but I don't think that any one should feel altogether clear in saying absolutely that it does, unless he has actual figures to show it.

Mr. MacKenzie: There is one thing I think ought to be eliminated from the problem, and that is the inequality of the track. We do not have poor tracks in this country any more; our tracks are such they will carry the most rigid truck that is built. The great object now is to have the best track we can possibly build. Anywhere that is done the rigid truck is the truck for a railroad.

Mr. Barr: I begin to get an idea of the argument for the rigid truck, and I don't know but what if I were indorsing it I would shove the argument a little bit further, and say that we ought to dispense with trucks altogether and attach our wheels to the body of the car, just as the English practice is, and then we would have the best thing going.

Mr. Barr: If there is nothing in the swing truck then I would go on further and advocate that we take the swing motion out of our passenger truck and thus have a better and cheaper truck.

President Peck: We have a swing motion on many of our cabooses, but on a great many of them we have taken it out.

Mr. Verbryck: I think if you were to carry a great many drovers on your "little jumpers" you would find a difference. We have got to have as good a truck under our cabooses as under our passenger cars, because we carry a great many drovers who sleep in the car and you would find they would not want to ride in a car with a rigid truck.

Mr. Darrall: I want to speak of a matter that occurred on the Union Pacific a little while ago. We had some engines running between Cheyenne and Sidney—a track with which Mr. MacKenzie is well acquainted. The eastern portion of this track, which is 100 miles long, for about 70 miles is very straight; the other portion, about 30 miles, is very crooked, and up hill and down. In that district we had 13 engines; out of those 13 engines there were eight of them freight. For two years I was unable, with those engines, to keep my tender wheels from cutting flanges. I did everything possible with the tender trucks on these engines, but I could not get those wheels to stop cutting on the left side of the engine. They always cut on one side, until I got a swing motion truck.

In 1883 I had occasion to buy some box cars, and the question arose in my mind whether I should adopt the rigid truck or a swing truck, and I spoke to several master mechanics that had years of experience, notably one named Cobwell, and he said, "Use the swing truck by all means." I asked him why. He said they had used the rigid truck, and they found the swing truck to be better. I told him I would like to see the trucks; so he took me down and I examined them, and found they had cut the swing of the bolster down to a quarter of an inch. It seemed to me that that was a rigid truck; I didn't call it a swing truck. Afterward they shortened their bolster beam, and gave it more swing, and the cars ran better. I know that at one time they had a great many sharp flanges reduced. On the Illinois Central we are having most excellent service from our wheels. I gave three reasons for it; the first is the use of a swing motion truck. The second is the use of the long hanger; I think the long hanger on the swing motion truck is one of the things that makes it a success. The third is the use of larger wheels, which have a tendency to reduce the cutting of the flanges.

Mr. Schroyer: I would like to ask you what the percentage of decrease of flange wear is and what is the average life of these wheels.

Mr. Darrall: I have not any data with me, as I did not come here intending to enter into discussion at all. I should be pleased, if the discussion is carried over to another meeting, to gather up such data as I can and I think it would be beneficial. But I know the wheel service on the Illinois Central is giving great satisfaction and I attribute it to the size of the wheel and to the long hanger in the truck. We use the 36-in. wheel.

Mr. Schroyer: I would like to have this question answered by some one of the rigid wheel advocates: What percentage of wheels are removed from service under trucks having rigid beams, for sharp flanges, and what is the average life of those wheels that are removed?

Mr. Barr: There seems to be an idea that we can settle the relative merits of the rigid truck and the swing beam truck by watching the wear of the flanges. I think every one who has observed this matter will agree with me in saying that out of every one hundred pairs of wheels removed from cars ninety-nine of those pairs have one flange worn and the other flange almost as good as the day it went into service. If that is so, how can we determine the relative merits of the two trucks from watching the wear of the flanges?

Mr. MacKenzie: There is one question that Mr. Barr raises that is not a new one; that if the truck is not a good one, why don't you take it out of your passenger cars? I am not a very old man, but I can look back to the day when the swing beam in a passenger car was 18 in. long; to-day it is not 6 in. Why is that? What is the 6-in. swing in the passenger car to-day—a hanger, I mean, 6 in. long in the beam? How much action does that beam have under that car? Why are they shortened up to-day and spread out at the bottom, if not to enable them to come back to the centre just as quick as we can get them there?

