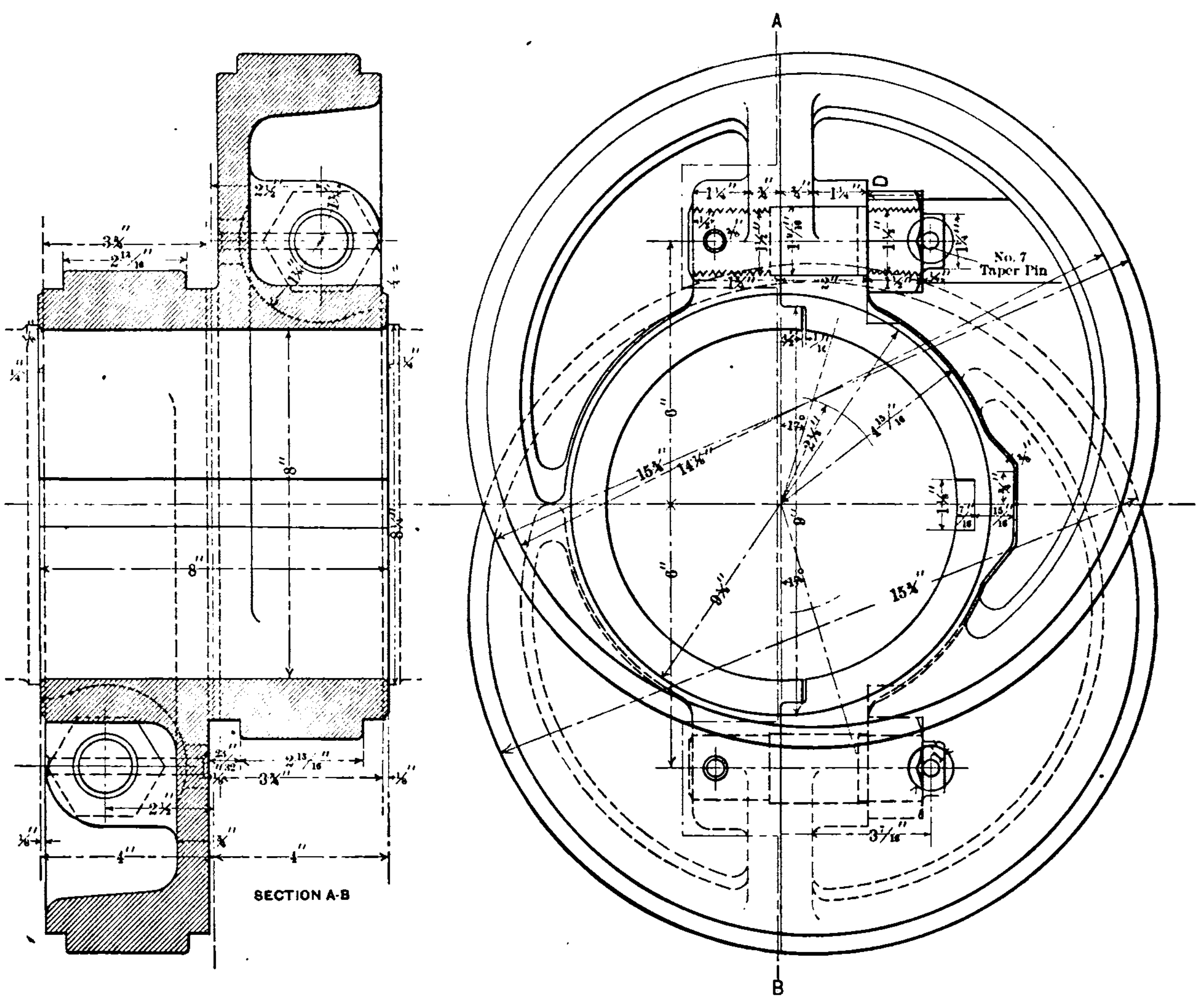


Double Eccentric for "Class R" Locomotives—Pennsylvania Railroad.

