The National Switch and Signal Co.

Latest Improvements in Signaling

ILLUSTRATED

With Discriptions and Views of Recent Installations

Asa T. Johnston.
Hammond Ind

'96 Model
Interlocking Machine

PREFACE.

THE advancement in the art of signaling and interlocking has been so rapid that we find it necessary to publish supplements to our regular catalog from time to time, in order that our patrons may be advised of the latest improvements in our designs and installations. The work installed by us during the last year has covered a great variety of track layouts, and perhaps the illustrations of actual working plants will be of interest.

We have installed our apparatus in all climates within the boundaries of the United States, and the testimonials which have been voluntarily tendered us lead us to believe that the superior quality of our material and the great care and skill exercised in the installation of our work is generally appreciated by those having in charge the purchase, operation or maintenance of signal and interlocking devices.

The National Switch & Signal Co.,
EASTON, PA.

General Offices: Easton, Pa.
Works: Easton, Pa., and Rahway, N. J.
Chicago Office: 1237 The Monadnock.

The '96 Model National Interlocking Machine.

WHILE the National interlocking machine has been received with great favor, and has stood the test of severe use in operating some of the most complex terminals, junctions and crossings in the United States, we have had an opportunity, in the course of manufacture and installation, to make some changes in the details of the machine which we are led to believe will be considered as material improvements, and instead of making any change in our standard, which would destroy the interchangeability of parts, we decided to incorporate all the improvements in a new machine, which we have been pleased to call our '96 Model, and since these changes would not, perhaps, be apparent on superficial examination, we have thought best to give our patrons and friends the benefit of a detailed description, showing wherein these improvements lie.

It will be observed that the general design and functions of the several members of the machine have not been materially altered, and the changes are simply refinements of design and machine work. Since the lever and preliminary locking mechanism are the most active parts of an interlocking machine, requiring the most careful design and manufacture, we will first call attention to that part as indicating most clearly the improvements incorporated in the '96 Model.

The lever, Fig. 1, plate 1, illustrated in the left half of the plate, shows the lever and preliminary locking mechanism as furnished with the "National." It will be noticed that the lever is in one piece, and that the pin "A," moving in slot "B" of link

