

would not squash out. All that I have seen loose are longer than they were originally and are uneven; certain parts have got a bulge in them which shows they have been crushed by the work.

Mr. West—The great trouble we have always experienced is that when that solid bushing got warm it expanded, the brass would expand more than the rod and after it cooled down it was loose. The West Shore engines were all equipped with solid brasses, and I was on the Buffalo division when we started with them. I thought it would be very nice and we would have a standard, but in three months we had about as many standards as we had engines.

Secretary Hill—I would like to ask if there is any man here who knows of consolidation engines running with solid bushings on main connection that do not get loose.

Mr. Childs (Erie)—I have known solid bushings on engines running for a full term of service without becoming loose, while others would loosen almost as often as you would want to put them on.

Secretary Hill—Do you believe that comes from the pin getting hot?

Mr. Childs—I cannot give the explanation.

Mr. Alcorn—We have had some engines run with the same bushings that were on at the start until rebuilt. In the new rods that we built we made them heavier. We got the end of the rod a good deal heavier so that they did not spring. In some of the first that we had, the material around the eye was so light that the bush would get loose. After we made them heavier we had no trouble.

Mr. West—I believe if it was possible to make the rod anywhere near as wide as it is necessary to make the bearing you might make a success of it. But we are confined to about 3 in. in the width of our rods, and when we get a 5 or 6 in. bearing on the pin and only about a 3 in. bearing on the rod, it is a difficult thing to hold.

Mr. Davis (Boies Wheel Co.)—Regarding these side rod brasses, when I was with the B. & M. all the engines that we ever had that used bushes were 8-wheelers; the management there was always down on the solid brasses; but the last five engines, I think, that the Hinckley Locomotive Works built for Boston & Maine road, had solid side rod brasses, and I never knew one of them to get loose in the strap. We never used a set-screw or key or pin, and I never knew a rod to have the brass taken out in six years, owing to its being loose.

Mr. West—Mr. Davis refers to side rods on 8-wheelers. We were speaking of main connections on six or eight coupled engines.

#### THE STOREHOUSE SYSTEM OF THE CHICAGO, BURLINGTON & QUINCY RAILROAD.

On any large system of railways the proper care and distribution of material through the storehouse department is an important feature. The great variety of the stock carried, as well as the large quantities of material required, make it important that the minimum number of pieces of each kind be kept on hand. The Chicago, Burlington & Quincy Railroad have a storehouse system which presents some interesting features in this connection. This railway comprises several separate organizations, but the general plan is the same on all and practically as follows:

Under each general manager a supply agent is employed, who reports to the general manager, either directly or through the general superintendent. The following circular, issued by one of the managers, will probably give the best idea of the duties of the supply agents:

Taking effect July 1, 1891, the following rules and instructions will govern the supply departments of the above roads:

Supply agents shall act under instructions from the general manager or general superintendent.

Fuel agents, storekeepers and others engaged locally in procuring, caring for or distributing materials or supplies shall be appointed and act under the direction of the supply agent with approval of general manager or general superintendent.

Supply agents shall have charge of all second-hand material and old material not fit to be used again for railroad purposes, and shall see that proper record is kept of all scrap, and that same is properly stored.

All requisitions made shall be sent to the general purchasing agent direct, but all requisitions received must be very closely scrutinized and any material that is not a standard or that is ordered in unnecessarily large amounts should not be ordered or the amount cut so as not to in any way increase the amount of stock to be carried over.

No material or supplies shall be purchased direct without the authority of the general purchasing agent with the authority of the general manager or general superintendent.

Occasional trips of inspection should be made to the various local storehouses, and supply agent shall have the right to question the proper department as to distribution of any material, either old or new, that does not seem to be in use.

The supply agent shall keep a detailed account of the amount of all materials and supplies furnished to the different departments, in such form, and shall make returns thereof to the accounting department in such manner, and at such times as the auditor shall direct.