Double Eccentrics for Class R Locomotives on the Pennsylvania Railroad.

In the accompanying illustration we present the drawing of a "double eccentric" inuse on Class "R" locomotives on the Pennsylvania Railroad. This "double eccentric," as it is called on the road, consists of two split eccentrics cast together, two castings only being required in place of the four usually employed, and the object of this method of construction is to obtain greater strength and better fastenings. The eccentrics are split at right angles to the customary line of division, and the two parts are bolted together by two studs 1¼ inches in diameter. The hub and rim of each eccentric are united by a plate or web ¾ inch thick and at the joint between the castings there is a cross web of the same thickness with a boss on it 1¼ inches high for the stud. The studs are screwed into one-half and each held in place by a ⅜-inch rivet passing entirely through the stud and boss. At the other end of the stud is one nut secured by a No. 7 taper pin. A 1-inch hole in the web of the eccentric opposite the taper pin makes it accessible from either side.

After planing the joint between the two castings which make up the double eccentric, they are put together with one thickness of heavy manilla paper between then and bored for the axle fit. The paper is then removed and the eccentric clamped onto a mandril for turning. This mandril has in its ends centers correctly located for both the throw and angular advance.

The completed eccentrics are evidently adapted only for one angular advance which cannot be changed in forward gear without distorting the back gear, but on a road having so many locomotives of one class as the Pennsylvania Railroad, this is no objection. Of course it would not pay to make eccentrics in this manner where the locomotives were few in number and their valve gears were not duplicates in every detail, but in the case cited it does pay, and a more substantial piece of work is obtained than is possible with the common construction. They have been used on Class "R" engines for more than a year with excellent results.

Chinese Railway Projects.

Advance sheets of consular reports for March contain a communication from the United States minister at Peking, on railroad enterprises in China, from which it appears that a decree has been issued by the Emperor, placing the construction of the railroad from Tientsin to Lu Kou Bridge, eight miles west of Peking, in the hands of Hu Chüfen, a native of Kwangri province, holding the rank of provincial judge, and a man who has had some experience with the Tientsin railroad. The cost of the line (approximately 70 miles) is stated in the decree to be 2,400,000 taels (about $2,000,000 United States currency), or more than $28,000 per mile. An American engineer recently estimated the cost of this line at $20,000 per mile, with rolling stock and equipment complete. The proposed route presents no difficulties except the necessity of high embankments and numerous drains and culverts in certain localities to cope with annual floods. It is understood that Mr. Hu's instructions are to employ no foreign capital whatever. He is said to have already 4,000,000 taels at his command, and it is said he proposes to finish the line within a year. A part of the decree ordering merchants to form stock companies for railroad building outlines the present railroad policy of China. There is a strong determination on the part of the Government to exclude foreign capital and foreign control. There is reason to believe, however, that this determination will give way before the magnitude of the undertaking which will bring to light the inexperience of the Chinese managers. There will then be a great field open there to foreign railroad enterprise.

This field has already attracted great attention, and it will doubtless be eagerly disputed by the representatives of the railroad interests of various nationalities. United States Minister Denby has urged on the Chinese authorities the pre-eminence of the Americans in railroad construction, and in the manufacture of all those products which China's railroad system will in time require. It would be much to be regretted should this market be allowed to pass without an effort into the hands of others.

Concerning another enterprise, the *North China Herald* of Jan. 17, 1896, says: It is reported, upon what seems to be good authority, that the Liangkiang viceregal government has given the construction of the Shanghai-Soochow Railway to a cosmopolitan syndicate, at the head of which is a Belgian. The Chinese are to borrow the money for construction from the syndicate, the loan to be repaid in installments beginning from the third or fourth year after trains have commenced running between the two cities. The object of this is to make the railroad obstructionists in Peking believe that Chinese capital has been employed in the construction of the road. The terminus of this railway is to be at Sinza (Chinese territory), where also will be the freight and passenger offices of the semi-government steamboat line to run between Shanghai, Soochow and Hangchow.

