection, to explain under what conditions the compound may show to advantage in passenger service: Usually in passenger service a locomotive does its work at a short cut-off, and when this is the case the steam is expanded through a range as wide as is possible with the compound locomotive; but as the load increases and the point of cut-off is delayed in order to give the required power the range of expansion is reduced and there is a point beyond which the compound will show to advantage. To regain such advantage for the simple locomotive, it will be necessary to increase its size to such a point that the heavier train can be handled at a shorter cut-off. Heretofore when the question has been asked whether the compound will show economy over the simple locomotive in passenger service, the reply has been that such a road is using them on its fastest trains, but no convincing proof of the economy in such use has been furnished. There are given in Mr. Herr's paper, however, examples of service in which each has shown to advantage and one instance where the two types were on an equality. This information is certainly very valuable.

It was not to be expected that such a paper as that now under discussion, would touch upon the advantages and disadvantages of the two and the four-cylinder type. Investigations along these lines must be made privately, and the "twists" given certain parts of the machinery incident to the use of one type, must be compared with the "bends" given certain other parts of the machinery due to the design of the other type, but the fact brought out in the discussion that in either type certain parts must be made much larger and heavier than for corresponding parts of simple locomotives and that heavier tools will be necessary, should receive due consideration. It is also a fact that, until the repair men and the locomotive crew become thoroughly informed concerning the mechanisms of the compounds, the cost of repairs to the compounds will be greater than should be reasonably expected after the first two or three years of their introduction on a road.

THE TARIFF ON MACHINE TOOLS.

A western manufacturer of machine tools has sent out a circular letter strongly advocating a revision of our tariff on machinery and its reduction to a nominal rate. He states as a fact that, now, just as the European field is becoming valuable to the American manufacturer, the makers of machine tools in Europe are seriously agitating the subject of retaliatory tariffs against American machines and that if we abolish our tariffs against them the strongest argument they urge in favor of retaliation will be taken from them.

The writer also says that the American manufacturer of machine tools no longer needs the protection of the present tariff and needs not fear European competition even if the protective duties were entirely abolished. Against the greater cheapness of labor abroad is set our cheaper iron, steel and lumber, lower railroad rates, more intelligent operatives and better methods, and also a far more remunerative home market which greatly increases the volume of production and consumption, and thus lowers the cost of production.

Still further the writer says that, practically, no machinery is imported nor will be in the future, so that no revenue will be lost if the duties are abolished.

The points in the letter are very clearly put and the author has resisted the temptation to write at too great length. The letter is a model of its kind. As for the suggestions made, they come from one who has spent most of the past two years in Europe, speaks some of the continental languages and has obtained his information at first hand. He claims to be a protectionist, but insists that in the matter of machine tools, protection has accomplished all that is desirable and should now cease.

It is enough to say, at present, that, undoubtedly, the time comes in the history of every protected industry when the protective tariff should be reduced or abolished. If, after a sufficient time, the industry is firmly established and reasonably prosperous, the protective tariff has accomplished the purpose for which it was imposed, and should cease to exist. If the industry has not reached this condition, it must be concluded that protection, in that particular case, has failed of its end and the industry should be no longer nursed. Wise statesmanship will carefully watch the growth of all protected industries and will tear away the temporary props and buttresses as soon as the structure is completed. The highest efficiency of the army and navy may warrant the government in continuing the protection of a few manufacturers, but as a general rule, protective tariff should be regarded as temporary assistance granted to new and struggling industries for the sake of the general public welfare.

Whether the time has come to withdraw such protection from the manufacturers of machine tools is a fair subject for investigation. Unquestionably the manufactures have, thanks to past protection, reached a commanding position, and it is not unlikely that they can maintain this position even without the aid of tariff protection.

RIGHT OF EMPLOYMENT AND DISCHARGE.

An attempt to recover damages from a railroad company for its alleged wrongful act in making a false entry upon its record as to the cause of the discharge of an employe, to prevent him from pursuing his calling by rendering it impossible for him to get employment from other railroad companies, appears to make the recent case of Hudley against the Louisville & Nashville Railroad Company one without direct precedent.

In discussing the underlying principles, the court of appeals of Kentucky says that a railroad company has the right to engage in its services whomsoever it pleases, and, as part of its right to conduct its business, has the right to discharge any one in its service, unless to do so will be in violation of contractual relations with the employe. But its right to discharge an employe and its duty to the public and to its own vast property interests to keep in its service only persons capable of discharging their important duties in a careful and skillful manner do not imply the right to be guilty of a violent or malicious act which results in the injury of the discharged employe's calling.

Furthermore, the company has the right to keep a record of the causes for which it discharges an employe, but in the exercise of this right the duty is imposed to make a truthful statement of the cause of the discharge.

If, by an arrangement among the railroad companies of the country, a record is to be kept by them of the causes of the discharge of their employes, and when they are discharged for certain causes the others will not employ them, it becomes important that the record should contain a true statement of the causes of an employe's discharge. A false entry on the record may utterly destroy and prevent him from making a livelihood at his chosen business. Therefore, such false entry must be regarded as intended to injure the discharged employe, and must be considered a malicious act.

If it is the custom of the railroads of the country to keep such record, and that employes discharged for certain causes are not to be employed by them, then it enters into, and forms part of, every contract of employment that neither a false entry shall be made, nor one so made communicated, directly or indirectly, to any other railroad company.

Suppose it was the custom of the railroad companies when an employe was discharged without cause to give him a card or statement to that effect, and if he did not have such card or statement, he could not get employment with other railroads, then that custom would enter into every contract of employment; and if a company wrongfully refused to give it to a discharged employe, and in consequence of that refusal he was injured, a cause of action would lie for the damages sustained.

But notwithstanding these principles, and the averments made in this case, the court holds that no cause of action was stated. It holds that it should have been averred that the plaintiff had sought and been refused employment by reason of the alleged wrongful act. It says that an agreement made with other railroad companies not to employ the defendant's discharged employes did not injure

the plaintiff unless carried out. An averment that the defendant conspired and combined with other railroad companies to do an act, if unlawful, would not obviate the necessity of making the averment that he had sought and been refused employment by reason of the alleged wrongful act. Injury is the gist of the action. The liability is damages for doing, not for conspiracy.

VANDALIA LINE PASSENGER LOCOMOTIVE.

The Schenectady Locomotive Works recently built a lot of four eight-wheel passenger locomotives for the Vandalia Line, under the direction of Mr. W. C. Arp, superintendent of motive power of that road. These engines were designed for heavy and fast passenger service, and are now in regular service between Indianapolis and St. Louis, where they are giving an excellent account of themselves. We give a perspective view of one of these engines. It has 20x26-in. cylinders; 78-in. drivers; an extended

VANDALIA LINE PASSENGER LOCOMOTIVE.

wagon top boiler, which is 62¼ inches in diameter and which is designed to carry 190 pounds of steam pressure; a firebox 108¼x40 inches; a grate area of 30.7 square feet, and a total heating surface of 2241 square feet. The engines weigh 132,300 pounds, of which 85,800 pounds are on the drivers. They have steel axles throughout, and solid bronze driving boxes. The tanks of these engines have a capacity of 6,000 gallons—the largest, it is stated, yet used in passenger service.

We understand that these engines went into service with an exceptionally small amount of trouble in "breaking in" and that the runs made with them have been very satisfactory, both in speed and weight of trains hauled. Before giving the general dimensions of these engines, we will print an account of the performance of two of them—Nos. 16 and 177—in movement of second section of train No. 5 on April 21. Engine 16 pulled the train from Indianapolis to Terre Haute and No. 177 from Terre Haute to East St. Louis. The train consisted of one express car, one combination car, one coach, one diner and one sleeper. The record of the trip is as follows:

Left Indianapolis 8:56 a. m., 1 hour and 41 minutes late.
Arrived Terre Haute 10:19 a. m., 1 hour and 9 minutes late.
Left Terre Haute 10:23 a. m., 1 hour and 13 minutes late.
Arrived Effingham 11:30 a. m., 40 minutes late.
Left Effingham 11:36, 46 minutes late.
Arrived East St. Louis 1:29 p. m., 1 minute late.
Left East St. Louis 1:31 p. m., 3 minutes late.
Arrived St. Louis 1:46 p. m., on time.
Delayed 2 minutes Funkhouser meeting No. 8.
Delayed 3 minutes Collinsville, blocked by first No. 5.
Stops were made as follows:
Belt Crossing, crossing stop.
Greencastle, station stop.
Limedale, crossing stop.
Brazil, station stop.
Terre Haute, crossing stop.
Terre Haute, 4 minutes station stop and changing engines.
Marshall, station stop.
Casey, crossing stop.
Effingham, 6 minutes station stop and water.
Altamont, crossing stop.
Vandalia, station stop.
Smithboro, crossing stop.
Greenville, station stop.
Willows, crossing stop.
East St. Louis, crossing stop (B. & O. S. W.).
East St. Louis, station stop.

The running time was as follows:

Indianapolis to Terre Haute, 72.5 miles, 83 minutes, 52.41 miles per hour.

Terre Haute to Effingham, 67.6 miles, 67 minutes, 60.54 miles per hour.

Effingham to East St. Louis, 97.4 miles, 113 minutes, 51.71 miles per hour.

Indianapolis to East St. Louis, 237.5 miles, 4 hours 33 minutes, 52.20 miles per hour.

The general dimensions of these engines are as follows:

GENERAL DIMENSIONS.

Gage	4 ft. 8½ in.
Fuel	Bituminous coal.
Weight in working order	132,300 lbs.
Weight on drivers	85,800 lbs.
Wheel base, driving	8 ft. 6 in.
Wheel base, rigid	8 ft. 6 in.
Wheel base, total	24 ft. 5 in.

CYLINDERS.

Diameter of cylinders	20 in.
Stroke of piston	26 in.
Horizontal thickness of piston	5¼ in.
Diameter of piston rod	3¼ in.
Kind of piston packing	2½ in. C. I. rings.
Kind of piston rod packing	United States.
Size of steam ports	18 in. x 1⅝ in.
Size of exhaust ports	13 in. x 3 in.
Size of bridges	1⅜ in.

VALVES.

Kind of slide valves	Allen-American.
Greatest travel of slide valves	6 in.
Outside lap of slide valves	1⅛ in.
Inside lap of slide valves	0 in. line.
Lead of valves in full gear	Line and line full forward motion, ¼ in. lead at 6 in. cut off.
Kind of valve stem packing	United States.

WHEELS, ETC.

Diameter of driving wheels outside of tire	78 in.
Material of driving wheels, centres	Cast steel.
Tire held by	Shrinkage.
Driving box material	Phosphor bronze.
Diameter and length of driving journals	8¾ in. dia. x 11½ in.
Diameter and length of main crank pin journals	6 in. dia. x 6 in.
Diameter and length of side rod crank pin journals	4½ in. dia. x 4 in.
Engine truck, kind	4 wheel rigid center.
Engine truck, journals	6 in. dia. x 10 in.
Diameter of engine truck wheels	36 in.
Kind of engine truck wheels	McKee-Fuller steel tired spoke wheels.

BOILER.

Style	Extended wagon top.
Outside diameter of first ring	62¼ in.
Working pressure	190 lbs.
Material of barrel and outside of fire box	Coatesville steel.
Thickness of plates in barrel and outside of fire box	⅝ in., 11-16 ins., ½ in.
Horizontal seams	Butt joint sextuple riveted with welt strip inside and outside.
Circumferential seams	Double riveted.
Fire box, length	108¼ in.
Fire box, width	40 in.
Fire box, depth	F. 75¾ in., B. 61¾ in.
Fire box, material	Carbon steel.
Fire box plates, thickness	Sides, 5-16 in.; back, 5-16 in.; crown, ⅜ in.; tube sheet, ½ in.
Fire box, water space	Front, 4 in.; sides, 4 in.; back, 4 in.
Fire box, crown staying	Radial, 1 in. dia.
Fire box, stay bolts	⅞ in. and 15-16 in. dia.
Tubes, material	Charcoal iron, 120 in. thick
Tubes, number of	320
Tubes, diameter	2 in.
Tubes, length over tube sheets	12 ft. 5 in
Heating surface, tubes	2066 sq. ft.
Heating surface, fire box	175 sq. ft.
Heating surface, total	2241 sq. ft.
Grate surface	30.07 sq. ft.
Grate, style	Rocking Vandalia standard.
Ash pan, style	Plain dampers, front and back.
Exhaust pipes	Single.
Exhaust nozzles	4¾ in., 4⅞ in., 5 in. dia.
Smoke stack, inside diameter	17½ in. at top, 16 in. near bottom.
Smoke stack, top above rail	15 ft. 4⅞ in.
Boiler supplied by	Two injectors, Sellers' Improved No. 9½ in. R. H.; Monitor No. 9 L. H.

TENDER.

Weight, empty	46,200 lbs.
Wheels, number of	8.
Wheels, diameter	36 in.
Journals, diameter and length	5 in. dia. x 9 in.
Wheel base	17 ft. 8 in.
Tender frame	10 in. steel channels.
Tender trucks	Center bearing double I beam bolster, with side bearings on back truck.
Water capacity	6600 U. S. gallons.
Coal capacity	10 tons.
Total wheel base of engine and tender	52 ft. 2½ in.

SPECIAL EQUIPMENT.

Engine equipped with 2 Coales safety valves; N. & Co. No. 9 triple sight feed lubricator; Westinghouse-American combined brakes on drivers, tender and for train; Leach sand feeding apparatus; Janney coupler at front of engine and rear of tender; steam heat apparatus complete for tender and train; lagging and jacket made removable over stay bolts.

The Design and Maintenance of Compound Locomotives.

In Mr. Herr's admirable paper on Compound Locomotives on the Northern Pacific Ry., a brief abstract of which is elsewhere given in this issue, occur the following suggestive paragraphs in the shape of notes on the design and maintenance of compounds:

Many railroad mechanical men, while freely admitting that the compound locomotive in heavy service will prove more economical in the consumption of coal than the simple engines of the same weight, boiler capacity, steam pressure and general design, give as their reason for not advocating the compound locomotive for such service, its liability to failure on account of breaking down, increased cost of maintenance and consequent longer enforced idleness. Were the failure of compound locomotives generally in the compounding features, and were such failures difficult to remedy, such objections to the use of such locomotives would have great weight. The intercepting and separate exhaust valve, where present, the receiver in the two-cylinder type, and the larger low pressure cylinders are the peculiarly compound features. Investigations will show that the increased cost of maintenance and general unsatisfactory performance is not on account of broken intercepting valves, leaking receivers, or difficulty in packing or counterbalancing the low pressure cylinder. Failures occur on account of broken frames, broken cylinders, unequal wear on the low and high pressure sides of the engine, broken piston rods, cut high pressure valves and consequent break-down in the valve motion, cut and badly worn cylinders and other causes, practically all of which are clearly traceable to either bad design, construction, or improper care in maintenance. It would seem an admission of inability to cope with the engineering problem of the design of the compound locomotive, or the administrative ability to care for a machine which is acknowledged to save a considerable proportion of the largest single item of expense on a railroad, to refuse to use such a machine because it breaks down. Is it not rather the duty of railway mechanical officers to study the causes of failure in such machines, and by remedying such defects as develop in existing types, learn to design a compound locomotive so strengthened in the weak places and modified in those of impractical construction that it will not fail in service. This accomplished, a further careful observation and effort to learn how to so care for and operate this more economical machine will soon enable its cost of maintenance to be reduced, just as long years of practice and care have done in the repairs of the simple locomotive.

No one realizes more keenly than the writer, that the problems above referred to are by no means easy. The importance of knowing exactly what difficulties are experienced in regular operation and immediately applying some remedy for every defect cannot be too strongly impressed. The old adage "a stitch in time saves nine" was never more apropos than in caring for a compound locomotive.

COMPOUND LOCOMOTIVES ON THE N. P. RY.

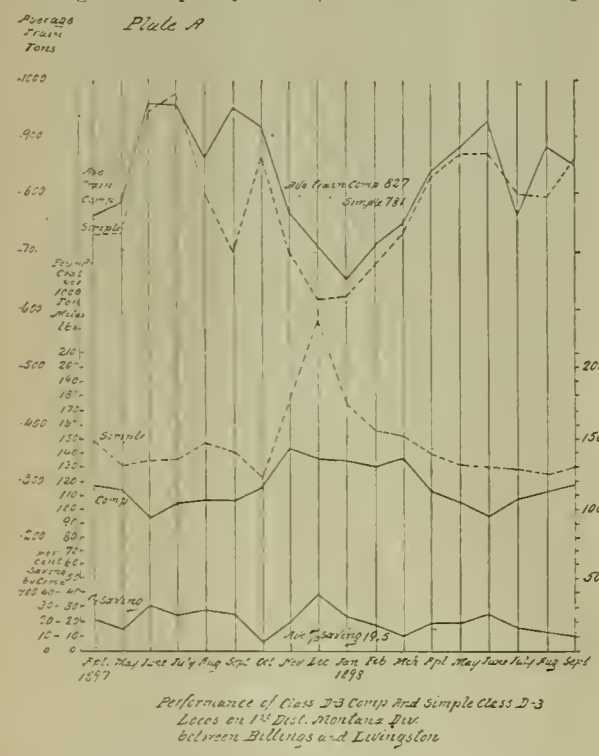
At the March meeting of the Western Railway Club Mr. E. M. Herr, formerly superintendent of motive power of the Northern Pacific, presented an unusually valuable paper on compound locomotives, based upon the service of such engines on that road. We append extracts from that paper, as follows:

The types represented include the Baldwin 4-cylinder and the Schenectady, Richmond, Pittsburg and Brooks 2-cylinder systems of compounding. The sizes and types of the compounds range from Moguls with 85,000 lbs. on drivers and with 19 and 27x24 ins. cylinders, to a mountain consolidation having 166,000 lbs. on the drivers and cylinders 23 and 34 ins. diameter by 34 ins. stroke. Ten-wheel engines for both passenger and freight service, weighing respectively 112,000 lbs. and 126,000 to 132,000 lbs. on drivers and also consolidation engines with 135,000 lbs. on drivers and mastodons with 150,000 lbs. on drivers are included. Table 1 gives data relative to these engines and also the simple engines with which they can be compared. We will make several extracts from Mr. Herr's paper and will quote him here with reference to the engines, for which data is given in Table 1, as follows:

CLASS	Date First in Service	STYLE	BUILDERS AND STYLE OF COMPOUND IF CHANGED.	Type of Comp.	Number of Engines in Service	CYLINDERS			BOILER						ENG. DIMENSIONS				Total Wheel Base Engine and Tender	WEIGHTS LOADED IN WORKING ORDER				Steam Pressure
						H. P. Dia.	L. P. Dia	Stroke	Grate Surface	Heating Surface: Fire Box	Heating Surface: Tubes	Heating Surface: Total	Dia. Shell	Type	Dia. Drive Wheels	Dia. Truck Wheels	Rigid Wheel Base	Total Wheel Base		On Drivers	On Truck	Total Eng.	Total Engine and Tender.	
						Inches	Inches	Inches	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Inches	Ext.	Inches	Inches	Ft. In.	Ft. In.	Ft. In.					
D-3	1-97	Mogul	Baldwin Simple changed to Richmond Comp.	2 Cyl.	1	19	29	24	16.77	130	1419	1549	56	Wagon T	56	30	15-3	23-4	45 3	85000	18500	104400	175300	180
"	1-97	"	" " " " Pittsburgh	2 "	1	19	29	24	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	1-97	"	" " " " Baldwin "	4 "	1	13	22	24	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	1-97	"	" " " " Brooks "	2 "	1	19	27	24	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
D-5	11-97	"	Baldwin Simple with new boiler ch'g'd to Schen. Comp.	2 "	1	19	30	24	18 4	145	1601	1746	58¼	"	"	"	15-8	23-9	"	102000	"	120500	191500	200
F-1	9-96	Mountain Consol.	" " changed to Baldwin Comp.	4 "	3	15	25	28	35 3	167	2154	2321	72	Straight	50	"	14-0	22-3	49-2	138000	20000	158000	235000	180
P	6-97	Ten-Wheel Passr	New Schenectady Compound	2 "	9	22	34	26	30 8	203	2332	2535	62	Ex.W.T.	69	33	14 10	25 10	52-2	112000	43500	155500	249500	200
R	8-97	" " Freight	" " "	2 "	20	22	34	26	34 2	240	2655	2895	76	Ex.W.T.	63	30	14-10	25-11	52-9½	120000	46500	172500	264500	"
S	5-98	"	" " "	2 "	8	22	34	28	34 2	240	2655	2895	70	"	63	30	14-10	26-3	53-1½	130800	42000	173800	268800	"
X	2-97	Mountain Mastodon	" " "	2 "	4	23	34	30	35	222	2722	2944	72	"	55	28	15-6	26-4	53-8	150000	36000	186000	270700	"
Y	11-98	" Consol	" " "	2 "	14	23	34	34	35	222	2706	2928	72	"	55	30	14-8	23-3	51-9½	166000	20000	186000	298000	210
SIMPLE LOCOMOTIVES WITH WHICH ABOVE COMPOUNDS CAN BE COMPARED																								
D-3	.....	Mogul	Baldwin		95	18	...	24	16.77	130	1419	1549	56	Ex.W.T.	56	30	15-3	23-4	45 3	85000	15000	100000	170900	150
D-5	.....	"	" with new boiler		3	18		24	18.4	145	1601	1746	58¼		56	30	15-8	23-9	45-3	93600	15000	108000	179600	180
F-1	.....	Mountain Consol			29	22	...	28	35 3	167	2154	2321	72	Straight	50	30	14-0	22-3	49-2	135000	15000	150000	227600	150
P	.....	Ten-Wheel Passr	Schenectady		9	20	.....	26	30.8	203	2332	2535	62	Ex.W.T.	69	33	14-10	25-10	52 2	110000	38000	148000	242000	200

TABLE 1—PARTICULARS OF COMPOUND AND SINGLE LOCOMOTIVES, NORTHERN PACIFIC RAILROAD.

The D^3 and F^1 compound engines are the same as the D^3 and F^1 simple, excepting the cylinders and other compounding features. They are, in fact, the same engine with compound cylinders attached in place of the original simple cyliuders, and the boilers strengthened to carry 180 instead of 150 pounds of steam. The D^5 compound engines are identical with the same class of simple engines, except the cylinders aud other compounding features, all this class of engine, both simple and compound, having new boilers carrying 200 pounds of steam. The simple engines, however, were only worked at 180 pounds. The Class P compound engines are also identical with the corresponding simple engines except the cylinders and other compouuding features. The changes from simple to compound, even if the engine is otherwise identical, make the compound heavier by the additional weight of cylinders. These excess weights are estimated in the table, except in the case of the D^5 engine. The weights of the new Schenectady engines are actual weights, excepting the Class Y, which is estimated by the builders.



Performance of Class D-3 Comp And Simple Class D-3 Locos on 1st Dist. Montana Div. between Billings and Livingston

The D^3, D^5 and Class R engines are all in through freight service on divisions where little local business originates, and therefore are called upon to do but little switching. The D^5 engines have more switching to do than the other two, but even they are required to do comparatively little. The trains the D^5 draw are carded to make 14.6 miles per hour east bound, and west bound 16.3 miles per hour. Those hauled by the D^3 compounds are carded 13.2 miles per hour east bound, and 13.7 miles per hour west bound, all on single track with frequent meeting points. The Class R engines on the second and third districts of division, between Spokane and Pasco, and Pasco and Ellensburg, were generally used on express freight trains carded between the two former points east bound 15.3 miles per hour, west bound 17.5 miles per hour; between the two latter, east bound 17.7 miles per hour, west bound 13 miles per hour.

The Class P engines are used in passeuger service exclusively, those the performance of which is shown on Plate D, running between Spokane and Ellensburg. This is a continuous run of 273 miles with heavy trains of 10 to 15 cars, stopping at nearly all stations, and in the summer and fall loading large quantities of express matter. The train west bound was carded 28.7 miles per hour, east bound 32.7 miles per hour in 1897. Early in 1898 speed was increased to 29.5 west bound, and decreased to 30.3 miles per hour east bound. The engines in this service make abont 8,600 miles per month and are all either double or triple crewed.

The performance of locomotives on the Northern Pacific railway is determiued by the number of pounds of coal consumed per 1,000 ton miles of train hauled, including the engine and teuder, and if of a freight train the caboose also. As the size of the train hauled has a very considerable effect upon the performauce figured as above, the weight of the average train hauled is also shown on the monthly performance sheet. On the accompanying plates are plotted the performance of certain compound locomotives, and where possible to make comparison, that of simple locomotives doiug the same service. The average train hauled is also plotted for each. The points so laid down for a series of months are joined, giving a curve showing graphically the performance and average train for as long a period as reliable data is at hand. Where a comparison between simple and compounds can be made, the percentage of saving in fuel of the compounds is also plotted.

Plate A shows the average performance, average train, and the economy of the four converted class D^3 mogul compounds over the simple class D^3 engines between Billings and Livingston on the Montana division. The work here is continuous and almost uniform westbound; the ascent of 1375 feet in 115 miles being gradual. On this plate the average performance of the four companies, D^3, is shown in full lines and the performance of the simple engines in dotted lines. The average saving of fuel of the compounds is shown to be 19.5 per cent. While none of the compounds had been through the shop since they were converted, the economy was well maintained nntil September, 1898, when the engines had averaged nearly 90,000 miles each. The compounds did not then compare quite as favorably as at first. The four compounds, class D^3, are designated as A, B, C and D. In table 2 the mileage and cost of repairs for these and the three simple class D^3 engines is given.

TABLE 2.

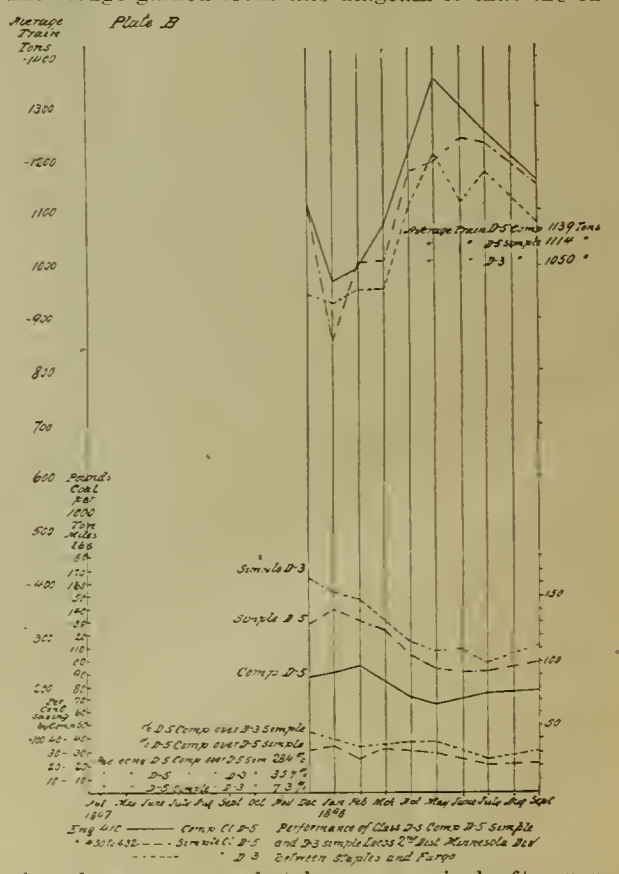
Engine.	Engine Miles.	Gross Ton Miles.	Repairs Per Engine Mile.	Repairs Per 1000 G.T.M.
Compound engine A	56886	42,146,900	$.0161	$.0217
Compound engine B	60234	49,070,628	.0154	.0182
Compound engine C	54497	42,404,236	.0154	.0198
Compound engine D	51248	40,544,366	.0121	.0153
Simple engine 507..	52915	31,400,344	.0166	.028
Simple engine 520..	63234	38,163,393	.012	.0198
Simple engine 566..	52738	34,612,835	.0184	.0284

Plate B shows the performance of the class D^5 compounds and simple engines and also the class D^3 simple engines between Staples and Fargo. The performance of the compound D^5 is shown in full lines; the simple engines D^5 in dash and dot lines and of the simple engine D^3 in dotted lines. The average train hanled by the compound was 1139 tons, by the D^5 simple engines 1114 tons, and by the D^3 simple engines 1050 tons. In fnel economy the D^5 componnd showed a saving of 28.4 per cent over the D^5 simple and 35.7 per cent over the D^3 simple. The D^5 simple engine showed 7.3 per cent fnel economy over the D^3 simple engine. The section of road on which these resnlts were obtained is said to be particularly favorable to the compound, as conditions permitted trains to be filled up in both directions. The grades over this section are ascending and descending both ways and are moderate. Table 1 will show that the compound D^5 carried 200 lbs. steam pressure and the simple engines D^3 and D^5 carried 150 lbs and 180 lbs. steam pressure respectively. On acconnt of the inequality of mileage made by the three classes of engines, a comparison in cost of repairs is made only between the compound and simple D^5 engines. Table 3 gives the mileage and cost of repairs for the D^3 engines.

TABLE 3.

Engine.	Engine Miles.	Gross Ton Miles.	Repairs Per Engine Mile.	Repairs Per 1000 G.T.M.
Compnd. D5, No. 410	19357	22,879,392	$.013S	$.0116
Simple, D5, No. 430	23835	27,697,742	.013	.0112
Simple, D5, No. 431	24215	25,493,019	.0148	.0141
Simple, D5, No. 432	20858	24,051,100	.022	.0191

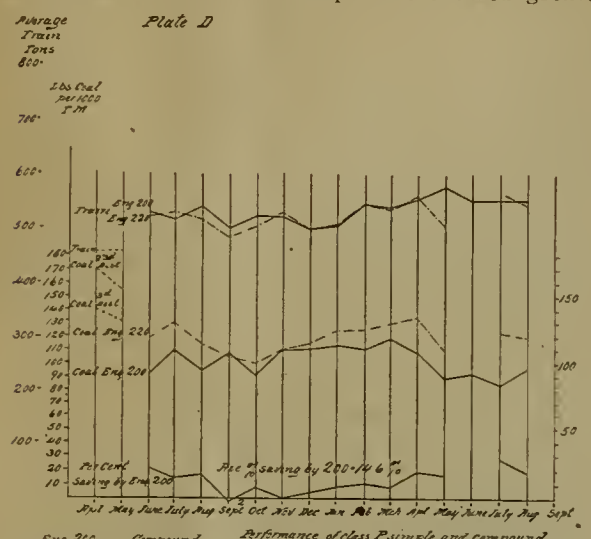
Plate C, which we do not reproduce, is principally a comparison between compound engines of class R on different sections of the road. The principal knowledge gained from this diagram is that the engines became somewhat less economical after running about 70,000 miles in heavy service. It is stated somewhat in explanation that the coal was of inferior quality in the latter part of the service recorded.



Performance of Class D-5 Comp D-5 Simple and D-3 Simple Locos 2nd Dist. Minnesota Div between Staples and Fargo

Plate D shows the relative performance of the class P simple and componnd passenger engines between Spokane and Ellensbnrg. The conditions of this service are given, somewhat, in an extract already made from the paper. The profiles for the sections of road over which these runs were made show the grades to be very heavy. The run is a continuous one of 273 miles, as before stated. On plate D the performance of the compound engine is shown in full lines and of the simple engine in dash and dot lines. The average train was upwards of

500 tons and at one time upwards of 550 tons weight. The average fuel economy in this service was 14.6 per cent in favor of the compound engines. The observations are that the compounds showed greater



economy when the trains were heaviest. The mileage and average cost of repairs is given in Table 4.

TABLE 4.

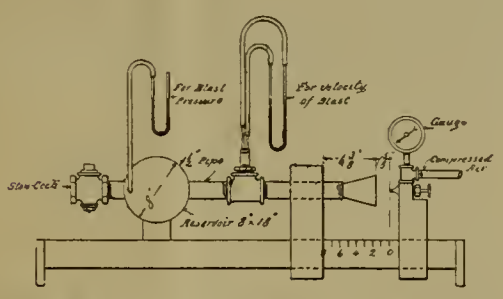
Engine.	Engine Miles.	Gross Ton Miles	Repairs Per Engine Mile.	Repairs Per Gross Ton Mi.
Compd., Cl. P, 200	106473	57,450,095	$.0226	$.042
Simple, Class P, 220	95347	50,361,863	.0228	.0431

Plate E, which we do not reproduce, shows the comparison between different types of compounds; classes X and F¹. Here the fuel consumption is found to be practically the same per 1000 ton-miles for the two type of compounds. Mr. Herr remarks that when the smaller average train hauled by the class F¹ engines is considered that the steam economy of these engines is somewhat the better of the two classes. He accounts for this from the fact that the engines in mountain service are worked almost always so nearly to full stroke that the cylinder ratio of the 2-cylinder compound does not give expansion enough to reach the point of greatest economy, while the 4-cylinder compound, having a larger cylinder ratio, more nearly approaches it.

It should be remembered in considering the above data that all of the compound locomotives, the performance of which is shown, have yet to receive their first general repairs. They are all comparatively new, but none have received any special consideration in the conditions under which they have thus far seen service; in fact, all master mechanics were instructed to put the compounds to the hardest test and always favor the simple engines in case conditions were not the same. Their performance in ton miles indicates that these instructions have been carried out. The exact facts as to the general design, conditions of operation and the results obtained, both as to performance, fuel economy and running repairs, have, it is believed, been faithfully given.

COMPRESSED AIR FOR FORGE BLASTS.

Tests to determine the relative value of compressed air and the fan for forge blast were made some time ago by Mr. J. F. Deems, master mechanic of the Chicago, Burlington & Quincy Railroad, at West Burlington, Iowa, and the results



APPARATUS FOR TESTING COMPRESSED AIR JETS.

were recently reported by him to the Western Railway Club. It will be remembered that we illustrated in a recent issue the air jet forge blast used by Mr. Deems at an outlying forge. The apparatus used for the tests referred to was of a similar form, as shown in our present engraving, the pipe being fitted with mercury tubes for measuring the blast pressure and also the velocity of the blast. The delivery jet was so arranged as to be readily placed at varying distances from the bell of the pipe.

The results obtained showed very conclusively that the air jet was vastly less efficient than the fan. Mr. Deems said of these results: "It was found that the very best results obtained in this way with a jet were as one to about twenty-five.

Table No 1

Observation Number	Pressure of Blast in ounces	Vol. of Blast in cu. ft. per sec.	Cu. ft. of Blast, per cu. ft of compres'd air used	Cu. ft. of Blast, per min. per H. P. at compr'sor	Remarks.
1	1.85	1.977	6.531	58.779	Air pressure constant—(100 lbs).
2	3.30	1.607	5.310	47.790	Posit on constant—No. 81.
3	3.15	1.517	5.012	45.108	Blast throttled with 1½ in. stop cock.
4	3.45	1.410	4.657	41.913	Ob. 1—B ast pipe free, stop cock off.
5	3.60	1.337	4.418	39.762	" 2—stop cock on pipe, wide open.
6	3.725	1.274	4 209	37.881	
7	3.90	1 200	3 965	35.685	
8	4.075	1.122	3 706	33.354	
9	4.35	1.021	3.374	30 366	
10	4.45	.954	3.153	28.377	
11	4.625	.8731	2.883	25.947	
12	4 825	.793	2 620	23.580	
13	5.00	.643	2.175	19 575	
14	5.25	.514	1.700	15.300	

Table No 2

Observation Number	Air Pressure Gauge	Pressure of Blast, in ounces	Vol. of Bast, in cu. ft per sec.	Cu. ft. of Blast per cu. ft. of compres'd air	Cu ft of Blast per min. per H. P. at compr'sor	Remarks
1	100	2.85	1.628	5.378	48.402	Constant position—(No. 8).
2	95	2.75	1.597	5.475	49.275	" opening in blast pipe; stop-
3	90	2.65	1.555	5 549	49.941	cock wide open
4	85	2.50	1.512	5.634	50.706	
5	80	2.30	1.456	5.691	51.219	
6	75	2.20	1.427	5.900	53.100	
7	70	2.00	1.356	5.925	53.325	
8	65	1.85	1.300	6.072	54.648	
9	60	1.70	1.248	6.296	56.664	
10	55	1.55	1.221	6.543	58.887	
11	50	1.45	1.165	6.442	57.978	

Table No. 3.

Observation Number	Distance from jet	Pressure of Blast in ounces	Vol. of Blast in cu. ft. per sec.	Cu. ft. of Blast per cu. ft. of compres'd air used	Cu. ft. of Blast per min. per H. P. at compr'sor	Remarks
1	7	1.975	2.002	6.614	59.526	Air pressure constant—(100 lbs).
2	8	1.875	1.946	6 559	59.031	Blast outlet constant—stop-cock
3	9	1 700	1.892	6.248	56.232	taken off.
4	10	1 475	1.774	5.860	52 740	
5	11	1.250	1.648	5.444	48.996	
6	12	1.050	1.530	5.053	45.477	

Table No 4.

Compressed air used by "jet" at various pressures

Air Pressure.....	100	95	90	85	80	75	70	65	60	55	50
Cu. ft. of compressed air per sec.....	.3027	.2917	.2803	.2684	.2559	.2419	.2288	.2141	.1982	.1866	.1809

COMPRESSED AIR JET TESTS.

when compared with a fan. It would appear from this that there is not very much economy in using compressed air, except in places where there could not be utilized the blast from a fan. This would be an excuse, sometimes, for the use of compressed air. The figures are rather startling to me. I did not think there would be as much difference as is shown." The diagram and table given herewith show the results obtained.