At each shop on the entire system a storehouse is located. Each of these storehouses is in charge of a storekeeper who is directly responsible to the supply agent. In small shops where a small quantity of ma-

terial is handled, the clerk of the master mechanic acts as storekeeper. In addition to the supply agent there is on the system a general lumber inspector who keeps posted on the use to which all lumber is put, sees that the orders are filled, and visits mills to watch the manufacture of the lumber furnished. A part of his duty is also to see that a superfluous number of sizes of lumber are not carried in stock. The duties of the storekeeper are to keep a proper record of the amount of stock on hand, issue requisitions to the supply agent for the material needed at the point at which he is in charge, and give out supplies to the departments in which they are required. All material which is used on new work goes through the storehouse, regardless of whether it is purchased or manufactured in the shops of the railroad company; for instance, in giving an order for a new engine the order will be issued by the motive power department on the storehouse, given a number and all material of any nature which is used in the construction of the engine, also all labor expended thereon, is entered against the order in the accounts of the storehouse and in this way the entire cost of the engine is kept. If a pair of cylinders are cast in the foundry the charge is made for them through the storehouse and if they go to the shop to be fitted to the engine they are charged against that engine as so many pounds of cast iron. If fitting or machine work is done to the cylinders before they are assigned to an engine the labor will be charged against them and they will be classed as manufactured material. All articles used for repair work in the storehouse are charged directly to locomotive repairs, and a separate memorandum kept giving the number of the engine upon which supplies are used. This memorandum is sent to the motive power department for the purpose of keeping a record of individual engines, but does not enter into the accounts of the storekeeper.

In drawing material from the storehouse the foreman of each department has authority to issue requisitions for supplies as they are needed, and the requisition thus issued is kept in the storehouse for charging out the material. The record of the stock on hand is kept entirely by book account and checked up once a year by an inventory. The auditor keeps a running account with each supply agent, and the latter must account to the former for all material furnished him. The following circular which has been issued to all the storekeepers will give a clear idea of what is expected of them:

The stock of new material carried at each place should be so ordered and held that the needs of the service can be best met without any accumulation of surplus or unstandard material.

No articles other than standard should be kept in stock when regular standards have been established. In case anything is needed different from the adopted standards, such material will be purchased upon regularly approved requisitions, in quantity sufficient for the immediate needs of the service, but a regular stock of the same will not be carried. Storehouses should be kept in neat condition, the stock being well arranged with such shelving, bins or boxes as are necessary to render it easy to handle and keep it in the best shape. Care should be always taken to issue broken packages, or store worn or rusty articles first, so as to keep stock of all kinds looking neat. Packing and unpacking should be done in one portion of each storehouse, as much as possible, so as to leave the rest neat.

One of the matters which receives close attention in this system is that of cutting down the number of different sizes of material of each class. Where this matter is not carefully watched, it has been found by all railroads that an enormous sum of money will soon be locked up in an unnecessarily large stock of supplies. With this end in view the accounts of each store are carefully looked through and if the amount of stock carried seems to be too great, an explanation is called for. If the explanation is not satisfactory the storekeeper is required to keep a detailed monthly account of his various classes of stock, giving the amount on hand at the beginning of the month, the amount received, and the amount given out. This will show whether the material is being turned over and, if it is not, a clew will be given as to the material of which an unnecessary amount is being carried.

There is one general storehouse located at the largest shops on each road where all classes of material are carried, but at smaller shops where less material is used, only such articles are carried for which there are frequent calls. If any material not in stock is required, it is ordered from the general storehouse. Each storekeeper has a complete list of the standard sizes and kinds of material and can readily see from this what he can obtain from the general storehouse. If any material not on this list is required for a special job, it must be ordered by special requisition and only by the head of the department in which it is to be used. The person so ordering must, in issuing the requisition, give an explana-

tion of why this odd material is necessary, and if the explanation so given is satisfactory the material is ordered, but only in quantities required for immediate use. A system of exchanging between storehouses is established and quite extensively used. When an exchange of stock is made the storehouse receiving the material is charged therewith, and the from which it is issued is given credit. This system is proving very satisfactory and is highly recommended by the road, whose officers say they have no difficulty in turning over their entire stock monthly since it has been in operation.