Station Name Boards.

On account of the many complaints received by the British Board of Trade as to the inconvenience caused to the traveling public by the ineffective manner in which the station names are indicated at railway stations, a circular was sent out to the various railway companies of the United Kingdom asking them to state what steps they proposed to take in order to deal effectively with the subject. The replies to this circular are contained in a blue book just issued. Among the various companies whose answers are given, the Great Northern Railway Company state that they have decided, with a view to keeping the names of the station distinct from advertisements, to show the names on angular boards projecting from the station walls, and also on platform lamps, and, when practicable, waiting-room windows. The Great Western Company report that they have taken steps to provide distinctive name-plates at all new stations, and to rearrange those at existing stations (when these stations are renovated), so as to leave a space of 12 inches between the name-boards and advertisements. A standard pattern of name-board has been adopted, and the boards are fixed in prominent positions. The names are also shown on lamps and seats. The Metropolitan Company report that the names are shown at their stations on boards and platform lamps and seats, and that they have given notice that all advertisements must be removed 18 in. clear of the name-boards. They have also provided additional boards, which, to prevent confusion with advertisements, bear the word "station." The Metropolitan District Railway, after describing the way in which the names are displayed at their stations, add that they have also decided to adopt an apparatus for automatically indicating in each compartment the name of the station the train is approaching. The Caledonian Company propose to make arrangements to prevent advertisements from being placed in close proximity to the name-boards. The majority of the other companies express the opinion that their present arrangements in respect to station names are satisfactory; but a number of them add that they will be glad to consider any recommendation which may be made to them on the subject.

It would be in order if we had a national Board of Trade to make a similar inquiry in this country. The elevated railroad in New York especially should improve its signs for the use of travelers at night. The names of the stations should be inscribed in some way in the glass globes of the gas lights. It is now very difficult for a stranger, or even native New Yorkers, to tell what station "he is at" in the night.

Contributions to Practical Railroad Information.

Chemistry Applied to Railroads.

SECOND SERIES—CHEMICAL METHODS.

XVII.—METHOD OF DETERMINING PROPORTIONS OF OIL, PIGMENT AND MOISTURE, OR DEFICIENCY OF HYDRATION IN FREIGHT CAR COLOR.

By C. B. Dudley, Chemist, and F. N. Pease, Assistant Chemist, of the Pennsylvania Railroad.

EXPLANATORY.

The standard freight car color of the Pennsylvania Railroad Company is bought in paste form, and the paste must contain nothing but oil, pigment and moisture. The moisture and other volatile constituents must not exceed 2 per cent. of the weight of the paste, and the paste must not be a "liver" when received. The oil must be pure raw linseed oil, and must not be less than 23 nor more than 27 per cent. of the weight of the paste. In determining the proportions of oil, pigment and moisture, or other volatile constituents, the oil must be heated before weighing to 250 degrees Fahrenheit, and the pigment must be dried before weighing at from 60 to 90 degrees Fahrenheit in air which has been artifically deprived of moisture. The inert material in the pigment may be sulphate of calcium or gypsum, silica, kaolin, soapstone or asbestine, the two former preferred. Carbonate of calcium must be present to the extent of 2 per cent., but must not exceed 5 per cent. of the weight of the pigment. Ground feldspar is not desired, and barytes or sulphate of barium, organic coloring matters and caustic substances are excluded. The pigment must contain not less than 20 per cent. of sesquioxide of iron, and if sulphate of calcium or gypsum is present, it must be fully hydrated. The paste must conform to standard shade, and must pass test for fine grinding.

OPERATION.