SOME POINTS ABOUT MAKING CAR BRASSES.

Some time ago Mr. James Swan, foreman of the brass foundry of the Atchison, Topeka & Santa Fe at Topeka, Kan., made a report to a friend upon the general subject of the making and care of journal brasses, and we are permitted to present some extracts from this report, as follows. All his statements may not be fully accepted by other founders; but they are as a whole, valuably suggestive as an expression of view from a successful, practical, brass founder:

I would first call your attention to sample of brass marked "27," which is the end of a 27 coach brass, such as is used on the A., T. & S. F. Ry. You can see for yourself the clean, compact character of the metal of which it is composed. What I may say of these coach brasses may be said of all the journal brasses that are made at the A., T. & S. F. shops at Topeka.

The brasses are moulded with the greatest possible care. By this I mean that we avoid hard or wet spots on the face of the mold, so that we may prevent any disturbance of the metal while flowing into and setting in the mold. There is where the first trouble generally begins; the molding being improperly performed. You cannot expect any good from journal brasses full of blow holes and scaly cells on the face of the brass, which are usual signs of a separation of the metal. Metal of this kind may be expected to show red copper spots.

Then again, the spots may be caused by the brass not being properly fused for want of sufficient heat, or not being stirred to combine it properly. Such brasses, whose copper is not diffused, being left in clots, as it were, will have more or less tendency to heat, and there may appear black and red spots, and greatly discolored, as if burned on the bearing surface. The bright copper spots seem to be pure copper revived; the black spots may be black oxide of copper or carbonate of copper, caused by carbonaceous matter being burned on the journal when the brass was hot.

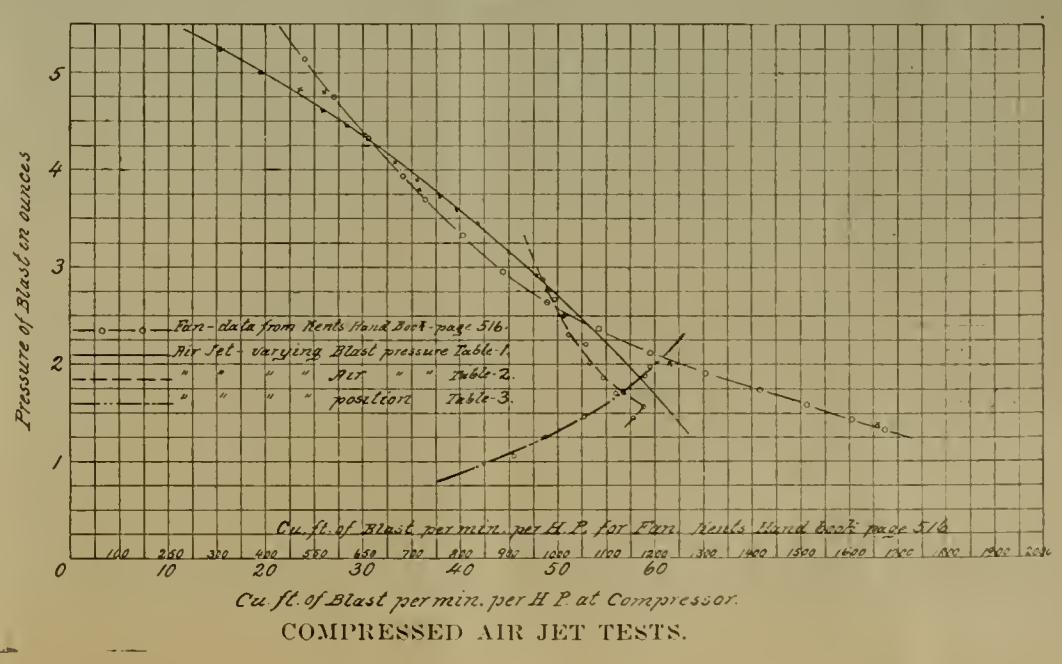
The importance of fusing and mixing the metals properly cannot be overrated, for on this depends the fineness and solidity of the castings. Our method is to melt the most refractory metal first, viz., copper; then the zinc; then tin; and bring the whole to a high temperature; then cool back to a lower temperature, which we think is most suitable for the piece of work we are about to cast. This temperature, after the metal is well stirred, is cooled down to a bright red, but still giving off a little flame from the crucible, and I find it about the right heat to pour all coach and car brasses. The right temperature at which to pour the work is one of the necessary things to learn to be successful at either iron or brass founding.

Now, I must revert to the sample brass No. 27. This is my chief journal metal for coaches, heavy freight and common freight brasses. The component parts are 6 1-2 lbs. of copper, 1 lb. of tin, and 2 1-2 oz. of zinc. The above is coach and freight car journal metal, until it has been used once on the road. When it is returned to be worked over, we add 20 lbs. of copper, 1 lb. of tin, and 1 lb. of zinc to every 140 lbs. of coach brass. It is now a better metal on this second melting than it was at first, when it was all new metal. This sample No. 27 is this very metal of the second melting.

I will say a few more words about copper spots, and how they may be prevented. I am satisfied that there are several causes for the appearance of these copper spots. They are: fusing the metal at too low a temperature; hard or wet places in the mould; thereby causing a metal distnrbance and separation. From what I can learn, people who have molding machines and depend entirely on the machine are the most troubled with copper spots; for years past proper care in doing the molding has been sadly underrated, and any kind of an impression in the sand is supposed to be good enough to receive the metal. This is all wrong. The fact is, the mold should have the greatest care as regards firmness, venting and temperature of the metal when pouring. Then, after everything has been done in a proper manner as regards molding, the patterns should be 3-16 of an inch in diameter larger than the journals they are intended to fit.

Some people intimate that the cause of the red spots is the acid condition of the oil. If that were so, why does it not occur on the A., T. & S. F. Ry.? I presume we all use the same oil. From what has come under my notice, quite a number of the roads are troubled with copper spots. I have handled a great number of these foreign brasses, but once melted they never reappear with signs of copper spots. High fusion, thorough mixing and proper molding, I believe, will remedy the evil.

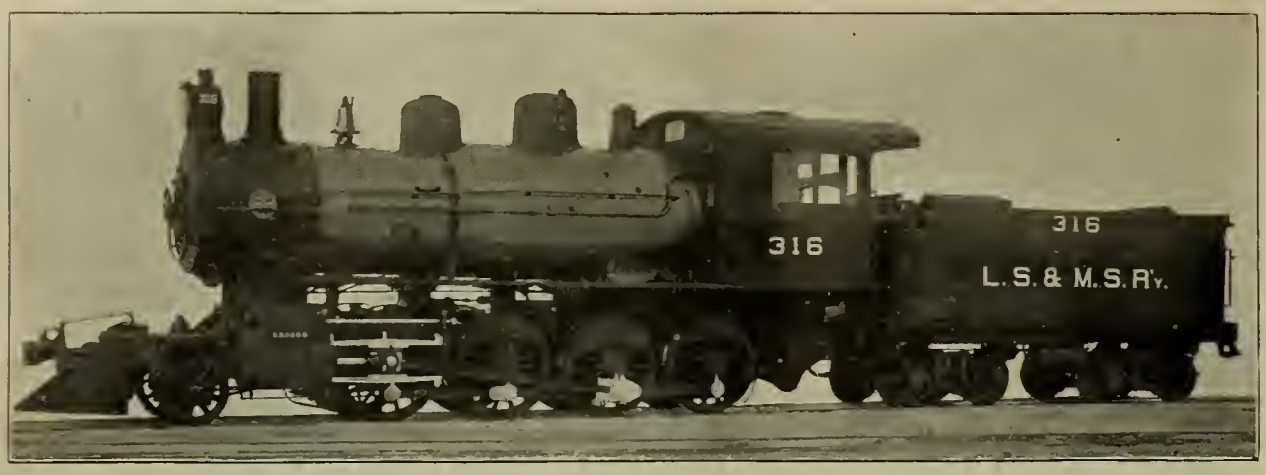
Mr. Swan appends to his letter the following formula for liquor for tinning brasses: 1 qt. muriatic acid; 1 qt. water; all the zinc it will eat up, and then add about 1 tablespoonful of sal ammoniac to this quantity.



COMPRESSED AIR JET TESTS.

THE LAKE SHORE'S NEW LOCOMOTIVES.

The Lake Shore & Michigan Southern Ry. Company some time ago gave large orders for new locomotive equipment to the Brooks Locomotive Works. These locomotives were the heaviest ever ordered by that road and their general design and details of dimension will be examined with rather more than usual interest. The orders comprised 15 consolidation freight engines, 15 10-wheel freight engines and 15 6-wheel switchers—all of which have recently been furnished by the builders.



CONSOLIDATION LOCOMOTIVE, L. S. & M. S. RY.

We present views of representatives of each of the three types built. The consolidations have 20½ x28 in. cylinders; 56 in. drivers; extended wagon top boiler, which is 64⅛ ins. in diameter and is designed to carry 180 lbs. of steam; a firebox 114x 42 ins.; a grate area of 32½ square feet, and a total heating surface of 2,183 square feet. These engines weigh 156,500 pounds of which 138,500 pounds are on the drivers.

The 10-wheelers have 19½x30-in. cylinders; 62 in. drivers; extended wagon top boiler, which is 64⅛ ins. in diameter and is designed to cary 180 pounds of steam; a firebox 114x42 ins.; a grate area of 32½ square feet, and a total heating surface of 2,173 square feet. These engines weigh 154,000 pounds, of which 120,000 pounds are on the drivers.

The switchers have 19x26 in. cylinders; 52 in. drivers; a straight boiler, which is 64 ins. in diameter, and is designed to carry 170 pounds; a firebox 80x34½ ins.; a grate area of 18½ square feet, and a total heating surface of 2,019 square feet. These engines weigh 124,000 pounds.

TEN-WHEEL LOCOMOTIVE, L. S. & M. S. RY.

SIX-WHEEL SWITCHING LOCOMOTIVE, L. S. & M. S. RY.

The leading dimensions of these engines are given in our tabulation on page 67.

AN EFFECTIVE JOURNAL PACKING.

A prominent railway chemist once said that the pressing need in providing for proper lubrication of car journals was the long sought "oil bath." The waste we now use, or have been obliged to use," said the chemist, "has done and is doing that which we least desire, namely, wiping the journal most effectually and thus preventing perfect lubrication." "The thing most needed and desired," he continued, "and the only thing that will procure for the railroads perfect lubrication, is the oil bath be it obtained in whatsoever way it may."

A journal packing which possesses the distinctive feature of providing a practical substitute for the ideal "oil bath," is that made by the Franklin Manufacturing Company, of Franklin, Pa., and known as the "Perfection" journal box packing. This feature is gained through the peculiar power that it possesses of retaining, on its surface, next to the journal after being applied to the journal box, the lubricating oil in small pools or pockets. The elasticity of the packing, always forcing it upward, presents these pools or pockets of lubricating oil continually to the face of the journal, and in this manner brings about in every practical sense the long desired oil bath for car journals. The capillary power of the packing gradually draws the lubricating oil from the bottom of the box to the pools or pockets just as fast as it is taken from the pockets by the action of the journal, and in this way the face of the car journal is kept constantly supplied with the lubricant. This packing after being saturated with the lubricating oil forms an emulsion, or jelly-like, spongy mass in the box.

This "Perfection" packing is a combination of the very best quality of wool fiber, vegetable fiber and asbestos fiber. In extended practice both the capillarity and the elasticity of this packing have been proven to excel that of all others; and its durability has been fully demonstrated. In many recorded instances as high as 20,000 miles and more have been made with one application of oil and this waste to the journal box, and at the end of this large mileage the packing was found in just as serviceable a condition apparently as when first applied, being well saturated with oil and standing up well against the journal, which was well lubricated.

COMMUNICATIONS.

One-Shovel Firing.

Chicago, April 20, 1899.

To the Editor of the Railway Master Mechanic:

Many of the railroads, especially those in the west, are now giving much attention to the question of firing locomotives with one shovel full at regular intervals rather than with a half-dozen scoop fulls at a time and then waiting five or six minutes to fill up the fire box again. One road, the Burlington, Cedar Rapids & Northern, has labored hard and earnestly to educate its firemen to fire often and regularly, and in order to accomplish the very desirable results which it is now enjoying it is understood that the assistance of every one on the road was necessary. Although it might be quite impossible for a large system to undertake the task so well carried out by the B., C. R. & N., nevertheless it is undoubtedly a fact that much can be accomplished toward the same end. The B., C. R. & N. has no particularly large locomotives, so it is a question in the minds of some whether long and wide fire boxes can be so managed, and it is probable that the question will be answered before long because other roads which have heavier locomotives with larger fire boxes are taking much interest in the matter and are trying to teach their firemen the advantages of putting in only one shovelful at regular and short intervals.

Subscriber.

[The work on the B., C. R. & N. in this direction is quite well known now, and has been heretofore referred to in our columns. Some comment on one feature of this "one shovel" practice—which practice, by the way, is not by any means new to the railway world, and which has been successfully followed with large locomotives—may be found in our editorial columns.—Ed.]

Hot Bearings and Porous Spots.

Montreal, April 3, 1899.

To the Editor of the Railway Master Mechanic:

I have just read over the article on page 47 in the current issue of your paper and I consider it is an extremely well written article, especially the remarks with regard to boxes being neglected until the packing falls away and box runs hot, the neglect taking place simply because it had not heated before.

Since writing you some time ago, I had a discussion with a mechanical officer who asserted that it was a practice in the United States to inspect all bearings received and test them by breaking one in each hundred, and that if a porous spot was found the whole consignment would be rejected. As I had cause to doubt this I had 115 foreign bearings taken from the scrap pile indiscriminately, and of these I found that 60.9 per cent had a porous spot in them varying from

one-half inch to the full length of the bearing. These bearings had not necessarily been removed on account of heating and a great number of them had not run hot.

I may say that in bearings of our make in the past I have found sometimes as many as 40 per cent which had a porous spot varying from one-half inch to three inches long, and, as I indicated in my previous letter, this has been, I thiuk, entirely overcome by a change in the foundry practice which enables us to melt the metal quicker and pour it hotter; but I am satisfied it will have little or no effect upon the number of hot boxes.

Yours truly,

R. Atkinson.

[As coming from a railroad officer whose ripe experience and whose years of systematic investigation of the cause and remedy of heated car bearings render him an authority upon the subject, the above letter possesses unusual interest. It would appear that Mr. Atkinson's experience leads him to the conclusion that insufficient lubrication and lack of care in the inspection and packing of oil boxes are much more frequent sources of hot boxes than are imperfections in the physical qualities of the bearing.—Ed.]

As a matter of interest in connection with the much-discussed smoke nuisance, it is worth noting that smoke is not by any means a modern annoyance. About six hundred years ago, so Mr. Durfee said in recently speaking of the subject, when the population of London did not exceed 50,000, its citizens petitioned King Edward I. to prohibit the use of "sea coal," and he responded by making its consumption a capital offence. His successors, however, were more merciful to the users of coal, and its employment was resumed; but again, in the reign of Elizabeth, there were loud complaints against it, and, in 1661, John Evelyn, in his "Fumifugium," laments that, "owing to the increase of coal smoke, the gardens no longer are fruitful." In the centuries that followed there were a number of parliamentary inquiries and some legislation intended to mitigate, if not remove, the evil, but, nevertheless, the consumption of bituminous coal has rapidly increased in London, and the inquiries and legislation relative to it have all ended—in smoke.—Cassiers Magazine.

SPECIFICATIONS FOR THE LAKE SHORE'S NEW BROOKS LOCOMOTIVE.