Mr. Darrall: I was under the impression that Mr. MacKenzie when he first spoke was in favor of the rigid truck, but I am afraid he is going to build a swing truck hereafter. When he gets to looking into the merits of the hanger, the length of the hanger, I think he is on the right road, and when you get the hanger the proper length I think the wheels will give you better satisfaction. But, as he says, with a 6-in. hanger you have no swing at all.

Mr. Schroyer: I don't know of anybody who has got the hanger 6 in. in length. I don't think anybody has. I know that our own is nearly twice as long; about 11 in. from centre to centre. We do spread the lower ends of the hanger, and for the purpose not to bring the car back to the normal position again, but to raise the outside of the body of the car when passing around a curve.

Mr. Forsyth: There is an important point which Mr. Barr has suggested about sharp flanges. It seems to me that the measure of the good of the trucks one way or the other is in sharp flanges, and Mr. Barr seems to think we cannot get the facts from our records of sharp flange wheels. But if we take one road that has swing trucks, and 30 per cent. of its wheels of equal and definite quality—the same kind of wheels—are removed with sharp flanges; and suppose the track and everthing else is equal, and then take another road where all conditions are equal, and they have the rigid truck, and the number of removals is 20 per cent., we will not have a measure of the relative flange wear of wheels with two trucks?

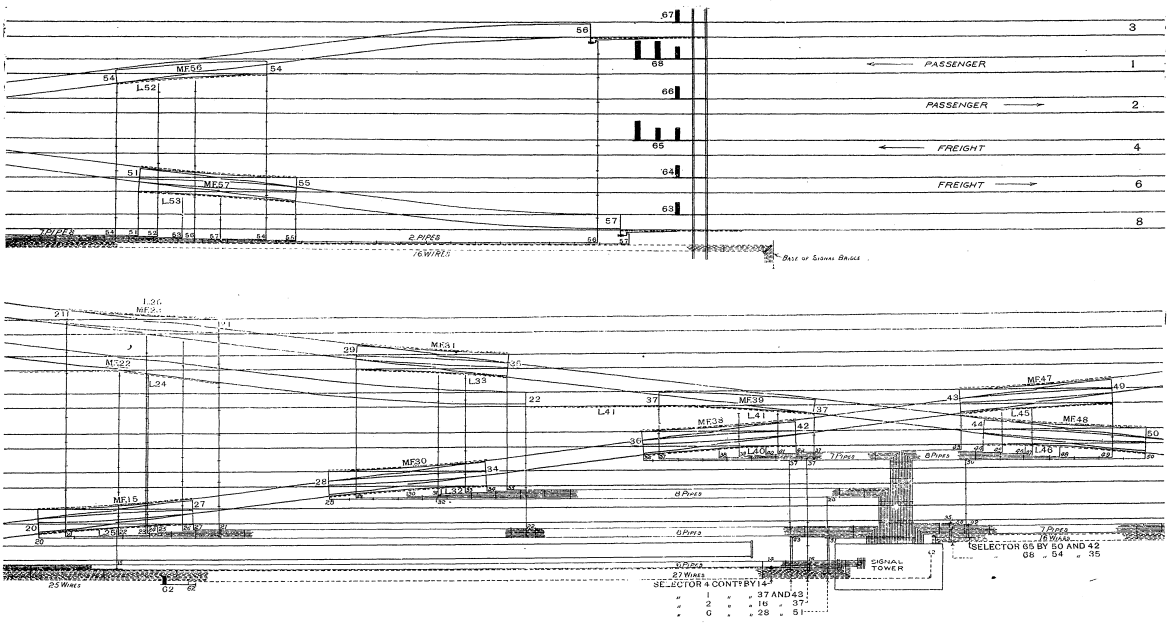
Mr. Barr: I would simply say this: If one road has 30 per cent. of its wheels scrapped on account of having worn flanges, and the other road under similar circumstances has 20 per cent., I think anybody could see that about 80 per cent. was due to the difference in quality.

Mr. Forsyth: But I say equal quality, the wheels being from the same foundry.