Weigh a six-ounce Erlenmeyer flask and then introduce five grams of the paste to be examined. The manipulation of the paste is not entirely easy. It is best to weigh the material into the flask, using a narrow spatula to transfer it and taking great pains to prevent any of the paste from getting on the outside of the flask, or near the top on the inside. Fill the flask about one-third full with 88 degrees Beaume gravity gasoline, and agitate with a rotary motion in a horizontal plane, until the paste is all decomposed. Now add more gasoline and agitate in the same way to secure mixing, until the flask is about two-thirds full, and finally add gasoline from the jet of a wash bottle, so as to mix as thoroughly as possible, until the flask is nearly full. Cork loosely, without permitting the liquid to touch the cork, and allow to settle, which may require from two hours to two days. When the liquid is clear, carefully remove the cork, and decant the liquid into a tall lipless beaker, holding about nine ounces. By using sufficient care, the liquid may be decanted down so that not over five cubic centimeters are left in the flask. Some skill and a little experience are required to secure this result. Incline the flask and allow perhaps half the liquid to run out. Then if the pigment has not already collected at the lowermost point of the flask, keep the flask inclined just so the liquid will not run out, and assist the collection of the pigment at the lowermost point, by striking the flask gently against the desk. If this operation roiles the liquid near the bottom of the flask, place it still inclined in the top of a beaker or other support and allow to settle again, which usually takes only a short time. Then continue the decantation until the limit is reached. Place the beaker where the temperature is a little above the boiling point of the liquid, and where there are no naked lights and then fill the flask with gasoline again in the manner before described. Allow to settle a second time, and repeat the decantation in the same manner. Enough of the liquid in the beaker will, if the evaporation is properly managed, go off while the pigment is settling the second time to furnish room for the liquid for the second decantation. Evaporate the liquid in the beaker as before, gradually raising the temperature as the liquid will bear it, until a temperature of 250 degrees Fahrenheit is reached. Cool and weigh from time to time, and continue the heating at the same temperature until constant weight is obtained. This weight, minus the weight of the beaker, is the weight of the oil. After the second decantation add to the flask containing the pigment three or four cubic centimeters of a mixture of equal parts of ethyl alcohol and distilled water, agitate to secure thorough mixing, cork with a double perforated rubber cork carrying two tubes, one of which reaches to within an inch of the bottom, and attach the other to a steam or water aspirator, or other means of drawing air through the flask. The air drawn into the flask should not carry dirt, or injurious gases along with it. The gasoline, the alcohol and the principal portion of the added water are removed in the course of a few hours. As soon as the visible liquid has disappeared, attach to the air inlet tube an arrangement for passing the air through concentrated oil of vitriol, and continue the drying until the flask containing the pigment shows constant weight. Deduct the weight of the flask from this weight, and proceed as explained under calculations.

APPARATUS AND REAGENTS.

The flasks and beakers required are perhaps sufficiently designated above.

The arrangement for taking moisture out of the air used in drying the pigment by causing it to bubble through concentrated oil of vitriol may, perhaps, be readily improvised in every laboratory. Drechsel's wash bottles for washing gas, with ground glass joint, are very convenient for this purpose.

The gasoline specified is readily obtained in the market. It is best to obtain it in tin cans and every new shipment should be tested. If the same amount used in an analysis leaves a weighable residue, when a blank oil determination is made, a correction corresponding to this should of course be made. It is better, however, to secure such a grade of gasoline, that no residue will be left. If the gasoline is not shipped or stored in wood or dirty cans, very little difficulty will occur.

The ethyl alcohol is the ordinary 95 per cent. alcohol of the market, and the ether mentioned later is the ordinary commercial sulphuric ether of the United States Pharmacopia.

CALCULATIONS.