	Consolidation	Ten-Wheel Freight.	Six-Wheel Switcher.
Weight on drivers	138,500 lbs.	120,000 lbs.	124,000 lbs.
Weight on trucks	18,000 lbs.	34,000 lbs.	
Weight, total	156,500 lbs.	154,000 lbs.	124,000 lbs.
Weight tender, loaded	93,900 lbs.	99,100 lbs.	79,000 lbs.
GENERAL DIMENSIONS.			
Wheel base, total, of engine	24 ft.	25 ft. 6 in.	11 ft. 3 in.
Wheel base, driving	15 ft. 9 in	15 ft.	11 ft. 3 in.
Wheel base, total, engine and tender.	52 ft. ¼ in.	52 ft. 9¼ in.	43 ft. 2¾ in.
Length over all, engine	38 ft. 3¾ in.	39 ft. ⅞ in.	33 ft. 2 in.
Length over all, total, engine and tender	62 ft. ¾ in.	62 ft. 9⅞ in.	56 ft. 4⅝ in.
Height, center of boiler above rails	9 ft.	8 ft. 6½ in.	7 ft. 6 in.
Height of stack above rails	14 ft. 8 in.	14 ft. 7 in.	14 ft. 5⅜ in.
Heating surface, fire box and arch tubes	212 sq. ft.	202 sq. ft.	163 sq. ft.
Heating surface, tubes	1971 sq. ft.	1971 sq. ft.	1856 sq. ft.
Heating surface, total	2183 sq. ft.	2173 sq. ft.	2019 sq. ft.
Grate area	32½ sq. ft.	32½ sq. ft.	18½ sq. ft.
WHEELS AND JOURNALS.			
Drivers, number	Eight	Six	Six.
Drivers, diameter	56 in.	62 in.	52 in.
Drivers, material of centers	Cast steel	Cast steel	Cast steel.
Truck wheels, diameter	33 in.	33 in.	
Journals, driving axle, main	9 in. x 12 in	9 in. x 12 in	8¾ in. x 12 in.
Journals, driving axle, others	8½ in. x 12 in	8½ in. x 12 in	8¼ in. x 12 in.
Journals, truck	5 in. x 10 in.	5 in. x 10 in.	
Main crank pin, size	6¼ in. x 6 in	6¼ in. x 6 in	5½ in. x 6 in.
CYLINDERS.			
Cylinders, diameter	20½ in.	19½ in.	19 in.
Piston, stroke	28 in.	30 in.	26 in.
Piston rod, diameter	3¾ in.	3¾ in.	3⅜ in.
Kind of piston rod packing	U. S. Metallic	U. S. Metallic	U. S. Metallic.
Main rod, length center to center	131 in.	111½ in.	135 in.
Steam ports, length	18 in.	18 in.	17 in.
Steam ports, width	1⅝ in.	1⅝ in.	1¼ in.
Exhaust ports, length	18 in.	18 in.	17 in.
Exhaust ports, width	3 in.	3 in.	3 in.
Bridge, width	1½ in.	1½ in.	1⅜ in.
VALVES.			
Valves, kind of	Richardson balanced	Richardson balanced	Richardson Balanced.
Valves, greatest travel	5¼ in.	5½ in.	5 in.
Valves, outside lap	1 in.	1 in.	15-16 in.
Valves, inside lap	None	None	None.
Lead in full gear	1-16 in. Negative	1-16 in. Negative	1-16 in. Negative.
Lead constant or variable	Variable	Variable	Variable.
BOILER.			
Boiler, type of	Extended wagon top	Extended wagon top	Straight Top.
Boiler, working steam pressure	180 lbs.	180 lbs.	170 lbs.
Boiler, material in barrel	Steel	Steel	Steel.
Boiler, thickness of material in barrel	⅝ in.	⅝ in.	9-16 in.
Boiler, thickness of tube sheet	¾ in.	¾ in.	¾ in.
Boiler, diameter of barrel	64⅛ in.	64⅛ in.	64 in.
Seams, kind of horizontal	Sextuple	Sextuple	Sextuple.
Seams, kind of circumferential	Double	Double	Double.
Crown sheet, stayed with	Radial stays	Radial stays	Radial Stays.
Dome, diameter	32 in.	32 in.	33 in.
FIRE-BOX.			
Fire-box, type	Over frames	Over frames	Deep, between frames.
Fire-box, length	114 in.	114 in.	80 in.
Fire-box, width	42 in.	42 in.	34½ in.
Fire-box, depth, front	78 in.	78 in.	82¼ in.
Fire-box, depth, back	75 in.	65 in.	80 in.
Fire-box, material	Steel	Steel	Steel.
Fire-box, thickness of sheets	Tube ⅝ in.; sides and back 5-16 in Top ¾ in.	Tube ⅝ in.; sides 5-16 in.Top ¾ in.; back 5-16 in	Tube ⅝ in.; sides 5-16 in.; Top ⅜ in.; back 5-16 in.
Fire-box, brick arch	On water tubes	On water tubes	On water tubes.
Fire-box, mud ring, width	Back and sides 3½ in.; front 4 in	Back and sides 3½ in.; front 4 in	Back and sides 3 in.; front 4 in.
Grates, kind of	Cast iron rocking	Cast iron rocking	Cast iron rocking.
Tubes, number of	286	286	246.
Tubes, material	Charcoal iron	Charcoal iron	Charcoal iron.
Tubes, outside diameter	2 in.	2 in.	2 in.
Tubes, thickness	No. 11 B. W. G.	No. 11 B. W. G.	No. 11 B. W. G.
Tubes, length over tube sheets	13 ft. 3 5-16 in.	13 ft. 3 5-16 in.	14 ft. 6¼ in.
SMOKE BOX.			
Smoke box, diameter, outside	67 in.	67 in.	67 in.
Smoke box, length from flue sheet	64 in.	64 in.	60½ in.
OTHER PARTS.			
Exhaust nozzle, single or double	Single	Single	Single.
Exhaust nozzle, variable or permanent.	Permanent	Permanent	Permanent.
Exhaust nozzle, diameter	5¼ in.	5¼ in.	5 in.
Exhaust nozzle, distance of tip below center of boiler	6¼ in.	6¼ in.	5¾ in.
Netting, wire or plate	Wire	Wire	Wire.
Netting, size of mesh or perforation	2½ x 2½	2½ x 2½	2½x2½.
Stack, straight or taper	Cast iron straight	Cast iron straight	Cast iron, straight.
Stack, diameter	16 in.	16 in.	16 in.
Stack, height above smoke box	34½ in.	39 in	49⅞ in.
TENDER.			
Type	8-wheel, steel frame	8-wheel, steel frame	8-Wheel, steel frame.
Tank, type	"U" shape	"U" shape	Sloping top.
Tank, capacity for water	5,000 gal.	5,000 gal.	3,500 gals.
Tank, capacity for coal	8 tons	8 tons	5 tons.
Tank, material	Steel	Steel	Steel.
Tank, thickness of sheets	3-16 in. and ¼ in.	3-16 in. and ¼ in.	3-16 in. and ¼ in.
Type of under frame	Steel channel	Steel channel	Steel channel.
Type of springs	Double elliptic	Double elliptic	Double elliptic.
Diameter of wheels	33 in.	36 in.	30 in.
Diameter and length of journals	4¾ in. x 8 in.	4¾ in. x 8 in.	3¾ in x 7 in.
Distance between centers of journals	5 ft. 4 in.	5 ft.	5 ft.
Diameter of wheel fit on axle	5⅞ in.	5⅞ in.	4⅞ in.
Diameter of center of axle	5 in.	5 in.	4¼ in.
Length of tender over bumper beams	21 ft. 10½ in.	21 ft. 10½ in.	21 ft. 1½ in.
Length of tank	20 ft. 4 in.	20 ft. 4 in.	19 ft. 6 in.
Width of tank	9 ft. 5 in.	9 ft. 5 in.	9 ft. 5 in.
Height of tank, not including collar	52 in.	52 in.	52 in.
Type of draw gear	Gould M. C. B.	Gould M. C. B.	Gould M. C. B.

SPECIAL EQUIPMENT.

Brakes, American for drivers; Westinghouse for tender and train service; pump, 9½ in.; sight feed lubricators, Nathan; safety valves, Ashton; injectors, Nathan; springs, French; metallic packing, U. S.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.

APRIL MEETING.

The regular meeting of the Car Foremen's Association of Chicago was held in the rooms of the Western Society of Eugineers, 1741 Monadnock building, Chicago, April 13.

President Morris called the meeting to order at 8 p. m. Among those present were:

Ashcroft, Norman.	Kroff, F. C.
Anderson, A.	Keebler, C. F.
Alderson, A. S.	Kramer, Wm.
Backburn, D. W.	Kameu, Fred.
Bell, W. A.	La Rue, H.
Bond, L. E.	Martin, J.
Bates, G. M.	Mercatoris, M.
Blohm, Theo.	Morris, I. R.
Coleman, J.	Mattes, J.
Cook, W. C.	Murray, D.
Cairus, F. M.	Munsou, Chas.
Deen, C.	Northam, F. R.
Davies, W. O., Jr.	Nightengale, H.
Downing, D.	Olsen, Louis.
Depue, Jas.	Prickett, James.
Fritz, Chas.	Rieckhoff, C.
Godfrey, Edward.	Stuckie, E. J.
Gruhlke, E. G.	Swift, C. E.
Grieb, J. C.	Saum, Geo.
Gehrke, Wm.	Stagg, C. S.
Godfrey, J.	Schoeneberg, C.
Guthenberg, B.	Showers, G. W.
Garduer, L. L.	Schultz, F. C.
Green, C. E.	Smith, E. B.
Holtz, Chas.	Schultz, Aug.
Harkenrider, J. M.	Shannan, S.
Hansen, A. P.	Sharp, W. E.
Husband, E.	Wentsel, Geo.
Jones, R. R.	Weschler, Henry.
Jones, A. A.	Wensley, W. H.
Johannes, A.	Wolfe, Chas.
Krump, M.	Williaus, Thos.

President Morris: The first order of business is the reading of the minutes of previous meeting. There being no objections we will dispense with this as usual, they appearing in the April number of the Railway Master Mechanic.

There beiug no reports from officers, we will hear from the secretary the names of new members:

L. E. Bond, P., F. W. & C.; O. P. Redman, C., M. & St. P.; David Downiug, C., R. I. & P.: Wm. F. Fries, L. S. & M. S.; D. W. Blackburu, Armour Car Lines; Richard Snyder, Belt Railway.

Proposed Alterations in Interchange Rules.

President Morris: We will now hear from the committee ou recommeuded changes in M. C. B. rules. You have all beeu supplied with a copy of the committee's report and I suppose are prepared to discuss the changes as recommeuded. Before starting on the discussion, would like to hear from Mr. Grieb, chairman of the committee.

Mr. Grieb: I harldy think that any remarks are required. The committee has donc its level best iu submitting a report that it cousidered would be acceptable. There is oue thing I would like to meution —the fact that the committee was guided very much by that notable feature of modesty that characterizes the Car Foremeu's Associatiou. We did not atteupt to introdnce an entire new set of rules—just some slight modifications that we thought would be acceptable pretty much all around. Of course, time will tell just with what favor it does meet.

President Morris: The secretary will please read off the report section by section and we will take it up and discuss it and pass on it.

Secretary Cook: Rule 3, Sec. 13. To be amended by adding after the word length, "And if in such cases the mate wheel has a flat spot 2¼ ins. or over iu length," so it will read "Delivering company responsible: Flat slidlug if the spot cause by sliding is 2½ ins. or over in length and if in such cases the mate wheel has a flat spot 2¼ or over in length."

Mr. Showers: I do not quite agree on that point. "Flat siding; if the spot caused by sliding is 2½ inches or over in length, 'and' if in such cases the mate wheel has a flat spot 2¼ inches or over iu length." Now a wheel may be slid 2½ or 2¾ inches, and if the mate is not slid 2¼ inches you cannot bill for the removal of the wheel. That is the way it reads, in

my judgment. I do not think the committee in recommending this means what it says.

Mr. Grieb: The idea of the committee was, of course, not to impose any limitations at all on any wheel that was slid 2½ inches or over, if that is the point Mr. Showers wishes to make. If our phraseology is such that it does not make this clear we are a little unfortunate. I thought it was understood. It may be subject to improvement and possibly Mr. Showers has some suggestion to offer.

Mr. Showers: No; I have no suggestion to offer any more than my understanding from the reading. We may understand what we mean but others may not; in fact, I interpreted the meaning different from what the committee seem to have intended. This was probably brought out by a discussion that took place at one of our meetings. But as I understand the reading of it, the delivering company will not be responsible unless the mate wheel is slid 2¼ inches or over. If the mate wheel is not 2¼ inches, then it relieves you from the opposite wheel.

The change as recommended by the committee was adopted.

Secretary Cook: Rule 3, Sec. 17. Change word ng to read, "Cut journals, axles bent also axles rendered unsafe by unfair usage, derailment or accident."

Adopted.

Secretary Cook: Rule 3, Sec. 20. Amended by adding the words "Missing material" between "except" and "on" so it will read, "Defective, missing or worn-out parts of brakes which have failed under fair usage, except missing material on cars offered in interchange."

Mr. Showers: I think that the section, in my opinion, would be better the way it now reads, from the fact that the delivering company, under the present rules, are responsible for missing, worn-out, or misuse or faulty construction in the brakes or trucks in any manner, while under the proposed change they would be responsible only, in my judgment, for missing material. I think for all concerned, it would be better in interchange.

President Morris: Wouldn't this change, as recommended, be practically the same as this association decided upon some time since, leaving out the worn-out parts, such as worn-out brake shoes? Wouldn't we be conforming to our ideas as decided upon some time since?

Mr. Showers: Has this association gone on record to that effect?

President Morris: We certainly have put ourselves on record in that way so far as worn-out brake shoes were concerned.

Mr. Davies, Jr.: As I understand it, this section is precisely the same as section 20 now reads, with the exception that defective and worn-out parts—that is, what the committee are trying to do away with, defective and worn-out brakes, when offered in interchange. This recommendation would be the same as we now have it with that exception.

President Morris: That was the intention of the committee in making that recommendation.

The recommended change was adopted.

Secretary Cook: Rule 3, Sec. 36. Omit entirely.

Mr. Grieb: Take the other two in connection with it. They all refer to the same thing.

Mr. Showers: Don't you think we are going over these rules too fast for recommendation to the Master Car Builders' Association? Don't you think they should be considered more?

President Morris: I will say that our idea in printing these recommendations and distributing them around to the different members was to give the members an opportunity to study them and digest them thoroughly before they came here, and be pretty well decided in their minds as to whether these things were right or not. But of course we want a thorough discussion and if any one has any remarks to make or any corrections to make or changes, which will in any way improve them, we would like to hear from them. I do not think any one should be a bit backward about speaking.

Mr. La Rue: While we have had a chance to read them over, possibly we read them in a hurry. I am like Mr. Showers, I think we should have a little time.

President Morris: We are very willing to hear any objections or remarks; there is no restriction on the number of times a member may speak, you know. I would like to hear from you, Mr. La Rue, at any time.

Mr. Showers: I would like to ask the committee what their idea is in omitting this section.

Mr. Grieb: The committee thinks that if Mr. Showers will read the notation that appears under sections 38 to 40, which ought to be taken into consideration in connection with sections 36, that the intention of the committee is sufficiently plain to make it understood. The idea is this: that it was thought that breakages resulting from rough usage to the pocket, spindle or their substitutes in connection with the draft timbers or sills, originate in that portion of the attachments which is not subject to inspection. For instance, pockets frequently fail under fair usage, being worn to such an extent that they will not stand the strain, or possibly by cracks forming at the corners in the rear end, which are not subject to inspection; and also to do away entirely with spindles—put the association on record as not sanctioning the use of spindles; and also covering the number of failures that have been experienced with American continuous draft rigging, which, when they occur, result in combinations, that, under the present rules, are regarded as rough usage.

Mr. Showers: I hardly agree with the committee. I think they should have done away with spindles years ago; in fact, they never should have been used; but doing away with drawbar pockets, spindles or their substitutes, I think is putting the association on record in an improper manner. We have had a number of cases recently of drawbars being broken in both ends of car. Is it fair usage? Break a sill today and another to-morrow; bill for both of them; rear end attachments broken the next day; bill for them, end sill next day, and bill for it. I can show one record I had last week. They have no right to break an end sill and a drawbar and then bill us for both, and afterwards the draft timbers. I think we should retain the rule. In my judgment, to do away with this section is only putting a premium on switchmen handling cars in a rough manner.

Mr. Stuckie: As I understand it, that is classifying the American continuous as a spindle drawbar.

President Morris: I believe they are classified that way.

Mr. Stuckie: Spindle connection in rear end?

President Morris: The intention is to do away with combinations denoting rough usage.

Mr. Showers: In eliminating any part of a combination I think we are reflecting a great deal on our occupation. They have added notes to a great many of their decisions and also written personal letters after decisions, stating that there was no way where a combination could be shown under the rules but, at the same time, in their opinion it was rough usage and the operating line should be responsible.

Mr. Kroff: I approve of the recommendation of the committee, for this reason, that it frequently happens that a draft rigging is all cut up by the followers in ordinary switching, and the draft timbers broken. Then, by taking it down, you will find that the drawbar pocket is almost worn out, or the spindle. You dare not bill it because it breaks into a combination. The inspector cannot find the worn spindle unless he takes it down. The same with pockets. Take a drawbar pocket—you will often find it cracked in the back part; but an inspector would never notice that. He does not crawl under cars to discover cracks in the angle of the pocket. In taking down the draft timbers the man making the repairs finds that the pocket is bad and he has got to stand it or call the owner over and show it to him and get a defect card. I think it is a good idea for this association to omit the rule entirely.

Mr. Davies, Jr.: I find a great many cars that have broken draft timbers and pockets. After taking everything down we find the pocket a very old break, especially in the corners. Of course, after finding that, we cannot bill for pocket and draft timber—it forms a combination. That is why I favor the amendment.

Mr. Showers: I think that is going a little too far. (Quotes rule, Sec. 40.) I do not have any objection to draft timbers; we frequently find them cut out by the followers; but end sill, that is getting a little too deep.

Mr. Bell: I would be in favor of eliminating the section. I do not see where you put a premium on breaking cars. I find that as cars are getting heavier, improvements are being made; there are more cars and more stringent rules brought to bear, and I think the less combinations we have the better. They only tend to confusion.

Mr. Kroff: I would like to answer Mr. Showers' question. He says he would not like to have the end sill omitted. The end sill is covered in another section, so that would not have any bearing on the end sill. It would not be omitted.

Mr. Showers: I do not see why it would not. It says damage to drawbar pockets, spindles or their substitutes, accompanied by damage to either draft timbers of their substitutes, or end sills. If you eliminate the entire section you can break an end sill, drawbar pocket, spindle, draft timbers and end sill and the combination would not be broken. I do not think that any person could look at that matter squarely and say that a man could break an end sill, drawbar pocket, spindle or their substitute and yet do it fairly. Regarding what Mr. Bell says about putting a premium on breaking timbers by rough usage, or rough handling, such matters, as I understand it, are not brought to light. So long as they are reimbursed you will never hear from it. The stringent rules laid down by our general managers today will be a back number in a short time.

Mr. Bates: I am in favor of loosening up the rules. I do not believe in so many combinations. I am entirely in favor of striking out that section.

The recommendation was adopted.

Secretary Cook: Rule 4, Section 5. Add new paragraph reading, "Metal brake beams of whatever make may be used if they are equipped with M. C. B. heads and fit properly to the hangers, rods, levers, etc., which are standard to the car."

Mr. Kroff: Ever since I have been railroading I have been trying to learn what an M. C. B. head is. I would like to have some gentleman explain the matter to me. I can argue better after I know what it is.

President Morris: I take it that the Christie brake head and shoes were meant when they speak of M. C. B. brake heads.

Mr. Stagg: I think the Christie brake shoe with a key is considered an M. C. B. head—anything a Christie brake shoe will take with a key.

President Morris: Is that a satisfactory reply?

Mr. Kroff: Is that regardless of the hanger?

President Morris: They provide for hangers here.

Mr. Kroff: As long as they receive an M. C. B. shoe and key.

President Morris: It also provides for hangers, rods, levers, etc.

The recommendation was adopted.

Secretary Cook: Rule 4. Add new section, "New wheels must be applied to foreign cars when bill is rendered in all cases except when repairs are made by switching road."

President Morris: I would like to ask the committee, as a matter of information, how, in case a railroad has no new wheels, they can protect themselves on bill? If some provision is not made for that, should not some provision be made? There are cases where it is impossible to apply new wheels, for the simple reason that they haven't them on hand. How would the railroad companies be reimbursed for the good material they are putting on the cars? It seems to me rather a hardship to put a railroad company under any such bonds.

A Member: I am not in favor of that section, because it is hardly possible to apply it to outlying points. The tendency in this age is to keep down stock, and if outlying points are compelled to keep a stock of new wheels for all classes of cars that may run over the road, it seems to me it will work a hardship that can hardly be lived up to. It is almost impossible.

Mr. Showers: I do not believe there is a railroad company in the country that is able to live up to it at all points. They may be able to do it at the larger points. It might be better for private line companies

THE AMERICAN LOCOMOTIVE FOR ENGLAND.

Much has been said about the orders for locomotives placed by the Midland Railway, of England, with the Baldwin Locomotive Works. The above picture of one of these engines will satisfy a considerable curiosity as to the type of engine furnished on this order. This engine is distinctively American in design. It has 18x24 inch cylinders, 60 inch drivers, a 60-inch boiler, 16.6 square feet of grate area, and 1372.4 square feet of heating surface. It weighs 109,250 pounds, of which 83,100 pounds are on the drivers. The engines will be used in freight service and will burn bituminous coal.

to have new wheels applied to all their cars, yet some of them are perfectly satisfied with second-hand wheels. We at times get wheels put under our cars that won't make a thousand miles, but the next turn she makes she may get a pair of new wheels that were not in service six weeks. One rebuts the other. We have had fair service from second-hand wheels. I do not think the association should go on record as favoring this.