#### INTERLOCKING AND BLOCK SIGNAL SYSTEM—C. & N. W. RY.

The rapidly increasing volume of business transacted in Chicago has necessitated a proportionate increase in the number of railway tracks entering the city. As a result of this growth complicated systems of switches and crossings have been introduced, which cause serious delay to all trains passing over them, and in some cases wrecks have occurred owing to the primitive and unreliable methods of operating and signaling in use. These conditions, together with the tremendous traffic which will be precipitated on the opening of the world's fair, have led to the introduction of a large number of block and interlocked signaling systems.

One of the most extensive of these is that now being put in on the Chicago & Northwestern Railroad. This is a combination of block signaling and interlocking. The block signals are of the automatic type. Those on the Milwaukee and Galena divisions from Wells street depot to Deering and West Fortieth street, respectively, being of the Westinghouse pneumatic type. Intermediate points, where cross-overs, junctions and draw-bridges occur, are equipped with interlocking apparatus, also of the Westinghouse type. The block and interlocking signals merge into each other in such manner that the whole system from one end to the other becomes practically automatically blocked. The track circuit extends the entire distance, divided, as usual, into blocks. Where an interlocking plant occurs, the signals normally set to clear by the lever man when the route is clear, automatically assume the danger position on the passage of a train and cannot again be set clear until the train has passed within the next succeeding block. Before a lever man can clear a signal at such interlocked point he must first have set the switch for the main line.

There is a system of annunciators, or "train describers" applied in each interlocking tower, by which each lever man announces to the next succeeding tower, or lever man, the approach of trains, giving description, class, etc., as it passes out of his section, and at the same time notifies the man in the preceding tower of the same fact.

The illustration herewith is reproduced from drawings and shows the important sections of the Galena division upon which the signaling extends as far as West Fortieth street station. In the illustration each solid line represents a single track, and breaks indicate that portions of the line have been omitted. All the towers and signals controlled thereby are shown.

The power is supplied from three separate points; one, the main power house, located on the corner of Kinzie and Kingsbury streets, a second at Ada street on the Galena division and a third on the Milwaukee line in the Chicago avenue round house. The piping of the entire system is joined so that any of the plants will furnish power for operating all the signals. The air compressors, of which one is placed at each point, were furnished by the Ingersoll-Sargent Drill Company of New York. The cylinders are 14 in. in diameter and have an 18 in. stroke. The air is discharged from these compressors through reservoirs into a main 3 in. in diameter extending the entire length of each line. This main is boxed and placed underground in order to prevent its being disturbed, and has branches leading to the switch and signal movements. At the point where the line crosses the river the pipe is laid under the bed of the river which is dredged out to receive it.

Tower No. 1 contains a 42 lever machine which controls all the signals in the yard of the Wells street depot and as far out as signals No. 4 and No. 6 on the Galena division, and to signal No. 10 on the Milwaukee division, which is shown branching off to the north. The location of this tower is directly on the east side of the river from which point a good view of all parts of the yard and the approaches thereto can be obtained. This tower controls all possible movements into and out of the yard from all approaches. The drawing shows the crossing on Canal street, which is that of the Evanston division of the Chicago, Milwaukee & St. Paul Road, provided with signals and derailing switches. While this is incorporated in the

plan of the signaling, it is not the intention to at the present, put this into service.

The second tower is located at Green street at which point it is combined with the gate house. This tower contains a 6 lever machine which controls the signals and switches in its immediate vicinity, for governing traffic across the two main lines into and out of the freight tracks on the south side of the line. The next tower No. 3, at Ada street, contains a 6 lever machine controlling similar movements. At this point one of the air compressors of the system is located in the gas house of the C. & N. W. Ry., on the south of the main line.