The weight obtained by deducting the weight of the beaker from the constant weight of the beaker and oil as above described, gives the weight of oil in 5 grammes of the paste. Let us suppose this to be 1.1865 grammes. Then the percentage of oil would be (1.1865 × 100 ÷ 5) 23.73. Also if the pigment in the paste were fully hydrated, the weight of the flask and pigment, minus the weight of the flask, gives the weight of the pigment in five grammes of the paste. Suppose this to be 3.7240 grammes. Then the percentage of pigment would be (3.7240 × 100 ÷ 5) 74.48. In this case, if no volatile constituent but moisture is present, the moisture would be 100 — (23.73 + 74.48) 1.79 per cent., the moisture being determined, as is seen, by difference. In case the pigment in the paste was not fully hydrated, the water added with the alcohol accomplishes this result, and the sum of the oil and pigment, provided no other volatile constituent was present, always exceeds 100 per cent., the excess representing the deficiency of hydration of the pigment, as is readily seen.

M. S. C. NOTES AND PRECAUTIONS.

It is quite apparent that this method involves as its principal features the insolubility of the pigment in gasoline, the solubility of the oil in the same menstruum, and the volatility of the gasoline without vaporizing either the oil or the pigment.

It frequently happens that samples of paste are found, the pigment of which settles very slowly. With many of these samples, the addition of 3 to 5 cubic centimeters of a mixture of equal parts of ethyl alcohol and distilled water, while decomposing the paste, facilitates the settling.

It is best to add this alcohol and water before the second addition of gasoline in order to secure thorough mixing. After a little experience is gained, the behavior of the pigment when the paste is decomposed and before the second addition of gasoline, is something of a guide as to whether the alcohol and water are needed. If the pigment shows a disposition to settle off readily on allowing the flask to stand a few minutes, the alcohol and water will probably not be needed. If there is no such disposition, it is better to add them. No harm results from the addition, and some operators prefer to always add the alcohol and water. With a very obstinate paste which settles very slowly, or indeed refuses to settle clear after considerable time, it is usually best to start afresh and use ether in place of the first addition of gasoline, and sometimes ether may be used to advantage throughout.

There is considerable evidence that the rapid settling of the pigment is a question of the hydration. During the grinding the mills usually become quite warm, and the tendency is to de-hydrate both the sulphate of calcium and the clay, both of which are almost universally present in greater or less amount in freight car color. Alcohol containing small amounts of water is slightly soluble in gasoline, and its presence, therefore, facilitates the transfer of the water to the pigment. Also commercial ether contains small amounts of water, and this is apparently transferred to the pigment in the same manner. With some paints a coagulation of the pigment in flakes, and almost immediate tendency to settle, follow the addition of the alcohol and water, or the use of the ether.

It should be stated, that, notwithstanding all precautions, it sometimes happens that some extremely fine portions of the pigment refuse to settle, even after a day or two, leaving a slight tint or opalescence in the liquid. No method is known of overcoming this difficulty, but it is believed that the error resulting does not exceed a small fraction of one per cent.

If the paste contains 25 per cent. of oil, as is desired and expected, the amount of oil in five grammes would be 1.2500 grammes. About 150 cubic centimeters of liquid is present before the first decantation, and by the supposition five one-hundred and fiftieths of this are left after the decantation is finished. That is (1.2500 × 5 ÷ 150) 0.0416 gramme of oil are left. But if the directions are followed, five one-hundred and fiftieths of this are left after the second decantation, that is (0.0416 × 5 ÷ 150) 0.0013 gramme of oil are left with the pigment and weighed with it. This amounts to an error of (0.0013 × 100 ÷ 5) 0.026 per cent. If greater accuracy than this is desired, a third treatment with gasoline can be employed.

The separation of the liquid from the pigment by decantation is much better than to use a siphon. Formerly a siphon was employed, but it was found that there was a little loss due to material adhering to the siphon, and also the liquid could not be drawn off so as to leave as small a volume behind, on account of the currents at the inlet end disturbing the pigment.