President Morris: How would it do to insert in that section a provision that wheels applied to foreign cars, when bill is made, shall show that they were cast not later than a year previous to date of application? Could it be got around in that way?

A Member: I do not think that would show the wearing quality in a wheel at all. Possibly the wheel that was previously in has never done much service. I am not in favor of that section in any way, shape or manner.

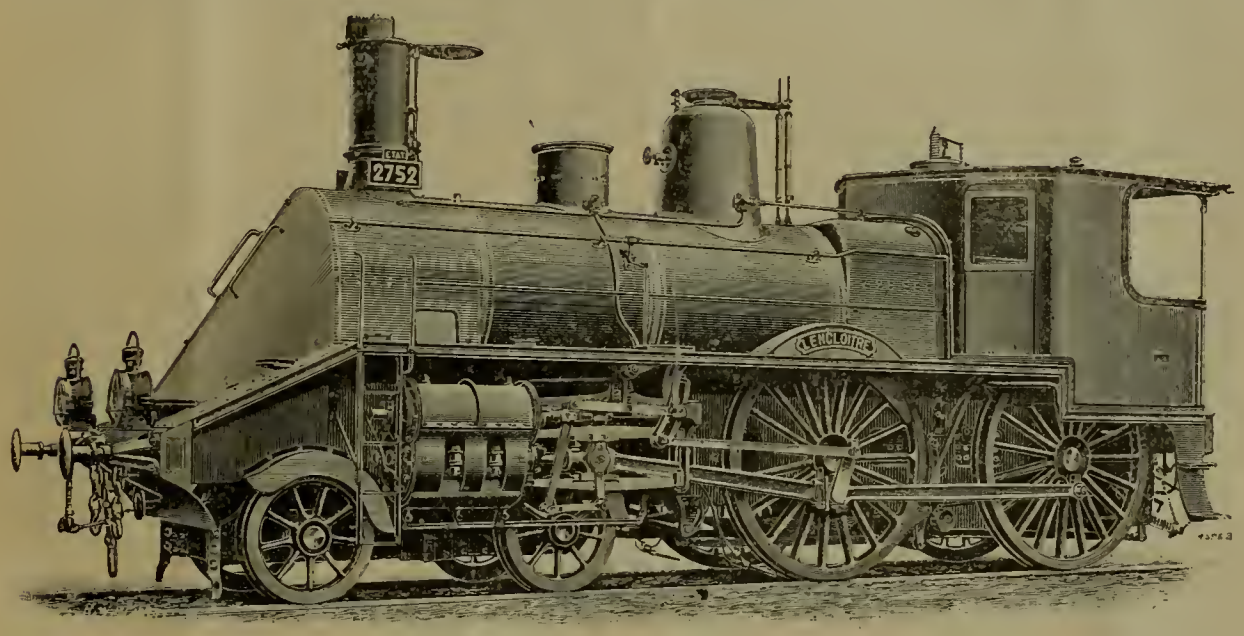
Mr. Grieb: I would say, in reply to your suggestion that I do not think that that provision if made, would tend very much to make this rule (which may possibly, at first sight, seem a little arbitrary) any easier. We have had a little experience in trying to follow out practically what is recommended in this change of the rules. Two or three roads make a special request on us to have new wheels used in their cars, and I do not recollect a single instance when flange or broken flange—the owners are responsible for it, yet if you have no new wheels and put in a second-hand one you get nothing for it. I am not in favor of it.

Mr. Wensley: I would like to ask what we are to do with the second-hand wheels?

Mr. Sharp: I do not see anything so startling in that recommendation. It no doubt would reverse the practice at a great many outlying points; but it occurs to me that it would be just as easy to ship new wheels for outside repair points as to ship second-hand wheels. The difficulty that has been mentioned by several who have spoken about not receiving new wheels would be readily overcome if this were embodied in the M. C. B. rules. The shop where the wheels are pressed up would make it a point to ship new wheels to outlying points. As they are protected in price, I do not see where the objection is to this rule as recommended.

Mr. Prickett: In answer to Mr. Sharp: How many different kind of wheels would you have to carry? Now there are four different sizes of journals. You would have to carry one or two pair of each and perhaps have them on hand a year before using them.

Mr. Sharp: I would like to ask Mr. Prickett what he does under the present rules. He quotes the size of the journal. This does not refer to the journal, only the wheels. If you repair a car with second-hand wheels, you have the same number of pair of wheels.



PASSENGER LOCOMOTIVE FRENCH STATE RAILWAYS.

This odd-appearing engine was recently built for the French State Railways by the Schneider Works at Creusot. The deep plate frames are extended well forward of the truck, and beveled at the end to receive the shap bow-plate covering of the smoke-box door, a device introduced to reduce the air resistance when running at high speeds. With the same object, the front of the driver's cab is finished with a pointed curve. We reproduce our engraving from London Engineering.

we failed to comply with their wishes. Between the car owner and the party applying the wheels, a serviceable or second-hand wheel is rather an indefinite matter—in fact, it is impossible to describe by rule when a wheel is good for further service—it depends upon individual judgment after inspection, and it seems impossible sometimes to have two agree. I do not see any good reason why we could not, with a little effort, supply the outlying points with new wheels to meet the requirements of this rule, and use up the second-hand wheels under our own cars. I think the rule is a good one. It may seem a little rigid at first sight; I think, though, it will work out all right; at least we found it that way, with the two or three railroad companies that made request on us; and we have had some experience of rather a disagreeable nature with other people who objected to wheels that we put in and considered we gave them good value for their money as second-hand material.

President Morris: My idea in making that suggestion was to remedy the difficulty to a certain extent. A wheel less than one year old in most cases is a pretty good wheel; there are exceptions of course, to that, but it would not be going quite so far as the committee has recommended.

Mr. Jones: I would hardly be in favor of this rule. Oftentimes wheels are broken out on the line and the wrecking car is loaded up with second-hand wheels—no new wheels on this car kept for that purpose. In many cases we are not furnished with new wheels. How are we going to apply them?

Mr. Prickett: I am not in favor of that rule at all. I do not believe it will work. It might work on some of the larger roads, but with a small road of four or five hundred miles we could not keep a supply of new wheels on hand always. And in cases of this kind, why, there is no provision made for second-hand wheels. Provided a road applies one to a car, are they going to put that wheel in for nothing? Often when cars come on the line the wheels are worn out—sharp

Mr. Prickett: That is very well if you have a press to press them off; put them on the same axle.

A Member: I will say that I have been at more than one outlying point on a long line, and I have side-tracked empty cars to get wheels to put under loaded cars in order to keep them moving. With new wheels it would have worked a hardship.

Mr. Showers: The company I represent operated about 3,500 cars in the year '97, and we used up something like 950 new wheels (that is a record I looked up), and in using 950 new wheels we mated up over 900 second-hand wheels. Taking that as a comparison, if new wheels were used altogether in foreign cars (of which I will say a majority of the roads in the country are handling over one-half foreign cars) would not their second-hand wheels pile up so fast that they could not use the half of them?

Mr. Kroff: I am not in favor of the rule, for this reason: The car owner is charged with second-hand wheels and he gets what he pays for. If you attempt to carry new wheels in stock to supply every foreign car that comes in, you will have all stock. Now we use a great many wheels over our way and in the month of February we had no new wheels on hand. We had plenty on order, but we didn't have them at the shops. In a case of this kind what would I have done? Suppose I could have hurried up the order and held the freight until I got the wheels. I think the rule ought to be stricken out.

The recommendation was not adopted.

Secretary Cook: Rule 4, Sec. 14. Amend the sentence reading, "This card shall specify fully the repairs made and reason for the same, date and place where made and name of road making repairs" by adding the words "whether material used in repairs is new or second-hand" after the words "place where made."

Mr. Grieb: I would like to supplement the recommendation by a few remarks. It was the intention of the committee that this recommendation apply only to such cases where the rules designate a different price for new and for second-hand material. I suppose everybody understands it that way, but we did not make ourselves sufficiently clear on that point.

President Morris: How would you get that in?

Mr. Grieb: Just take it as it reads and add the words "In case the rules designate a different price for new and for second-hand material."

Mr. Prickett: I would like to ask the committee if this is for all material.

President Morris: For material where a different price is specified for new and old.

The recommendation was adopted.

Secretary Cook: Rule 5, Sec. 1. Add the following: "If repair card and stub do not state positively whether new or second-hand material was applied, charge shall be made on the basis of second-hand material when the rules specify a difference in price between new and second-hand material." "If the repair card and stub do not specify whether car is loaded or empty, charge shall be made on the basis allowed for an empty car when a difference in the charge is specified in the rules for empty and loaded cars."

Adopted.

Secretary Cook: Rule 5, Sec. 3b. After the words, "shall be final" add the words "and proper authority for bill when accompanied by repair card." Sec. 3c to be omitted entirely.

Adopted.

Secretary Cook: Rule 5, Sec. 10. Add to the list of material: Brake shoes, 30c. Change "Freight car paint, mixed" to read, "Mineral freight car paint, mixed, 5c per lb.; lead freight car paint, mixed, 15c per lb."

Add a note to the list of materials, "Not more than one lb. of mineral paint can be charged for 15 sq. ft. of surface covered, and not more than one lb. of lead paint for 12 sq. ft. of surface covered; no charge to be made for material for lettering."

A Member: I think that an arbitrary charge of 30 cents for brake shoes will turn out a good deal the same as the price for M. C. B. couplers. That M. C. B. coupler question has been brought up. No railroad company wants to do anything without a profit. Now, men, if there is an arbitrary charge of 30 cents for brake shoes it is my opinion that the brake shoe will be cut down in weight below the price that will bring it to 30 cents and there will be no redress. It seems to me it ought to be at the actual weight of material applied.

Mr. Miller: In regard to the member's remarks, I would say that if brake shoes were applied that would not come up to the dimensions given in the M. C. B. recommended practice, I think they could be considered wrong material and would not have to be accepted.

A Member: I do not see how they could hold to the dimensions, for it would be almost impossible to tell what the wear on a brake shoe would be. It might be worn one-half down in a hundred miles.

Mr. Grieb: I am a little surprised to hear anybody put himself on record that he was making repairs to foreign cars for the money there was in it. I thought we were making repairs to expedite freight and keep cars in repair instead of enhancing our profits. There is no profit to be made on journal bearings, but I did not think there was anybody mean enough to cut down the weight of journal bearings to get the reward. Certainly if anybody was laboring under that impression that he was saving money for his company by cutting down material in that way, he lost a golden opportunity when he didn't commence when restrictions were placed on journal bearings, considering the value of the material used in journal bearings as compared with brake shoes.

A Member: In reply to Mr. Grieb, I did not say that I was doing that. I simply brought the matter up on account of a controversy that took place in a railroad paper. He will remember that the thing was brought up, I think by Mr. Leeds, I could not say positively, but it was brought up in a paper about applying a coupler that was only worth $5. That is why I brought the subject up in that way.

The recommendation was adopted.

Secretary Cook: Rule 5, Sec. 17. Add to the list of labor charges the following: Straightening one bent axle, 4 hrs., 80c. Blacksmith labor repairing one metal brake beam, 2 hrs., 40c. American continuous draft key replaced 4 hrs., 80 cts. One American continuous draft rod repaired and replaced, 4 hrs. 80c. Two American continuous draft rods repaired and replaced, 4 hrs. $1.00.

Adopted.

Secretary Cook: Rule 5, Sec. 23. Add to the list of items for which switch roads can render bill against car owners "broken draft springs," "followers" and "center pins."

Mr. Showers: I am opposed to the recommendation from the fact that switch roads receive more revenue than railroad companies do for operating cars. They own no equipment, they do more damage to cars, they handle cars more roughly than a railroad does, ten to one, and I see no reason why they cannot return cars in the condition they get them.

President Morris: We would like to hear from some switching-road representatives.

Mr. Wentsel: While we handle a good many cars on small revenue, I think some of the railroads handle them just as roughly as the switch roads, from what I can learn, and as these parts are liable to break in ordinary handling, I think we ought to be entitled to the defense.

Mr. Deen: I am not interested in that although I am heartily in favor of that rule. I have seen switching done in a great many railroad yards in this town where cars were handled just as roughly as in any switch yard I was ever in—they do just as much breakage and they get more for it as a rule.

The recommendation was adopted.

Secretary Cook: Rule 7. Sec. 1. Amend the form of Home Card so as to provide space for car number and initials.

Adopted.

The report of the committee was then formally adopted as amended.

A vote of thanks was tendered the committee for its work and the committee was discharged. The committee consisted of J. C. Grieb, chairman, S. Shannou, T. B. Hunt, W. E. Sharp, Geo. Wentsel, Wm. Miller and C. S. Stagg.

Damage to Cars by Staking.

President Morris: The next question for discussiou is in regard to damage to cars by staking. Should owners be responsible?

Mr. Wensley: The mau doing the damage should be responsible.

Mr. Jones: I think the man doing the damage should be responsible.

Mr. Grieb: I think that any damage done to the outside of a car ought to be taken as unfair usage, and damage done by staking makes the party responsible that did it.

Mr. Prickett: I think that for all damage caused by staking the party doing it should be responsible. That is rough usage. Put a stake ou a corner of a car to stake it and if it is a heavy train it will break the corner post if uot three or four end sheathings. The road staking should be responsible.

Mr. Godfrey: I think as Mr. Grieb says the company using the stake should be held responsible—unfair usage.

A Member: I would like to know whether railroad companies consider it right to stake cars. They all make it a practice. I thiuk if they are obliged to stake a car and the staking is done in the right place, and the car does not stand it, the owner should be responsible.

Mr. Bell: It depends entirely on the manner the stake was used and the kind of stake. I have seen some very crude stakes used which were certain to do damage. A man may pick up a 2x4 scantling to stake cars with. I think if the stake was of proper standard—round at the ends and in good order—and car was equipped with pockets for staking they should not be held responsible for any damage caused by staking cars. I think in using an improper stake it would be unfair usage.

Mr. Stagg: Most cars are provided with a place for stakes. In watching switchmen you will generally find that they never look for pocket for stake; they put the stake wherever they happen to find a place for it and the consequence is that the pocket is bent and generally the stake is broken. I do uot know whether there are any rules in regard to staking, but I think if railroad companies were made responsible for the damage done in staking cars, the traffic department would be more particular in the manner of staking and thus prevent considerable damage being done.

Mr. Gehrke: I think the damage caused by staking cars should be considered unfair usage and consequently a cardable defect. I have often noticed that cars are staked at places that are not made for that practice and a good deal of damage has beeu caused on account of it. I think that on a traiu of about 30 or 35 cars they are liable to do a good deal of damage by staking; therefore, I think it is a good thing to prohibit it entirely.

Mr. Bates: As you all know, there are lots of roads that do all their switching by staking; and the majority of cars have corner bands and a good many of them have recesses in them to receive the stake; and it is the general practice of all railroads to stake cars. I believe if any man builds a car that has no corner bands and a stake is used ou his car, and the end sill is damaged, I think he ought to stand the damage.

Mr. Davies: I think any damage done to cars by the stake—that is the slipping of the stake and damaging the end or side of car—makes the railroad company responsible.

Mr. Smith: I think that for any damage done to cars by staking the owner should not be responsible, from the fact that any careful staking would not injure a car if properly done.

Mr. Showers: Inasmuch as the general practice of railways is to stake cars and as the majority of switch engines are equipped with stakes for that purpose it is undoubtedly the intention of the operating department to have cars staked and as it is their intention to have cars staked I think that for the damage that is done by staking cars the owner should be responsible if properly staked and the staking does not cause wreck or break combination.

Mr. Stagg: I move that it is the sense of this meeting that the company staking cars is responsible for damage doue through staking.

The motion was seconded and carried.

Credit for Missing Knuckles.

President Morris: The next question is "What credit should be allowed when billing owners for missing knuckles?" This is a question that was sent to the secretary by one of the members. He had a dispute with a neighboring line in regard to a bill rendered and asked to have the association give its opinion as to what was proper.

Mr. Grieb: Should we not have more particulars regarding the conditions under which this knuckle was lost? Is that the only damage done—the loss of the knuckle—or was there any other damage that caused the loss of that knuckle?

President Morris: The papers I think, specify only missing knuckle; uo other damage.

Mr. Davies: As the rules say that we shall give actual credit for broken couplers and parts of same, I should think for a missing knuckle there would be no credit. Car comes in off line with missiug knuckle and there is uo credit to give.

Mr. Murray: There is an M. C. B. decision that covers it all right.

President Morris: To what decision do you refer?

Mr. Murray: I do not remember the uumber of it: a missing knuckle is specified as a broken knuckle.

Mr. Prickett: The party that made the repairs to this knuckle must have pulled the car over their line and therefore must have the scrap somewhere on their line and should give proper credit for it. They would be very foolish to receive it from a connecting line with a missing knuckle without an M. C. B. card.

Mr. Showers: In cases of knuckles being lost ou the line of a railroad isn't it often because of the knuckle pin being broken? The owner of the car should receive credit for second-haud material.

Mr. Grieb: Is it a case of knuckle pin lost?

President Morris: Knuckle only; the charge was made for knuckle missing; the knuckle pin was supposed to be there; there is nothing to show that it was not.

Mr. Showers: That case would come under the same head. We frequently lose knuckles along the road and they are picked up and applied to another car. Often they are removed from one car and put in another. They have the use of the knuckle and I think the owner of the car should receive credit for second-hand material.

Mr. Bates: I do uot quite understand the case; but if it was a case of a missing knuckle on any line I would say that there was a decision rendered on that and it was between the E. J. & E. and the B. & M. Railroad in Nebraska. The E. J. & E. lost a knuckle on their line out of one of the B. & M. cars and rendered a bill on the B. & M. for this missing knuckle, and the committee decided that it was a proper charge; that it was more likely that the knuckle was missing on account of being broken than from any other cause, and was chargeable to owners.

Mr. Showers: I move that owners of car should receive credit for second-hand material where knuckles are found missing.

The motion was lost.

Mr. Grieb: In order to close this question, I make the motion that owners be allowed scrap value of the knuckle.

Seconded.

President Morris: Full weight?

Mr. Green: I would like to ask the question, in allowing scrap credit for broken knuckles or broken M. C. B. couplers, is just the weight of the coupler or knuckle allowed, or whether full weight is allowed?

A Member: Actual weight.

Mr. Green: Actual weight of the coupler removed. I have found in several cases that full weight was allowed and I did not know how to take it. I should take it that full weight be allowed.

President Morris: I think the secretary has found the decision referred to aud he will please read a synopsis.