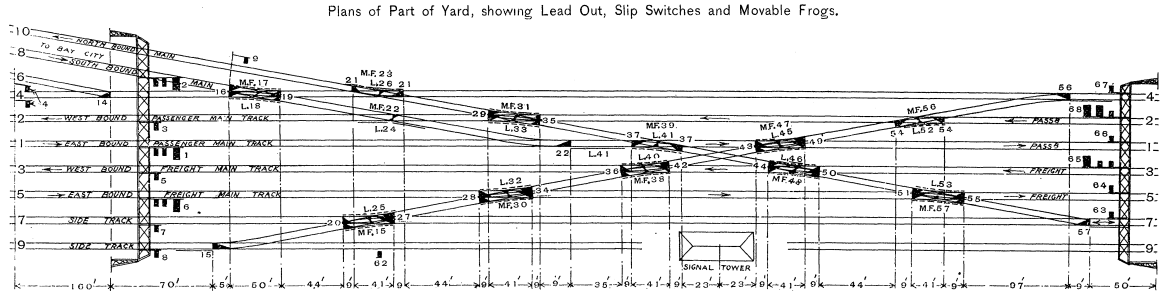
Mr. Barr: The point is simply this: In removing a pair of weels, in ninety-nine cases in one hundred you will find the flange worn on one side and on the other the flange as good as when it went out of the foundry; and you will find the other pair of wheels under the same truck in the same condition; sometimes the worn flanges being on the same side of the truck and sometimes on diagonally opposite sides. That can be demonstrated in five minutes' observation at any railway shop in the country.

Mr. MacKenzie: Are there not conditions connected with the wear and tear of wheels that would make it a very difficult matter to determine whether it was the truck or not that caused the flange wear? There are soft wheels and defects in mounting wheels also.

The discussion was here closed.



Plans of Part of Yard, showing Lead Out, Slip Switches and Movable Frogs.



INTERLOCKING AT BAY CITY JUNCTION, DETROIT—MICHIGAN CENTRAL RAILROAD.

Interlocking at Detroit.

The signaling and interlocking of the Bay City Junction in the Detroit yard of the Michigan Central Railroad is a remarkable instance of modern American practice. We have repeatedly pointed out the ingenuity with which signal engineers get the maximum work out of a lever, and thus reduce to a minimum the cost of the plant and the time and labor of operation. In the example before us the machine is built for 68 levers, of which 8 are spare. The 60 working levers move

67 facing point locks, 43 switches, 12 movable point frogs and 27 signals. These are distributed as follows:

24 levers for 43 switches, 4 movable point frogs, 4 locks.

8 levers for 8 movable point frogs.

12 levers for 63 facing point locks.

16 levers for 27 signals.

That is, 60 levers operate 149 signals, switches, locks and frogs. In the new plant at the Grand Central Station, New York City, described by us last December, 87 working levers operate 73 switches, 73 locks, 55 signals and 32 indicators. Although the moving parts are more per lever in the Grand Central plant than in that at Detroit, the work per lever is probably really less because of the relatively greater number of light parts,—signals and indicators. The interlocking of the Jersey City terminus of the Central of New Jersey, which we described in June, 1889, was another example of the same kind of economy. In that plant the levers are:

22 levers for 40 switches and 3 movable frogs.

1 lever for 2 movable frogs.

14 levers for 48 facing point locks.

29 levers for 40 signals, 40 indicators and 1 facing point lock.

Or in all, 66 working levers. The parts moved per lever in each case are: Detroit, 2.48; Grand Central, 2.68; Central of New Jersey, 2.64. The great saving effected in the two plants last mentioned was pointed out by Mr. R. H. Soule in his valuable paper before the New England Railroad Club last December. He said that the Grand Central plant would have required, under the old method, 179 levers, instead of the 87 actually used. This was as compared with the former practice of the Union Switch & Signal company, which built the old and the new plants of the Grand Central station. He compared the Jersey City example with English practice. A plan of the yard, with specifications, was submitted to Messrs. Saxby & Farmer, who advised the use of a frame of 185 levers. The same work is actually done with 66 levers. These three fine plants were all built by the Union Switch & Signal Company.

Of course, real economy is not secured by overloading levers, but by skillful arrangement of the tracks to begin with, and then by judicious use of selectors and other devices. An examination of the plan of the lead out in the Detroit yard shows six selectors.