Tower No. 4 is located at Ashland avenue. The equipment and operation is similar to those

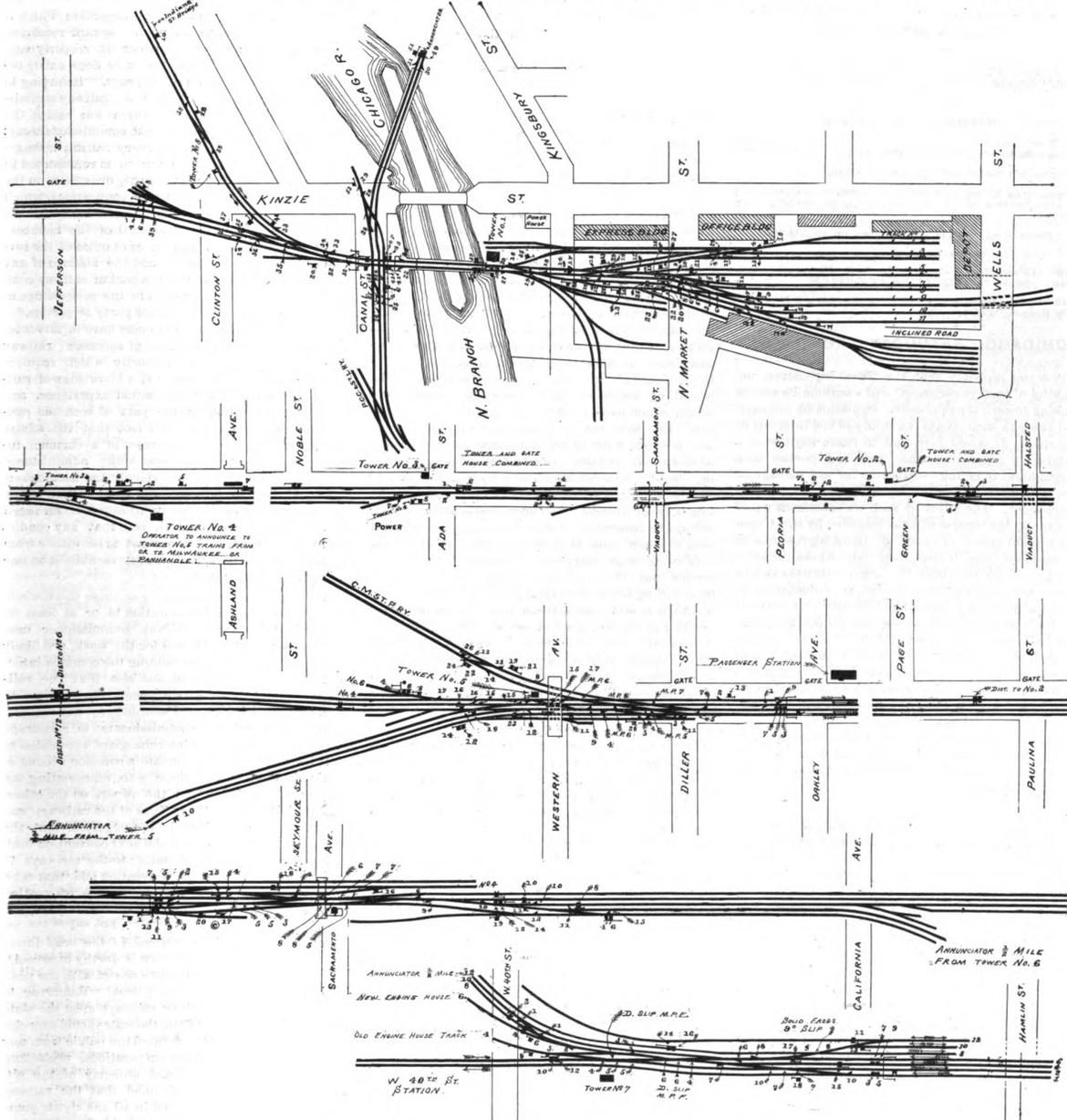
and reliable interlocking. It will be noticed in the illustration that annunciators are placed one mile from this tower on both the Panhandle and Milwaukee lines. This is for the purpose of informing the operator of the approach of a train from either direction.