Secretary Cook: Arbitration case 389; the E. J. & E. Ry. versus the B. & M. R. R. in Nebraska. The E. J. & E. replaced a missing knuckle in a B. & M. car and applied a repair card for one Hinson knuckle and one knuckle pin allowed; the reason for making repairs being "missing," and reudered bill for $3.75, allowing a credit of 55 lbs. steel, 41 cents, net charge $3.34. The decision rendered by the arbitration committee in that case is as follows:

"Knuckles of M. C. B. couplers when missing are more likely to be missing owing to having been broken under conditions coming under the head of fair usage than from any other cause, aud therefore is properly an owner's defect."

President Morris: That appears to be iu line with Mr. Grieb's motion.

Mr. Grieb's motion was carried.

The meeting here adjourned.

The next meeting of the Car Foremen's Association will be held in the rooms of the Western Society of Engineers, 1741 Monadnock Building, Thursday evening, May 11, at 8 p. m. The building should be entered on Dearborn street at second entrance south of Jackson boulevard.

The program will be as follows:

(1) A question in dispute relative to broken sheathing being owner's defect.

(2) A question in dispute as to responsibility for wrong arch bars applied.

(3) Is it advisable to use buffer blocks on freight cars, from the points of protection to car, economy, etc.?

COMMENT BY CAR FOREMEN.

This column is edited by the Publication Committee of the Car Foremen's Association, and the RAILWAY MASTER MECHANIC is not responsible for any of the views expressed therein. Communications and items of interest to car men are solicited. T. R. Morris, chairman.

Stem Attachment for Couplers.

Although the M. C. B. association has adopted a standard attachment for couplers, which consists of a pocket or yoke, there are still a few railway companies that use the stem.

It would probably be difficult to find a car man who would openly advocate the use of the stem in preference to the pocket, as it has been thoroughly demonstrated that it is impossible to put the necessary strength into a pin of two inches in diameter, after the same has been weakened by cutting a slot in it to receive the key.

Still the fact remains that there are a great many cars iu use to-day with this very weak draft gear.

It would seem that the members of the M. C. B. association at its next convention should take some action in the way of hurrying into oblivion this dangerous device, by inflicting a penalty upon its use by railways after a certain time has elapsed.

Dust Guards.

The discussion at the March meeting of the Car Foremen's Association developed the fact that the dust guard is not receiving the attention it should.

There are thousands of cars running to-day having oil boxes with dust guards which were placed there when the boxes were first applied, and in the meantime these same oil boxes have been on perhaps five or six different journals. It is safe to say that a majority of car men will agree that a large percentage of hot boxes are caused by packing getting dry at the back, caused by loss of oil and also by dust entering the box and absorbing the oil. The dust and dirt also mix with the packing and there can be but one result.

Granting that the above is true, and there is scarcely a doubt of it, there seems to be no reason why such an important matter as the removal of dust guards should be so neglected. To be sure there are patented articles which are used to some extent and for which, with more or less justice (probably less) great claims are made, but the freight cars of to-day are nearly all equipped with dust guards of the old style, made of wood, leather or some patented composition. Recognizing the fact that we have a poor device to work with, would it not be advisable to make the best of it?

Whenever an oil box is renewed or a pair of wheels changed, or whenever any repairs are made necessitating the removal of the oil box, the dust guard should be examined and, if found defective, as it will be generally, a new one put in. Care should be taken to have it fit the axle snugly and it should also be thick enough to fill up the slot in the oil box so as to leave as little space as possible for the dust and dirt to enter. The top should be cut off so that it will not come to within less than one inch of the top of the box, and a piece of wood one-half inch in thickness should be fitted in the slot.

These precautions will have the effect of keeping a great deal of dust out of the box and will result in a consequent improvement in the condition of the packing.

COMMUNICATIONS.

Applying Second-Hand Wheels.

Chicago, April 13th, 1899.

To the Editor:

Please permit the undersigned to address a few words to the Car Foremen's Association with respect to the equity of substituting second-hand wheels to replace such as may be worn out or otherwise defective in foreign cars. It is frequently the case where railroads apply second-hand wheels they put in such as are hardly fit for further service and will barely pass inspection at time of application. There is no justice in this, besides it creates considerable hardship on car owners.

A proper method towards discontinuing such practice would be to require all second-hand wheels applied to give a certain length of service or an average mileage equivalent thereto; for suggestion would say, six (6) months' service or 15,000 miles.

We are all equally interested and will agree that this is a matter of importance which should receive our attention for discussion with a purpose of forcing same before the eyes of our superior officers, who might give the subject a hearing at the next Master Car Builders' convention.

A Member.

SHOP TESTING OF LOCOMOTIVES.

The facility with which the stationary engine has lent itself to the conduct of experimental investigation of its performance has had much to do with its present high efficiency. The conditions of its operation are, in general, especially favorable to the securing of accurate data regarding its economy. The accessibility of the various parts while in service and

the constancy of the conditions of operation make it possible and easy to secure reliable results.

With the locomotive, almost the reverse is true. The conditions of operation are widely variable, and the peculiar service required renders the application of measuring and recording instruments and the taking of observations difficult in the extreme. The load is constantly changing, due to changes in grade and curvature, and frequent stops, and slow downs are usually unavoidable. Furthermore, it is difficult to duplicate conditions on different days; differences of temperature and of the velocity and direction of the wind which may occur during succeeding tests introduce variables, and, consequently, errors of considerable magnitude. For these reasons the accurate determination of the economy of the locomotive while in service is almost impossible.

Notwithstanding these difficulties in the way of locomotive testing on the road, a great many such tests have been made from time to time. The larger roads have conducted special investigations of many kinds, both with their own engineering force and through the co-operation of the various engineering schools. Some of these tests have had for their object the determinating of fuel economy under different conditions, while others have dealt solely with questions of tractive effort, steaming capacity, and matters not involving the measurement of coal and water. Many roads have built, at considerable expense, dynamometer cars to measure and record the draw-bar pull required to draw trains of various weights and at various speeds. These tests have yielded a great deal of valuable information concerning locomotive performance which has had its effect upon the design and the methods of operation. The field for improvement was large, and the sources of loss and waste were many and of such magnitude as to be readily revealed by road tests.

But, as improvements have been made, the chances for further betterment in economy have diminished, and correspondingly greater refinement is needed in the methods of testing the value of those changes. While there are many facts which can be revealed only by tests in road service, notably those connected with strength and wearing and riding qualities, it is now very generally recognized by those conversant with the subject that for investigations involving the accurate determination of coal and water consumption, recourse must be had to the method of testing known as shop testing.

The term shop testing has been applied to all methods of testing in which the moving parts of the locomotive are allowed motion while the machine, as a whole, is stationary. If, while fulfilling this requirement, conditions of operation similar to those in regular service, —the same load, speed and boiler pressure,—can be secured and maintained at will, it is apparent that we have found a means of conducting experiments which possesses great advantages, both in convenience and accuracy, over the road test. Every part of the machine is at all times accessible to the experimenter for inspection,—a feature of special importance when testing the performance of new devices. In fact, a full understanding of the stresses and strains occurring in the various parts could hardly be had without the opportunity afforded by the testing plant to study carefully the moving machine.—Richard A. Smart in Cassier's Magazine for May.

LOADING LOCOMOTIVES.

With the development of modern rolling stock attention was called to the unsatisfactory system of loading locomotives, by giving them a stipulated number of cars to haul without knowing what the total tonnage amounted to; one train would be handled easily and the next one would stall the engine on the first heavy grade. Considerable friction naturally existed among all parties connected with the movements of trains under this plan, and often an engineer fell into bad repute with the operating officials when trying his best to keep moving. The tonnage system of rating engines, giving them a known load, largely overcame the difficulties and removed the irritating causes. The traffic department caught on to a few pointers with the adoption of tonnage rating. It was discovered that many cars were being sent out on long trips with but a few tons of some special freight that could not wait for the slow "way freight" distribution that only took place on day runs. A new plan was adopted, a zone system, that is, goods for zones A, B, C and tributary points were loaded promiscuously into cars at shipping centers and sent forward by fast freight, overhauled on arrival at A, B and C, put in station order and sent forward again for local distribution within a few hours, thus reducing the distance lightly loaded cars were hauled to the minimum, and expediting the distribution of goods, greatly to the satisfaction of the patrons and their own advantage

There is a limit even to the capacity of modern equipment, and in the case of cars this can be fairly approximated by calculation and close observation, noting wear and tear, undue strain, etc. It is different, however, with the locomotives; many variables complicate the problem. The aim of operating officials is naturally to move as many tons of freight as possible with the locomotives assigned to their districts, financial results being of course the chief consideration, but a system of comparisons with other divisions and other roads spur them up to make a favorable showing. It is doubtful, however, if the most economical results are obtained by loading locomotives to their utmost capacity; there is a line beyond which the load and speed cannot be increased without excessive consumption of fuel and undue wear and tear on machinery and boiler. There are other unfavorable effects that follow excessive loading, such as abnormally slow movement of trains, stalling, doubling hills and increased liability of accidents, which usually develop under such conditions. This proposition is more or less indefinite, and the possible results cannot be measured directly in dollars and cents, but that they exist to a greater or less extent any practical man will agree, and I would ask if a large price is not often paid for the "last straw" or few tons of freight that constitute its equivalent.—Wm. McIntosh, before the Northwest Railway Club.

BOOK NOTES.

STEAM BOILER PRACTICE, in its relations to fuels and their combustion and the economic results obtained with various methods and devices. By Walter B. Snow, S. B. 297 pages; 24 illustrations; 8 vo.; cloth, $3.00. John Wiley & Sons, New York.

The author explains in the preface that the book is not intended to describe designs and constructions of boilers and their accessories nor the special methods of operation and devices for increasing the efficiency of the same, but rather to explain effects and not causes, and to indicate the possible gain or loss for a given arrangement and to point the way toward securing the highest efficiency in steam boiler practice. The first chapters treat of steam boiler practice, the costs and efficiencies of water and steam, and of combustion, and on these subjects tables usually found in books on similar subjects are given. The compositions of different kinds of fuel are given and explanations of gas analysis methods. The chapter on "Fuels" is very complete and embodies much information collected from many sources. The table giving the composition and calorific value of American coals is very complete and such information is frequently desired. In treating of the efficiency of fuels Mr. Snow makes one declaration which it is probably well to emphasize; he says: "With ordinary coal and hand-firing the prevention of smoke is largely dependent upon the fireman, irrespective of any special appliances." This will not be entirely new to many, but some of the city officials should consider the matter well. The chapter on the "Rate of Combustion" will prove of much value to users of steam and the arguments presented are readily understood and such as generally meet with approval. The last chapters on "Draft," both chimney and mechanical, give a number of tables and formulas founded upon both theory and practice and will be found very safe to follow. It will probably be concluded generally that the trend of the argument is for mechanical draft, and it must be acknowledged that mechanical draft is each day receiving new converts. The appendix contains the rules for conducting boiler trials which rules were adopted by the American Society of Mechanical Engineers.

That entertaining periodical, Sunset, for March excels all previous issues both in quality and quantity. The opening article is from the pen of Prof. David Starr Jordan, and "Mexico," the theme, handled with his usual penetration and power. Then there is a well-considered paper on the resources of Stockton, fully illustrated; an account of a hunting trip in Sonora, Mexico; the fourth in the series of papers on the old Spanish Missions in the Southwest; "Wawona and the Mariposa Big Trees," by Eliza D. Keith; "Game of Southern Arizona," by that famous nimrod, Sherman Powell, and an unusually large fund of interesting miscellany. Sunset is published monthly at San Francisco by the passenger department of the Southern Pacific Company.

The bulk of the contents of the April Open Court is concerned with the Science of Education. Prof. L. Lévy-Bruhl, of the University of Paris, writes on Jean Jacques Rousseau, the founder of modern pedagogy, and one of the most interesting and paradoxical figures in the history of modern philosophy. The frontispiece of the number is a fine portrait of Rousseau. The Education of Parents by Their Children is the subject of an essay by Dr. Paul Carus. The Origin of Speech is treated by Prof. Th. Ribot, the celebrated psychologist. Current questions are discussed by the editor under the headings of Americanism and Expansion and Americanism in the Roman Church. Interesting to students of comparative religion, and to clergymen and theologians, will be the article on The Cross in Central America, which is profusely illustrated. (Chicago and London: The Open Court Publishing Company.)

The Ingersoll-Sergeant Drill Company, of New York, has just issued a little "booklet" entitled "Index of Ingersoll-Sergeant Air Compressors and the Many Uses of Compressed Air," which, on 28 pages, envelope size, gives a great deal of information. Each type of air compressor made by this company is illustrated and briefly but sufficiently described. The tables of uses of compressed air embraces 162 different uses—which is a good many. A later publication, large envelope size, issued by this company, is also well deserving of special mention. It is entitled "No. 25000," this title being chosen because of the fact that the company recently finished its twenty-five thousandth rock drilling machine. The pamphlet is filled with information concerning the Ingersoll-Sergeant Rock Drills, and is exceedingly perfect in its typography. The person who superintends the printed matter issued by this company thoroughly understands his business. Both these booklets will be sent to any one who applies for them.

ELECTRIC POWER FOR PORTABLE MACHINE TOOLS.

To most minds, portability in the case of a machine tool carries with it the suggestion of relatively small size, and a 48-inch slotting machine, for example, would not ordinarily be thought of as a tool of the portable type. The advent of electricity as a motive power, however, has brought some of its striking results into this field as well as into others of perhaps better-known character, and has given to some of the heavier machine shop equipments a flexibility of application which has widely extended their sphere of usefulness and has correspondingly simplified operations of hitherto awkward nature. The possibility, through electric driving, of bringing the tool to the work instead of the work to the tool has, indeed, led to a degree of economy in the handling of material which, in one of the large engineering workshops, is the immediately striking feature of the place and at once commands attention. An overhead electric traveling crane picks up a heavy slotting, or shaping, machine, or drill press, or other tool of required kind, carries it the length of the shop, if need be, to the work in hand, and as promptly takes it away after its mission has been accomplished, to operate upon some other piece of work, or to make room for some other tool. That portion of the shop floor commanded by the crane is one huge work table, slotted and grooved in all directions for temporarily bolting down the tools, and the equipment in its entirety and the methods of handling it afford a splendid object lesson of evolution in shop practice. No time is lost in carrying the heavy piece of work from tool to tool to be adjusted and fastened for each separate one; it is left in its originally allotted place, to be operated upon by each tool in turn, or, preferably, by several tools at once, as is often possible, with a degree of ease, rapidity and precision which invariably is impressive.—From Cassier's Magazine for May.

Goodsell's Pump Packing.

The "98" pump packing made by the Goodsell Packing Co., 33 S. Canal street, Chicago, possesses a feature of decided value. This feature is the wax end stitching, shown clearly in our engraving, which passes through the plies throughout each coil, adjacent to the wearing edge and parallel with it.

This happy thought successfully overcomes all tendency or possibility of splitting. The imperfect features of square duck packings held only by friction are eliminated by this method of manufacture. The frequently met with rapid disintegration of the wearing edge where adhesion fails by crosswise contact with plunger or piston head is also done away with by the wax end stitching.

"THE PAINT WONDER."

A line of paints which are actually heat proof, fire proof, rust proof, brine proof, acid proof, water proof, damp proof and teredo proof and which contain no oil, lead, zinc, iron or graphite is really "something new." The line of Pyro paints made by the Shearer-Peters Paint Company, of Cincinnati, Ohio, comes under this description and the proofs of their remarkable efficiency which the company offers, are certainly very strong and convincing.

These paints are unquestionably unique and in a class by themselves. In one sense Pyro paint is not new, for it is fourteen years since the first application was made. This was to the roof of a schoolhouse in Winfield, Kan., and the roof at that time was so old and leaky that the school board had decided to put on a new one. They consented to have this paint applied and a few weeks ago one of the then members of the board reported that

the roof was in perfect condition and had never leaked since the paint was applied, fourteen years before. He also says that the roof of his own dwelling, painted at the same time, is still "as hard as gloss and in as good shape as on the day it was painted." This is only one of a great many similar testimonials concerning work done during the fourteen years that the paint has been in use. These testimonials embrace many kinds of work, including bridges, viaducts, etc.

Applied to shingle roofs the paint is asserted to be genuinely fireproof. One man tells of building a hot fire on his shingle roof as soon as the paint hardened and not only were the shingles unaffected but the paint grew harder under the influence of the heat.

The experience of railroads which have used this paint on locomotive front ends and other hot metallic surfaces, indicates that the guarantee of the company that it will outlast any other paint at least five times, is more than sustained. One well-known superintendent of motive power writes that he had run engines five weeks with one painting and the front ends still looked all right.

The experience of those who have used these paints for protection against acids, gases, etc., has been equally satisfactory. The company insists that its paint is "a wonder," and the evidences it offers go very far toward substantiating the claim. It is certainly well worth looking into.

The company has, during the past year, established branch manufactories at Boston, Mass., Norfolk, Va., and San Francisco, Cal., and will soon have others. The permanent location of the company's main office and manufacturing plant was recently fixed in Cincinnati, Ohio.

MODOC LIQUID CAR CLEANER.

To keep passenger cars clean, sweet and bright, outside and in, without rapid injury to the paint, varnish, and trimmings, requires the use of something different from soap and water. The Modoc Liquid Car Cleaner has been found by a large number of leading roads to be entirely satisfactory for this work and is in regular use by them. In cases where a car has been neglected and has become very dirty, a preliminary cleansing with Modoc soap is recommended. This is a mild soap designed to do the least possible harm to the car. But if the Liquid Cleaner is properly used from the time the car leaves the shop, the car will be kept clean and bright, and it is found that at least eight months will be added to its length of service.

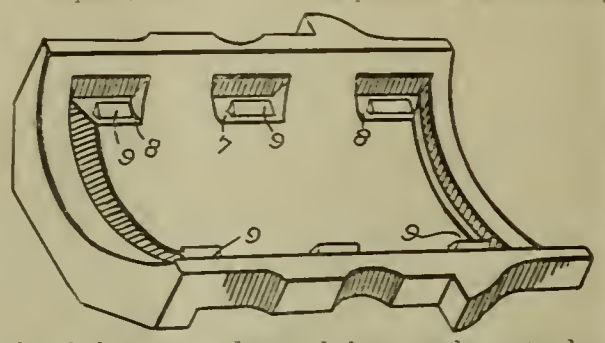
The manufacturers insist that a passenger car in ordinary service should be cleansed with the car cleaner not less frequently than once every thirty days, and that the cost of the treatment will not be more than $1.25. To allow cars to run five or six months without cleaning is uneconomical as well as shiftless, and regular monthly cleansing with the cleaner keeps the varnish and paint bright, pleases the traveling public and gives the car department a good reputation.

The company calls attention to the fact that in the first cleaning of very dirty cars the cleaner must not be expected to act as rapidly as strong soap and water, but neither will it do the mischief which such harsh measures cause. Attention is also called to the fact that when the dirt has become absolutely ground into a car the only effective treatment is that which is given in the shop. The proper work of the cleaner is to keep cars clean and bright and in good sanitary condition. It is also excellent for cleaning locomotives and is much used for that purpose.