The free use of slip switches in this case will be noticed. All but four of the crossings have double slip switches, and two have single ones. All but one of the crossings have movable frogs; this one having an angle great enough to permit the safe use of a rigid frog. The other crossings are all on an angle of 7° 10′.

Spring rail frogs will be used in this work wherever it is possible, and where the work is about equal on both tracks the Jordon, double spring frog will be used.

The arrangement of tracks and signals is clearly shown in the engravings. Although the plan of the yard is simple, there are a good many reverse movements to be provided for, and these, together with all the direct movements necessary to let trains pass to and from any track, make a complicated interlocking. The Saxby & Farmer machine will be used, and it is expected that it will be one of the most perfect ever built by the Union Switch and Signal Company.

The Chicago Automatic Steel Coupler.

This coupler is of the M. C. B. standard, vertical plane type and is constructed on the standard contour. In perfecting the device it has been subjected to physical, chemical and actual service tests. Two thousand couplers are now in service. The claims for this coupler are superior strength, simplicity, easy and certain operation, and light weight.

The coupler is made of the best grade of steel, for the reason, as the manufacturers assert, that a coupler that will meet the requirements of the purpose it must serve must not only be able to withstand the severe service to which it would ordinarily be subjected, but must go further than this and withstand the abuses with which it will meet. It is manufactured by the Chicago Tire & Spring Co., of Chicago, Ill. (for the Chicago Railway Appliance Co.), by a new process and from a grade of steel run for this purpose only. This steel is known as "C. T. S." brand. Its uniformity has been shown by the tests made. All couplers are made under a rigid system of inspection, and by the new process of molding every part is exactly uniform to the standard lines and absolutely interchangeable. The weight, complete, is 185 lbs.

The locking bar is chambered in the drawbar, and is provided with lugs cast on each side near the upper rear end. It is pivoted on these lugs, which fit into raised seats, provided with a rounded inset, and which are cast in the drawbar. One end of the locking bar projects through a slot in the bottom of the drawbar, and at this point the unlocking rod is attached. The location of the pivot point leaves the entire weight of the locking bar below the line of support, and the locking bar consequently lies by gravity on the bottom of the drawbar. It is prevented from having any side motion by lugs cast on the inside of the drawbar. The bottom of the locking bar inclines slightly upward at its outer end, to admit of an inclined plane at the end of the knuckle passing under it, which raises the locking bar until the inclined plane has passed,

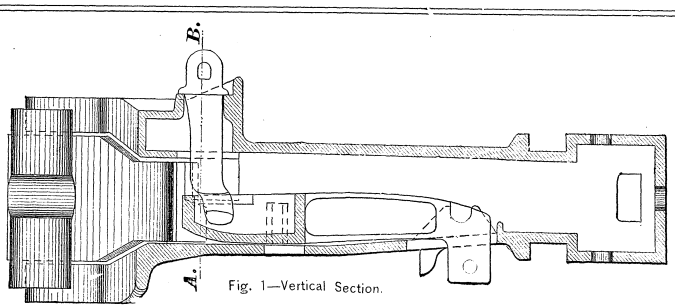


Fig. 1—Vertical Section.

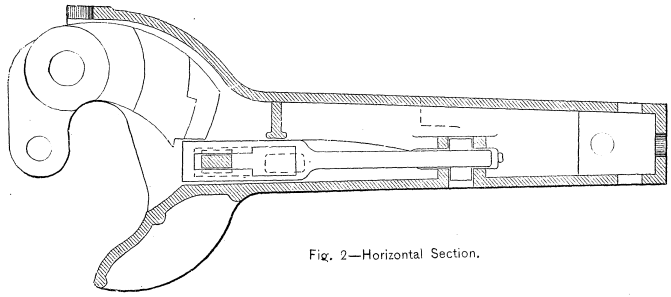


Fig. 2—Horizontal Section.

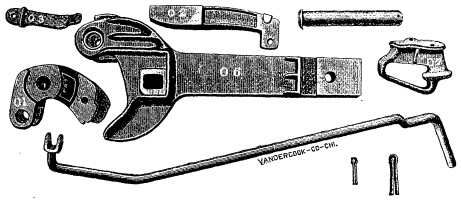


Fig. 3—Plan and Details.