Tower No. 6 is located at Sacramento avenue. As this is virtually the beginning of the four-track system of the Chicago & Northwestern Railway, as well as the point where the leads to the freight yards begin, and much transfer of trains to all tracks occurs, it is of as much importance as an interlocked point. The apparatus consists of an eighteen lever machine designed to handle this work. Tower No. 7, located at West Fortieth street, is of the same capacity and

Western Railway Club.

The next regular monthly meeting of the Western Railway Club will be held in room 850 Rookery Building, Chicago, on Tuesday, February 21, at 2 o'clock p. m. The paper of Mr. G. W. Rhodes on "Wheel Flanges," read at the last meeting, will be discussed, and a paper on "Tests of Locomotives in Heavy Express Passenger Service" will be read by Mr. William Forsyth, mechanical engineer of the C., B. & Q. Railroad.

The governing committee of the New York stock exchange has listed the following securities: \$44,000 additional consolidated mortgage 4 per cent. 50-year guaranteed gold bonds of the Colorado Midland Railway Company, making total listed \$4,852,000; \$1,193,



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at Green and Ada streets. The operator in tower No. 4 is instructed to announce to the next succeeding tower, No. 5, which is located at Western avenue, the approach of trains on the Panhandle tracks, which at this point run parallel with the Chicago & Northwestern. This announcement is also automatically given to tower No. 5 by the train itself. The reason for this is the fact that at tower No. 5, which is located at Western avenue, a complicated system of interlocking exists, which these trains must pass through. Tower No. 5 controls the movements of all trains of the three systems; Panhandle, Chicago Milwaukee & St. Paul and Chicago & Northwestern in both directions. This is a complicated junction; high speeds are desirable by each road, but are impossible with any degree of safety without substantial

importance as that at Sacramento avenue, No. 6 being the other end of the four-track section and including leads to coaling and shop tracks.

Throughout this entire system the block signals are located at convenient distances, and each signal is operated automatically by an independent track circuit. The length of each circuit is about 1,500 feet. The batteries which supply the electric current are placed in battery wells.

The first of the block signals is located just beyond Jefferson street, and the automatic block signaling begins at this point and extends as far as West Fortieth street. The instruments used throughout this entire system are the latest design of the Union Switch & Signal Co.'s electro-pneumatic system (Westinghouse).

000 additional unified 50-year 4 per cent. gold coupon bonds of the Louisville & Nashville, making total listed \$10,998,000; \$1,000,000 additional general mortgage 5 per cent. gold coupon bonds of the Central Railroad of New Jersey, making total listed \$37,460,000; \$2,119,000 additional first mortgage 5 per cent. gold bonds of the Oregon Short Line & Utah Northern, making total listed \$11,234,000; \$600,000 additional general mortgage 5 per cent. gold bonds of the Buffalo, Rochester & Pittsburgh, making total listed \$3,471,000; \$1,004,000 additional first mortgage extension and collateral 5 per cent. of 1894 of the Rock Island, making the total listed \$38,777,000; \$300,000 additional capital stock and \$300,000 additional consolidated first mortgage 5 per cent. gold bonds of the Toledo, Ann Arbor & North Michigan, making total stock listed \$6,500,000, and bonds \$725,000, and \$2,625,000 first mortgage 6 per cent. coupon gold bonds of 1898 of the Willmar & Sioux Falls Railway Company.

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