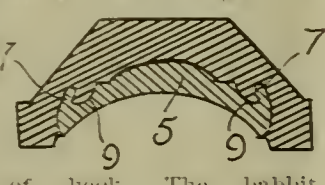
The directions which the company gives for preparing and applying the cleaner are very clear and easy to follow. This cleaner is manufactured by the Modoc Soap Company, of Cincinnati, Ohio.

A NEW JOURNAL BEARING.

A new form of journal bearing was some time ago designed by Mr. James Swan, foreman of the brass foundry of the Atchison, Topeka & Santa Fe at Topeka, Kan., and it has proven so satisfactory



that it has, we understand, been made a standard on that road. The distinctive feature of this bearing lies in its being so designed that the babbit lining is firmly attached to the brass without the use of rivets or the usual tinning process. As will be seen by reference to our engravings, which are made from rough sketches, the brass is cast with side and end recesses, 7 and 8, in which lugs 9 are integrally cast. When first cast these lugs 9 stand upright as shown in the perspective view. They are then bent down —to form a sort of hook. The babbit metal 5, is then poured into the brass and runs around and settles in the recesses; when set the hook-shaped lugs firmly hold the lining in place. The sectional view shows very fairly how the lugs effect a perfect interlocking of brass and lining. The claims made for this design, based upon experience in its use, are: more wear, the need of less oil, less chance of hot boxes and greater strength, as compared with the ordinary form of brass. The design may, of course, be adapted to any class of brasses.



"A CAR SHOP NECESSITY."

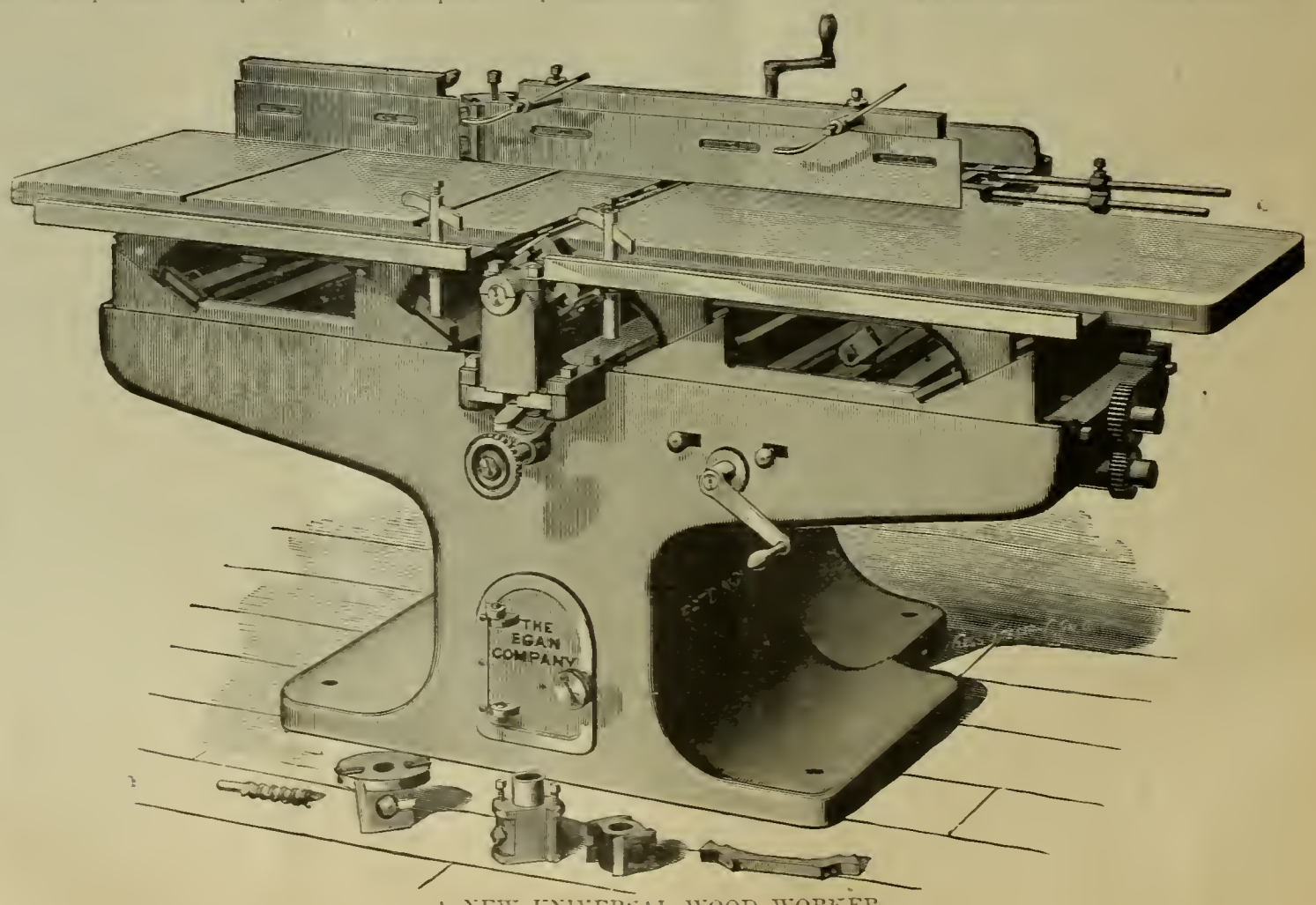
Our engraving presents the new No. 2½ Extra Large Universal Wood Worker, recently put on the market by the Egan Company, 216 to 236 W. Front street, Cincinnati, Ohio. It is especially designed for heavy and light work. It will be found especially adapted to car work, general wood working purposes, and for dressing and taking out of twist large timbers and plane perfectly true, a right angle at one operation. The main head is slotted on all four sides, and 19½ inches wide, and, running in connection with the four-sided upright head, makes a very desirable machine for general use, and gives the very best of satisfaction.

The column is one complete casting cored out, heavily braced and with ample floor space, insuring steady running and freedom from vibration when the mandrels are running at high speed.

The tables are of extra width and length, planed perfectly true, and made with wide grooves to secure the gaining and paneling frames, and exactly at right angles to the cutter head. Either table can be raised and lowered independent of the other, or can be raised or lowered together on a circle of the head, or straight up and down. All of these adjustments are made from the working side of the machine close to the cutter head, which allows the operator to make the necessary adjustments without going to the end of the machine. On this point the Egan Company claims to excel all other manufacturers.

The mandrels are of the best quality of steel, running in self-oiling boxes, lined with best genuine Babbit metal. The main mandrel is of large diameter, with the pulley on same running between the two back bearings. The front bearing is adjustable and can be taken off instantly when a change of heads is desired. This mandrel is also fitted up with patent adjustable bearings, by which the boxes, with mandrel and head, are moved back and forth across the bed, as desired, instead of making the adjustment by means of the fence, which will be found a great advantage and a great saving in time.

The patent beveling fences are made to adjust across the tables. One fence is placed over the main head, and one back of the upright head. Both are made with sliding plates and, when beveled, the lower part is close to the tables and so constructed as to have no forward motion. It is also arranged to take in posts and springs for holding down the



A NEW UNIVERSAL WOOD WORKER.

stock while being passed over the cutter head.

The boring attachment on the opposite side is perfectly independent in operation. Two men can work the machine at one and the same time, without any interference. It is capable of doing all kinds of boring, routing, rosette making, dovetailing table slides, and a general run of this kind of work.

The machine is furnished complete for ordinary work, such as planing out of wind up to 19½ inches wide, and squaring one edge up to 4 inches thick, at the one operation, also for surfacing straight or tapering, beveling, jointing, rabetting, making glue joints, either concave or convex; moreover, circular, straight and wave mouldings, chamfering, routing, boring, as well as gaining, grooving, panel raising, ripping, cross-cutting, rosette cutting, etc., can be done to the best advantage on this machine.

The builders of this new machine, the Egan Company, 216 to 236 West Front street, Cincinnati, Ohio, are putting out many new machines this season, in order to keep fully abreast of the natural evolution that goes steadily on in the mechanical world. For the past year this company has had a large corps of experts engaged in nothing else but designing improvements in existing machines and evolving new ones.

The machine we illustrate is the latest achievement of these men, and it is put before our readers with perfect confidence that it embodies in its design and construction their very latest talent and experience.

This company's line of machinery covers everything used in the manufacture of wood, and they can furnish single machines or complete outfits. Full information and prices on any kind of machines for working wood will be furnished on application.

PERSONAL.

Mr. W. T. New has resigned as assistant master mechanic of the Missouri Pacific at Kansas City, Mo.

Mr. Joseph Elder, superintendent of motive power and master car builder of the Rock Island & Peoria, has resigned.

Mr. A. J. Leonard has been appointed purchasing agent of the Chicago Junction railway, vice Mr. F. T. Croxon, resigned.

Mr. James N. Duff, master car builder of the New England Car Co., of Chicago, died suddenly at Wichita, Kan., on April 21.

Mr. John Vought has been appointed master mechanic of the Lehigh Valley, at Hazelton, Pa., vice Mr. Frederick Roth, resigned.

Mr. William G. Tuller, formerly general purchasing agent of the Atchison, Topeka & Santa Fe, died at Chicago, April 24, aged 80 years.

Mr. Andrew Anderson, Jr., has resigned as purchasing agent of the Mexican National. President W. G. Raoul will attend to purchasing.

Mr. G. H. Hess has been appointed general foreman on the Grand Trunk. Mr. Hess has hitherto been a locomotive engineer on the Wabash.

Mr. Frank Ray has been appointed road foreman of engines on Pennsylvania lines at Fort Wayne, vice A. H. Polamus, whose death we noted last month.

Mr. F. W. Williams, machine shop foreman of the Minneapolis & St. Louis at Minneapolis, Minn., has resigned to go to the Delaware, Lackawanna & Western.

Mr. G. W. Dixon has been appointed master mechanic of the Pittsburg, Lisbon & Western, with headquarters at New Galilee, Pa., vice Richard Beeson, resigned.

Mr. George Gurry, chief draughtsman at the Brooks Locomotive Works, has resigned and will return to his former position with the Rhode Island Locomotive Works.

Mr. R. A. Dugan, purchasing agent of the Elgin, Joliet & Eastern, has been appointed purchasing agent of the Chicago, Lake Shore & Eastern also, vice Mr. L. D. Doty.

Mr. O. E. Work has been appointed general foreman of the Wheeling & Lake Erie at Massillon. Mr. Work has hitherto been a locomotive engineer on the Wabash.

Mr. J. H. Pennington has been appointed superintendent of motive power of the Delaware, Susquehanna & Schuylkill, with headquarters at Drifton, Pa., vice John R. Wagner, deceased.

Mr. Theodore Haberkorn, of the Pittsburg, Fort Wayne & Chicago Railroad motive power department, has been appointed master mechanic of the Kenova division of Norfolk & Western.

Mr. William Forsyth has resigned as superintendent of motive power of the Northern Pacific, on account of ill health. He will return to his home at Aurora, Ill., for a summer's vacation.

Mr. A. B. Quimby, foreman at the Tracy, Minn., shops of the Chicago & Northwestern, has been appointed general foreman at the Winona shops of that road, vice J. T. Fleisher, promoted.

Mr. Thomas Fildes has resigned as master car builder at Chicago of the Lake Shore & Michigan Southern. Mr. Fildes has filled the post which he now relinquishes with signal ability for many years.

Mr. B. Adams, heretofore valve setter at the Winona shops of the Chicago & Northwestern, has been appointed foreman of the locomotive shops of that road at Tracy, Minn., vice A. B. Quimby, promoted.

Mr. Frank M. Wilder formerly superintendent of motive power of the Erie, and lately with the Richmond Locomotive Works, has been appointed superintendent of the works of the Standard Coupler Co.

Mr. W. A. Halstead has been appointed chief draftsman motive power department of the Oregon Short Line at Salt Lake City, Utah, vice Mr. J. E. Selby, who has accepted a similar position with the Mexican Central.

Mr. C. D. Pettis, chief clerk to Master Car Builder Medway of Swifts' Refrigerator Transportation Co., has resigned to accept the position of general foreman car department of the Illinois Central at the Burnside (Ill.) shops.

Mr. C. L. Bundy, of the car inspection force of the Chicago, Rock Island & Pacific, has resigned to become general foreman of the Swift & Co.'s shops at Chicago, vice H. V. Kuhlman, resigned to enter private business.

Mr. J. T. Fleisher has been appointed division master mechanic of the Chicago & Northwestern, at Eagle Grove, Ia., vice Wm. Hutchinson, transferred to Winona. Mr. Fleisher has hitherto been foreman at the Winona shops.

Mr. C. A. Seley has been appointed mechanical engineer of the Norfolk & Western, vice Mr. G. R. Henderson, resigned, effective April 15th, 1899. Mr. Seley has hitherto been mechanical engineer of the Chicago Great Western.

Mr. W. J. Wilcox has been appointed division master mechanic of the Santa Fe Pacific, at Winston, Ariz., vice Mr. T. F. Underwood resigned. Mr. Wilcox has hitherto been master mechanic of the South Carolina & Georgia, at Blacksburg, S. C.

Mr. B. R. Moore has been appointed chief draftsman, motive power department, of the Chicago & Northwestern. Mr. C. D. Jennings, who has heretofore occupied this position, has been assigned to special duties, reporting to the mechanical engineer.

Mr. H. V. Kuhlman, general foreman of Swift & Co.'s shops at Chicago, has resigned to become representative of the Standard Railway Supply Co., vice Mr. L. T. Canfield, who, as elsewhere noted, becomes master car builder of the Delaware, Lackawanna & Western.

Mr. J. S. Turner has resigned as superintendent of motive power of the Colorado & Southern to accept the position of superintendent of motive power of the Fitchburg. The appointment dates from April 11. His jurisdiction will extend over all matters pertaining to the locomotive department.

Mr. Wm. Hutchinson, division master mechanic of the Chicago & Northwestern, at Eagle Grove, Ia., has been appointed master mechanic at Winona, Minn., vice Wm. McIntosh, who, as previously noted, resigned to become superintendent of motive power of the Central Railroad of New Jersey.

Mr. L. T. Canfield, formerly in charge of the car building work at the Chicago shops of the Chicago, Rock Island & Pacific, and who has of late been engaged with the Standard Railway Supply Co., at Chicago, has been appointed master car builder of the Delaware, Lackawanna & Western.

Mr. L. L. Smith, foreman of the brass foundry of the Chicago, Burlington & Quincy, at Aurora, and who has been from time to time assigned to special detail work by the mechanical department of that road, has been placed in charge of the company's roundhouse at Streator, Ill., vice Mr. A. R. McDaniel, resigned.

The following appointments are announced as having been made in the mechanical department of the Pennsylvania railroad: Alexander Kearney, assistant engineer of motive power; D. M. Perine, assistant engineer of motive power on the Philadelphia & Erie and the Northern Central; James T. Wallis, assistant master mechanic of Meadow shops.

Mr. F. O. Brazier, of the auditor's department of the Illinois Central, has resigned to engage in the service of the Lappin Brake Shoe Co. Mr. Brazier, who is a son of Mr. F. W. Brazier, assistant superintendent of machinery of the Illinois Central, was prior to his connection with that road chief clerk in the offices of the Chicago, New York & Boston Transportation Co.

Mr. T. R. Morris has been appointed general foreman, car department, of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, vice Mr. W. O. Davies, transferred. The appointment dates from April 28th. Mr. Morris has hitherto been assistant general foreman at Chicago of the same road, and his many friends are much pleased to learn of his deserved promotion.

Mr. Robert McKenna, who has for 29 years been master car builder of the Delaware, Lackawanna & Western, has resigned that position. Mr. McKenna was born in Scotland, in 1826. He entered railway service in 1853 as foreman of car shops of the Hudson River railroad and remained in that position until 1870, since which date he held the post that he now retires from.

Mr. A. L. Kendall, general foreman of the car department of the Illinois Central at the Burnside shops, has been appointed master car builder of the Lake Shore & Michigan Southern at the Englewood shops (Chicago), vice Mr. Thomas Fildes, resigned. Mr. Kendall was formerly for some time in the service of the Lake Shore, at the shops of which he now takes charge.

Mr. John H. Goodyear has been appointed assistant general superintendent of the Buffalo & Susquehanna R. R. Co., including leased lines and branches, the appointment dating from April 1. Mr. Goodyear, it will be remembered, was formerly chief clerk of motive power department of the Chicago Great Western Ry., and only recently resigned that position to enter the service of the B. & S. road. His many friends will be pleased to learn that promotion has come so quickly to him.

Mr. John W. Fitz Gibbon, whose resignation as assistant superintendent of motive power of the Chicago, Rock Island & Pacific to become the head of the mechanical department of the Delaware, Lackawanna & Western, as we have previously noted, has his headquarters at Scranton, Pa. His title—a new one on the Lackawanna—is superintendent of motive power and machinery, and he will have full charge of the construction, maintenance and repairs of the locomotives and machinery of the company.

Mr. L. N. Hopkins has been appointed supply agent of the Chicago, Burlington & Quincy, with headquarters at Chicago. He will have entire charge of all material belonging to the company which is not actually in use. All officers of the company who have the immediate custody of any material whatever, will be governed by his instructions, and will co-operate with him in all matters relating thereto. Until further notice, the routine business of the supply department will be transacted through the storekeeper at Aurora, as heretofore. This appointment dates from April 15.

Mr. John Forster has been appointed superintendent of motive power of the Colorado & Southern, vice Mr. J. S. Turner, resigned to become superintendent of motive power of the Fitchburg. Mr. Foster was formerly division master mechanic of the Atchison, Topeka & Santa Fe, and only recently was appointed division master mechanic of the road of which he now becomes superintendent of motive power. The office of division master mechanic of the Colorado & Pueblo districts, which has hitherto been held by Mr. Forster, has been abolished, and Mr. J. Piccioli has been appointed general foreman at Denver, with jurisdiction at Denver.

Mr. John W. Cloud, who for many years has represented the Westinghouse Air Brake Co. at Chicago, will go to London to represent the company there. He has resigned as secretary of the Master Car Builders' Association and of the Master Mechanics' Association, and also as treasurer of the Western Railway Club. It has been with sincere regret that the railway world has learned of Mr. Cloud's leaving this country, but warm God-speeds will follow him. His discharge of the duties of secretary of our two great national railway associations has been simply ideal; and in all his business and personal relationships he has won friends on every hand.

Mr. Oliver H. De Young, master mechanic of the El Paso division of the Galveston, Harrisburg & San Antonio Ry., died at El Paso, Tex., March 24, of catarrh of the stomach. Mr. De Young entered railway service in 1875, and for the ten years following was first apprentice and then machinist on the Houston & Texas Central and Texas & New Orleans Rys. From 1885 to 1887 he was fireman and engineer on the Texas & New Orleans. For the year following he was machinist and round house foreman on the Sabine & East Texas. From 1888 to 1892 he was master mechanic of the latter road. Since 1892 he had been occupying the position that he held at the time of his death.