THE CHICAGO AUTOMATIC STEEL COUPLER.

Made for the CHICAGO RAILWAY APPLIANCE CO., *Chicago, Ill.*

when it falls in front of the knuckle, locking it securely in place. The raising of the locking bar frees the knuckle. The lifting-pin forms no essential part in the locking device. It is used only for convenience in raising the locking bar when a man is nearer to the pin than to the unlocking rod. This locking device is simple, and easy and certain in action. There are no parts subject to undue wear, and snow, ice or cinders do not interfere with its operation. The unlocking rod is attached to the point of the locking bar which projects through the slot in the bottom of the drawbar. It passes to the corner of the car, where it is hung in a clutch casting. The clutch casting is so constructed that in unlocking the coupler the rod can be clutched in the casting, thus holding the coupler unlocked. A slight shock to the car will cause its release. If a car should strike another equipped with this coupler at a time when a coupler was unlocked, the shock would dislodge the unlocking rod and lock the knuckle. The knuckle, like the bar, is made of the "C. T. S." steel. Its form is such that the metal is concentrated in a compact mass to resist blows.

The following tests have been made of this coupler:

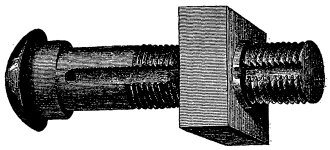
First—For the purpose of ascertaining the ability of the coupler to withstand shocks in service by the throwing of cars together. Two cars loaded with car wheels were equipped with the steel coupler and one thrown against the other. On the fourth trial the cars were damaged so as to be unfit for further use. The speed at which the cars were thrown together increased gradually from about 15 miles per hour to about 30 miles. The couplers were not damaged.

Attempt was then made to break the coupler to show the metal at fractures. A box car equipped with a Potter drawbar was thrown against a car equipped with the steel coupler. The blow was taken squarely on the knuckle, making two indentations therein; no injury was done to the steel coupler. The trucks of the box car were damaged, and had to be repaired before further tests could be made. In this second trial the Potter drawbar was adjusted so as to strike entirely on the arm of the steel coupler, for the purpose of breaking it off. The box car was again thrown back at the highest rate of speed that could be obtained in about a quarter of a mile run, speed judged to be over 30 miles per hour. In this test both cars were wrecked badly, and the arm was broken from the steel coupler and driven into the draft timber; fractures showed good metal.

Second—A test was made to demonstrate the ability of the coupler to withstand a tensile strain. The steel coupler was placed in the testing machine and an ordinary coupling link coupled into the knuckle and over a pin. At a strain of 104,000 lbs. the link broke; coupler not damaged. A second trial was made, and a special link, made from 1½-in. square tool steel, was used in the place of the ordinary coupling link. When subjected to a tensile strain of 139,100 lbs. the face of the knuckle of the coupler was cracked, caused by the bending of the pin so as to form a wedge.

The Champion Nut Lock.

In this device the locking feature consists of a groove in the bolt, as shown, and a ring on the outside of the nut, which is driven into the groove after the nut is screwed down. These bolts and nuts are made in all sizes and sold at a very reasonable price, the cost being



but little more than that of ordinary ones. It is claimed as an advantage that no additional parts are required. It is also claimed that the nuts can easily be removed with a wrench and can be locked and unlocked many times without breaking the thread. This lock is made by the Illinois Bolt & Nut Company, Peoria, Ill.

The Latest Sound Steamer.

The new steamer "Plymouth," of the Fall River line, is now running regularly as a mate to the "Puritan," "Pilgrim" and "Providence;" she is the best of the four, having many marked improvements in accommodation, comfort, safety and service.

The vessel is of 3,778.89 gross tons and 2,280.13 net tons burden, has 247 staterooms and 1,033 berths, and can carry 1,200 first cabin passengers. Some of the staterooms are large and are fitted with complete bedroom sets. The length of hull is 366 ft. over all and 351 ft. 8 in. at the water line; the draft of water loaded is 12 ft., the breadth is 50 ft. on the hull and 86 ft. at the guards.

The engines are of triple expansion type, having four cylinders; the high-pressure cylinder is 47 in. in diameter, the intermediate 75 in. in diameter, and two low-pressure cylinders are each 81.5 in. in diameter. The