It is probable that there is a slight oxidation of the oil during the evaporation and subsequent drying to constant weight. Direct experiments on oil free from moisture, however, show that the change in weight due to this oxidation is very small. Mülder has shown that during exposure to the air, especially at high temperatures, linseed oil loses carbon and possibly hydrogen, while it gains oxygen, and experiments made for the purpose show that the loss and gain very nearly balance each other, so that the error introduced during the drying can safely be ignored.

The directions require that both the oil and pigment be dried until constant weight is obtained. It is probable that, especially with the oil, absolute constant weight would never be obtained. If the difference between two weighings an hour apart does not exceed one or possibly two milligrams, the resulting error will be small, as is readily seen, as to have no practical importance.

The directions to put the paste low down in the flask during the weighing, and to prevent the liquid from touching the cork, are perhaps of more importance than would appear at first sight. The difficulty of avoiding loss while decomposing the paste, if it is near the top of the flask, is quite considerable, and the loss if the liquid touches the cork is much more than would be supposed.

Gasoline is quite sensitive to changes of temperature, and its vapor tension even at ordinary temperatures is quite considerable. If the flask is tightly corked, therefore, there is danger of loss of both flask and its contents.

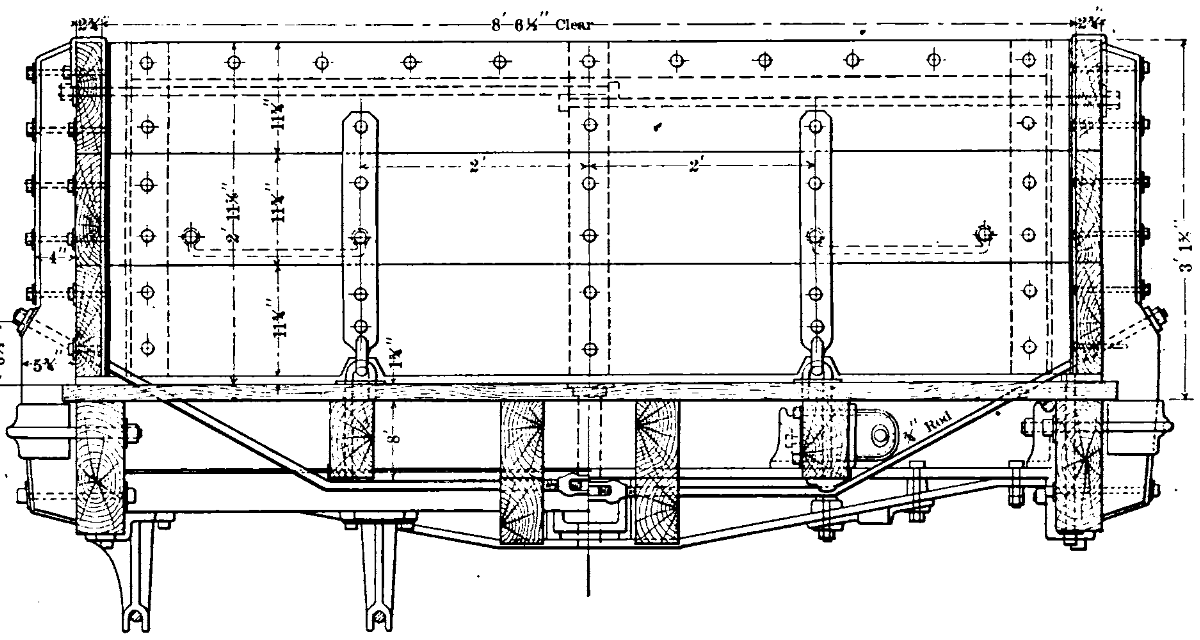
If the pigment is fully hydrated, the amounts of pigment, liquid and moisture, or other volatile constituents are given by the method with all the accuracy that is necessary in the analysis of such a product as freight car color. But if, as frequently happens, the pigment is not fully hydrated, it is evident that benzine, turpentine or some other volatile substance, could be added equal in amount to the lack of hydration of pigment, without this fact being revealed by the method as described. In cases where such additions are suspected, their presence or absence is determined by other tests, especially by distilling over the volatile constituents from a portion of the paste and examination of the distillate. The temptation to put volatile constituents into a paste is not very great, however, since, as stated above, owing to the heat of the mills, the loss of such volatile constituents during grinding would be quite considerable.