Mr. William Buchanan has resigned as superintendent of motive power and rolling stock of the New York Central & Hudson River, thus closing one of the most notable careers in American railway service. Mr. Buchanan was born March 6, 1830, in Scotland. He entered railway service in 1847, since which he has held the following positions: 1847 to 1849, apprentice shops Albany & Schenectady R. R.; Sept., 1849, to July, 1851, machinist Hudson River R. R.; July to December,

1851, locomotive engineer, and January, 1852, to June, 1853, shop foreman; June, 1853, to 1859 master mechanic (Southern division); 1859 to 1880 master mechanic entire line and Troy & Greenbush R. R.; April, 1880, to April, 1881, superintendent of motive power Hudson River and Harlem division New York Central & Hudson River R R.; April, 1881, to date, superintendent motive power and rolling stock New York Central & Hudson River R. R. Mr. Buchanan has a world-wide fame, not only as the head of the mechanical department of one of America's foremost railway systems, but as the designer of the noted locomotive "999" which was exhibited at the World's Fair at Chicago in 1893.

Mr. Frank Bruce, master mechanic of the Montana Central, died at his home at Great Falls, Mont., April 14, aged 53 years. Mr. Bruce was born in 1846 near Newburg, N. Y. He served an apprenticeship as machinist with the Washington Iron Works at Newburg and entered railway service June, 1870, as machinist on Chicago, Milwaukee & St. Paul Ry. at Minneapolis, where he remained for nine year. His career from that time until death closed his labors was as follows: April, 1879 to June, 1882, foreman shops Minneapolis & St. Louis Ry. at Minneapolis, Minn.; June, 1882, to March, 1885, roundhouse foreman St. Paul, Minneapolis & Manitoba Ry. at Crookston, Minn.; March, 1885, to September, 1887, division master mechanic of the same road at Barnesville, Minn.; September, 1887, to February, 1888, foreman shops Louisville & Nashville Ry. at Bowling Green, Ky.; February, 1888, to March, 1889, division master mechanic Atchison, Topeka & Santa Fe Ry. at Emporia, Kan., and Raton, N. M.; March, 1890, to October, 1890, master mechanic Chicago division of the same road; in October, 1890, to April, 1891, master mechanic Union Pacific Ry. in Kansas; April 1, 1891, to November, 1891, general master mechanic Chicago & Eastern Illinois R. R. at Danville, Ill.; February, 1892, to February, 1893, master mechanic Great Northern Ry. at Barnesville, Minn.; February, 1893, to the time of his death, master mechanic Montana Central Ry.

Mr. A. M. Waitt, who has since 1892 been general master car builder of the Lake Shore & Michigan Southern Ry., has been appointed superintendent of motive power and rolling stock of the New York Central & Hudson River R. R., vice Mr. Wm. Buchanan, resigned.

Mr. Waitt has been often thought of and talked of for this position and its final coming to him has given sincere pleasure to his many friends. Mr. Waitt is best known as a "car man;" indeed his railway work has been quite closely confined to the car department; and his appointment as a superintendent of motive power has consequently occasioned some surprise among those who have not known of the fact that he is a mechanical engineer by education and that he has all through his active railway service kept a close eye upon, and directed an attentive memory to, what has been going on in the locomotive department. These not generally observed facts, coupled with the quite well recognized fact that he is a man of unusual executive ability, make clear his especial fitness for the high post to which he now attains. Mr. Waitt was born in 1858 and entered railway service in 1879, his previous training consisting of a course in the Massachusetts Institute of Technology, from which he graduated with the degree of mechanical engineer. His first railroad work was as draftsman in the car and locomotive department of the Chicago, Burlington & Quincy R. R., which work he engaged in from 1879 to 1881. During the next year he was draftsman in the car and locomotive department of the Eastern R. R. From 1882 to 1884 he was chief draftsman in the locomotive department of the same road. For the next three years he was the general foreman of the car department of that road, and was later, up to February 1, 1889, assistant master car builder of the Boston & Maine R. R. He then came west as assistant manager of the Pullman Car Works at Chicago, holding that position until October, 1889, when he was appointed assistant general master car builder of the Lake Shore & Michigan Southern Ry. He performed the duties of this office until October, 1892, when he was made general master car builder of that road. He held this office continuously until the present time. Mr. Waitt has been very active in club and association work and has held office both as vice-president and president of the Western Railway Club, and he was last year elected third vice-president of the American Railway Master Mechanics' Association. He is also a member of the American Society of Mechanical Engineers and of the Franklin Institute, of Philadelphia.

One of the Old Timers.

We have from time to time published photographs and sketches of railroad men, who by industry, perseverance and ability have risen to prominence in their profession, and have acquired enviable names, and accumulated competencies which have enabled them to enjoy an earned and deserved rest from labor at an advanced age. We lately were interested in the subject of this sketch by reason of the example it sets, for the young men of this country who have started, or are about to start, in a mechanical line, for in no place are there so many opportunities for the young mechanic to acquire a competence as in this country. One has not to rise to prominence to make one successful, but the every day endeavor met, and successfully accomplished, in the end brings its reward, and few there are who can look back to a service at one place covering a period of over forty years.

Mr. Geo. O. Durrell, whose photograph we herewith publish, was born in New Market, N. H., April 4th, 1830. His parents were farmers, with a family of twelve children—ten boys and two girls. As a boy, and one of the eldest, he was apprenticed out to a farmer at the age of 12, for four years for his board and clothes, doing farm work. At the age of 16 he secured employment as a mechanic apprentice in a bobbin and shuttle shop at New Market, with the late Daniel Jewell, who was for about twenty years master car builder for the Cincinnati & Muskingum Valley R. R., at Lancaster, Ohio. He worked for Mr. Jewell until 1853. In 1852 he married his employer's daughter, and in 1853, in company with his father-in-law, he moved to Hocking Valley, Ohio, then a wilderness, and engaged in the lumber business. He remained there one year, returning to New Market, and was immediately offered journeyman's wages to return to the old shop, but believing a better possibility of advancement lay in the knowledge of the iron business, he entered an iron works at the munificent pay of seventy-five cents per day, continuing in that for one and a half years, during which time his services were so appreciated as to cause his employers to increase his pay twice. In the year 1856 he moved to Dunkirk, N. Y., and entered service in the New York & Erie repair shops, under Mr. Wm. Hart, master mechanic; having only a limited experience at machine work, he contracted to work for $1.25 per day, but before his first month had expired, his pay was advanced to $1.32 per day. At the end of the first year he was placed upon a lathe, turning pistons, glands and composition packing for the Western division of the Erie R. R., and with an increase of pay each year he held this place until August, 1862, when he enlisted in the 72nd Regiment New York State Volunteers for three years' service.

At the time of his enlistment, the late Mr. H. G. Brooks, president of the Brooks Locomotive Works, who had succeeded Mr. Hart as master mechanic, said to him that in case he returned from the war safe, he should have his old, or a better place. Previous to his enlistment he had been for four years a member of 68th Regiment New York State militia, and custodian of the states guard armory. During his service in the rebellion he was engaged in the battles of Fredericksburg, Chancellorville, Gettysburg, and participated in all the battles of the Army of the Potomac up to June, 1864, when he was detailed and ordered to report to Gen. D. C. McCallum, in charge of military railroads at Washington. Upon reporting to Gen. McCallum he was sent to City Point in charge of locomotive repairs on the road running from City Point to Petersburg and Richmond. He continued to serve in that capacity until the close of the war, when he was mustered out of service. Mr. Durrell entered into Richmond from City Point with the first railroad train which entered the city after the surrender of General Lee.

Returning to Dunkirk immediately after the close of the war, Mr. Brooks fulfilled the above-mentioned promise, and placed him in charge of the second largest lathe in the shop. The year following, 1866, or thirty-three years ago, he was placed upon the driving wheel work. In 1869 Mr. H. G. Brooks and Mr. M. L. Hinman leased the New York & Erie shops, and organized the Brooks Locomotive Works. From that time up to within a few weeks ago, when he resigned his position, Mr. Durrell had entire charge of all driving work connected with the locomotive works. He continued with the company until they had completed 3060 engines, and of all of these engines, none ever passed without the work under his jurisdiction being carefully inspected by him. By economy he has gained a competency which enables him, after so many years of labor, to feel secure of the comforts of life during his remaining years.

In conversation with Mr. Durrell, he says, to use his words, that the secret of his success "was looking after his work personally and seeing that each detail was done right." This is truly the reason of success in any undertaking.

Mr. Durrell is to be congratulated upon the success which he has made, even though in a humble walk of life, and the Brooks Locomotive Works upon having for so many years one in their employ in whom they have had such confidence as they have shown in this employe for nearly half a century.

SUPPLY TRADE NOTES.

—Grain doors furnished by the Chicago Grain Door Co. will equip the 1000 Chesapeake & Ohio cars recently ordered from the Pullman Palace Car Co.

—The Buffalo Forge Co. has removed its New York office from room 406 Havemeyer Bldg., 26 Courtlandt street, to room 114, Taylor Bldg., 39 Courtlandt street.

—The Boston Belting Company is doing some up-to-date advertising these days. A "special" postal card recently issued by this company contains a good combination of humorous picture and clear, straightforward reading matter which cannot fail to be effective.

—The Jones Car Door Company has been organized in Chicago to manufacture and sell the new Jones car door. This door retains some of the best features of the Moore car door and has several new features which promise to put it in the very front rank of that class of car equipment. The door has been in use for some time on several roads and will be exhibited at the June conventions.

—Mr. Schuyler Hazard, for many years in the engineering department of the Big Four system and of late the principal assistant engineer of that system, resigned May 1 to engage in selling the Lumen bronze, Lumen anti-friction metals, Lumen linotype metal, etc. He has formed a partnership with Mr. Thomas Lee, of Cincinnati, Ohio, to conduct this business. The firm will also handle a line of mechanical specialties. Its office is at 209, 211 and 213 Race St., Cincinnati.

—The Marshall & Huschart Machinery Company, Cleveland, O., selling agents for Gould & Eberhardt, of Newark, N. J., have sold to the Brown Hoisting and Conveying Machine Co., Cleveland, an automatic gear cutting machine of 120x20-in. capacity. This machine is a duplicate of one built by Gould & Eberhardt and recently installed at the works of the Blake steam pump plant at East Cambridge, Mass. It is said to be the largest size of entirely automatic gear cutting machines built.

—The improved Michigan triple locomotive lubricators and automatic steam chest plugs were specified on the following recent locomotive orders: Chesapeake & Ohio, nine locomotives with the Richmond Locomotive & Machine Works and two locomotives with the Schenectady Locomotive Works; Hocking Valley, five locomotives with the Baldwin Locomotive Works; Buffalo, Rochester & Pittsburg, ten locomotives with the Brooks Locomotive Works; also on the Wabash order with the Rhode Island Locomotive Works.

—The annual meeting of the stockholders of the Joseph Dixon Crucible Company was held at the company's main office, Jersey City, N. J., Monday, April 17, and out of a possible vote of 7,345 shares, there were 7,069 shares voted for the re-election of the old board, consisting of Edward F. C. Young, John A. Walker, Daniel T. Hoag, Richard Butler, William Murray, Alexander T. McGill, and Joseph D. Bedle. President E. F. C. Young; vice-president and treasurer, John A. Walker; secretary, Geo. E. Long were re-elected by the directors. Judge Joseph D. Bedle was also re-elected as counsel.

—The Detroit Graphite Manufacturing Company has been compelled to add largely to its works and has nearly completed an addition of a brick building 53 by 74 feet with five stories above a high basement. The old building will be used for pulverizing ore and the new structure will be devoted entirely to the manufacture of paints. The arrangement is such that the work will begin on the fifth floor and the paints will reach the first floor ready to be marked for shipment. At present the company is obliged to run its old plant day and night to keep up with its orders and the completion of the new building will give a much needed relief.

—The Gates Iron Works, Chicago, sends its rock crushers all over the world. Some two hundred and fifty of them are now at work in the mining regions of South Africa and scores of them have been shipped to the Australian continent. A third order was recently received from Germany for a plant originally installed by the company for crushing an exceedingly hard basaltic rock, and twice enlarged since. Last year a plant was established on the island of Guernsey. At the installation of a Gates' plant in Dalbeattie, Scotland, last year, important public ceremonies were participated in by the citizens of the town. No manufacturing concern in the country has a higher reputation for integrity in its work and methods than the Gates Iron Works.

—The Chicago Pneumatic Tool Company is pleased to announce valuable acquisitions to its working force in securing the services of Messrs. W. P. Pressinger and J. M. Towle. Mr. Pressinger is well known to

users of compressed air everywhere, through his long connection with the Clayton Compressor Works, and he now leaves that concern to work with the New York office of the Chicago Pneumatic Tool Co. Mr. Towle, who will open an office for this company in Boston, has been for the past ten or twelve years engaged in the manufacture and sale of pneumatic tools, and is an expert in that line, and well known throughout the east, where his work has principally been done. This arrangement gives the Chicago Pneumatic Tool Co. offices in Chicago, New York, Boston, Buffalo, Pittsburg, St. Louis and San Francisco, thus enabling it to easily reach its trade all over the United States.

—J. A. Fay & Egan Co., the largest builders of wood working machinery in the world, whose extensive works are located in Cincinnati, are making great improvements in their plant, and they have already put in some $50,000 worth of the latest improved iron working tools, and workmen are now erecting an addition to their plant, which is to be equipped with all the latest devices for turning out their machines to the best advantage. "Superior quality above everything" has always been this company's motto, but the new machinery now being placed, will enable them to build and finish their machines in a better manner than ever before. Orders for the newly improved and advanced type of machines for working wood which they have brought out in the past year or eighteen months, are coming in very rapidly, and they are very busy; so busy in fact, that if business increases much more they will have to work at night. If their business is any indication of coming prosperity, the year of 1899 will excel all others. The new building now in course of erection will be quite extensive. This company, by the way, gave an increase of 10 per cent in wages to its employes on May 1, without solicitation from its men. This is good witness of the return of better times.

—That the wonderful tidal wave of prosperity which is now sweeping the country is not confined to any particular trade or business is evidenced by the very large number of orders received by the National Pneumatic Tool Co., of Philadelphia, during the past month. This company succeeded to the business of the C. H. Haeseler Co., on March 1st, as previously noted, and its business during that month was four times as large as that of the precedessor company in its best month. Its orders included thirty-six of its drilling and reaming machines for the Schoen Pressed Steel Co. (the largest single order from a consumer, it is stated, ever given for this class of tool), ten to the Atlantic Works, East Boston; eleven drills to the Baldwin Locomotive Works; four to the Dickson Manufacturing Co., beside a multitude of drills and hammers in smaller lots to other concerns all over the country. These orders were all secured after competitive tests and speak well for the merit of this company's product. We may add in this connection that on April 6 the National Pneumatic Tool Company bought from the American Pneumatic Tool Company, of New York, the sole and exclusive right to manufacture pneumatic chipping, calking and riveting hammers under all patents owned by the latter company, who were the first concern to place this class of tool on the market. The American Pneumatic Tool Company have brought a number of suits for infringement of their patents on both valve and valveless hammers, and the United States court of appeals for New York has, we are informed, unanimously decided in their favor. It is their intention, so it is stated, to bring suits for infringement against all users of hammers not manufactured by the National Pneumatic Tool Company. This purchase, we understand, was effected by the National Pneumatic Tool Company with the idea of saving and preventing their customers from annoying litigation and consequent excessive damages for infringement.

—The month's reports concerning new shops and shop additions and shops destroyed by fire are as follows: The details of the additions to the Chicago & Northwestern shops at West Fortieth street, Chicago, referred to in our last issue, are as follows: The company expects to extend its present tank shop by an addition 140 feet long and 80 feet wide; the roof of the present shop will be raised 5 feet. It is intended to put a 30 ton electric traveling crane in this building. It is also the intention to build a new boiler shop 120 feet wide by 300 feet long, to be equipped with a 50 ton electric traveling crane and one 5 ton electric crane. The company also expects to build an extension (or annex) to the machine shop 150 feet long by 100 feet wide and two stories high; the second story will be merely a gallery. In this building the company expects to manufacture material for the entire system. The manufactured parts that are to be made in this building are such standard parts of locomotives as can be finished up in large quantities, thereby greatly reducing the cost of the same. The company also expects to put up a new power house in which will be installed all of its pumps, air compressors, electric lighting plant and engines and generators for furnishing power to the shops. It is the intention to distribute power by electricity to the various buildings.—The Lehigh Valley shops at Sayre, N. Y., will, it is stated, be doubled in size. The new shops are to be used for the building of passenger cars.—The Northern Pacific machine, boiler and blacksmith shops at Mandan, N. D., were destroyed by fire April 9.—The contract for building a 24-stall roundhouse for the Chicago, Burlington & Quincy at Hannibal, Mo., has been awarded to the George B. Swift Company, of Chicago, and the building will be completed by August 1. The structure will be of brick, the flooring of the pits to be brick or concrete. The turntable will be mounted on pilings, with concrete and oak drillage, and with stone footings, capped with granite.—The Santa Fe roundhouse at Winfield, Kan., which was recently destroyed by fire, will be replaced with a much more substantial building.—The Ohio Southern Railroad Company will soon place in operation a large locomotive and car repair plant in Lima, O. New machinery will be installed.—It is reported that the Pennsylvania Company will, during the coming summer, build roundhouses and repair shops a short distance west of Brier Hill, O.—In addition to the numerous shop buildings now being completed by the Santa Fe Railway Company at Cleburne, Texas, bids have been invited for the erection of three more, as follows: One stone building 220x90 feet, one corrugated iron car repair shop 100x400 feet, one corrugated iron storage house 60x220 feet.—The Columbus, Sandusky & Hocking shops at Columbus, were damaged by fire April 17, the oil house, sand house and water tank being destroyed.—The Canadian Pacific Railway's roundhouse at Fort Williams was destroyed by fire April 18. Seven fine new locomotives were ruined.—The Allegheny Valley is building a new blacksmith shop at Verona; it is 40x70 feet.—The Minneapolis & St. Louis Railroad Company is contemplating an enlargement of the general shops at Cedar lake.—The Burlington will, it is reported, expend about $17,000 on improvements at the Havelock shops.—The Pecos Valley road will, it is reported, build a roundhouse at Amarillo, Tex.—The Central of New Jersey will build new shops at Elizabethport, N. J.—The shops of the Louisville & Nashville at New Decatur, Ala., will have an addition of 40 feet to the boiler shop, 60 feet to the blacksmith shop, 40 feet to the planing mill and 160 feet to the car shops; $20,000 worth of new machinery will be installed, including a stationary engine for the boiler shop and a 2000-lb. steam hammer for the blacksmith shop. R. M. Newbold & Co. have the contract.