On the Halberstadt-Blankenburg Railway in Germany graphite is used successfully for lubricating the inner vertical faces of the outer rail-heads on curves. It is ground very finely and mixed with just enough water to form a thick paste, and when applied to the rails dries quickly, and the thin layers formed adhere a reasonable time to the rails. During the wet season of the year it appears that there is no necessity for lubricating the rails. Experience shows that in dry weather it is advisable that the line watchman should lubricate the rails every five days, although, doubtless, the frequency of the lubrication will depend upon the amount of traffic. On the Hartz line it is said the trains are hauled by six-wheel coupled engines, with trailing Bissel pony truck. Prior to the introduction of graphite lubrication, the tires had to be turned every four or five months. The original tire material, which was too soft, was replaced by Krupp crucible cast-steel, and, at the same time, the lubrication of the outer rails introduced. The tires now need turning only after they have been in service 18 months to two years. The same lubricant is also used on the sections of the road which are worked on the Abt system for lubricating the rack and spur wheels.

An Effective Truss for Coal Car Sides.

The trussing of coal car sides to prevent their bulging under the pressure from the load is a problem that has seldom been settled satisfactorily. It was made the subject of a report by a committee to the Master Car Builders Association in June, 1895, but the methods recommended for strengthening the sides did not appear to meet with approval, either because they were considered ineffective or because they were patented and therefore could not receive the official endorsement of the association.

In the accompanying illustration we show a method in use on the Chicago, Milwaukee & St. Paul Railway, which appears to us to be very neat and effective. We are indebted to Mr. J. N. Barr, Superintendent of Motive Power, and Mr. Geo. Gibbs, Mechanical Engineer of the road, for our drawings and information. It will be seen that the stakes are secured to the side sills in the usual fashion, but at a point about 6¼ inches above the floor are provided with a beveled surface which forms the seat for a



Improved Method of Trussing Coal Car Sides—Chicago, Milwaukee & St. Paul Ry.

nut and washer on the end of a truss rod that passes through the stake and down under the intermediate and center sills and up to the stake on the other side. The truss rod is made three-quarters inch in diameter and is provided with a turn-buckle at the center. Saddles are provided under the intermediate sills which may be in the form of castings or simply an angle iron secured to the corner of the sill.

This construction has the advantage of not encroaching on the coal space in the car, and not being in any way attached to the side sills it counteracts the tendency of the load to push or "roll" them out, an evil which most methods do not overcome. It is simple, and has been found to be quite effective. In cars 34 feet long inside, and with sides 3 feet high, four of these trusses are employed. In addition to the trusses and the fastenings at the end boards or gates, the sides are further held by straps on the inside, bent over at the top and terminating at the bottom in bolts which pass through the side sills. These are also shown in our drawing, and form a construction well known to our readers. Those seeking a remedy for bulging sides of coal cars might do well to give the method of trussing here shown a trial.

Convenience and Efficiency of Locomotive Design.

The following very sensible suggestions on this subject are made in an article written for the *Railway Herald*, the author of which signs himself J. H. Jenkins, Engine Driver, Swansea Dock Railway:

"The object in writing the article," he says, "is to point out that the things which are of vital importance to drivers and firemen for the proper manipulation of the machine such as the convenient position of tool boxes, sand boxes, brakes, levers, etc., are left to look after themselves. Indeed, things which appear to be mere trifles to designers, are, if not convenient and efficient, 'mountains of vexation' to the men.

"Of course, we are progressing in many things but we