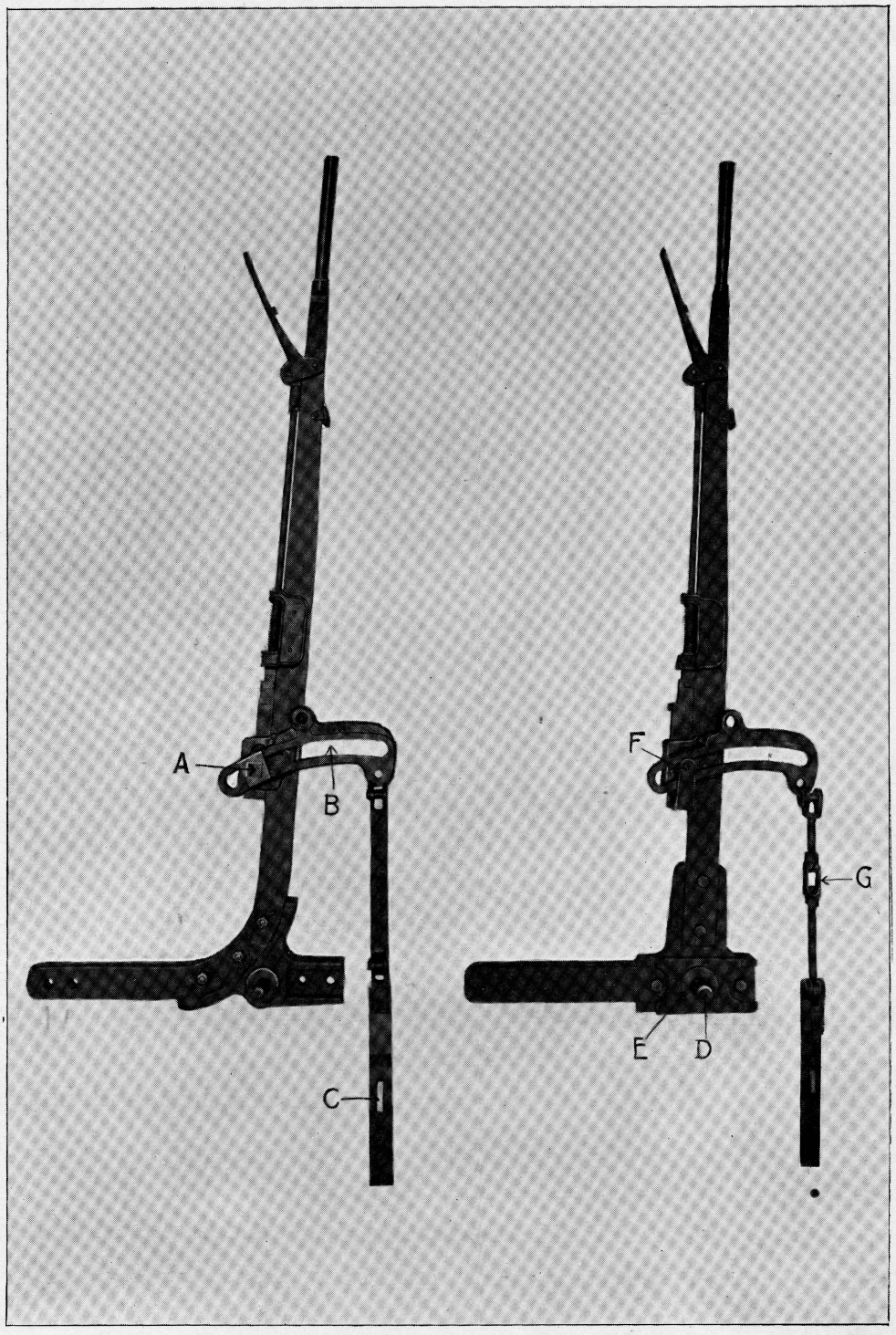

PLATE 1.

FIG. 1.
"National" Lever.

FIG. 2.
'96 Model.

which actuates the tappet "C," is unsupported at front end of pin. Perhaps the most important improvement in the lever and preliminary locking mechanism will be found in the present method of connecting latch rod to the link. In the '96 Model, Fig. 2, plate 1, it will be seen that the pin "F" corresponding to pin "A" in the "National" is supported at both ends by extending the latch dog below and in front of the link in one continuous piece. With this arrangement we avoid the possibility of the pin coming loose. Should the pin become loose, it would destroy the accurate adjustment of the locking. It will be observed, also, that the lever is made in two pieces. The pivotal pin "D," upon which the lever moves, is of much larger diameter, being increased from 1" to 1½". The boss "E" of lever shoe is accurately milled, so as to make a machine-fit in the girder which supports it. This point is somewhat more clearly shown in plate 2, which shows a back view of the machine, and it will be noticed that there is no space between the boss of the lever shoe and the support on the girder which carries the pivotal pin.

We believe the '96 Model is the only machine of any make in which the seat of shoe is made a machine-fit. The practice heretofore among all signal companies has been to place the shoe on the lever in the condition it comes from the foundry. The increased size of pivotal pin gives a greater area of wearing surface, and the milling of the shoe and girder secures an accurate fit, so that the lever does not play from side to side.

The tappet connection between the link and the tappet in the '96 Model is made adjustable through the turn buckle "G," Fig. 2, plate 1, so that the slightest wear in the locking may be taken up. This adjustable connection will interchange with solid connections on any machine of our manufacture.

The top plate, leg and girder of the machine have been made about twenty per cent. heavier. The end view of the '96 Model

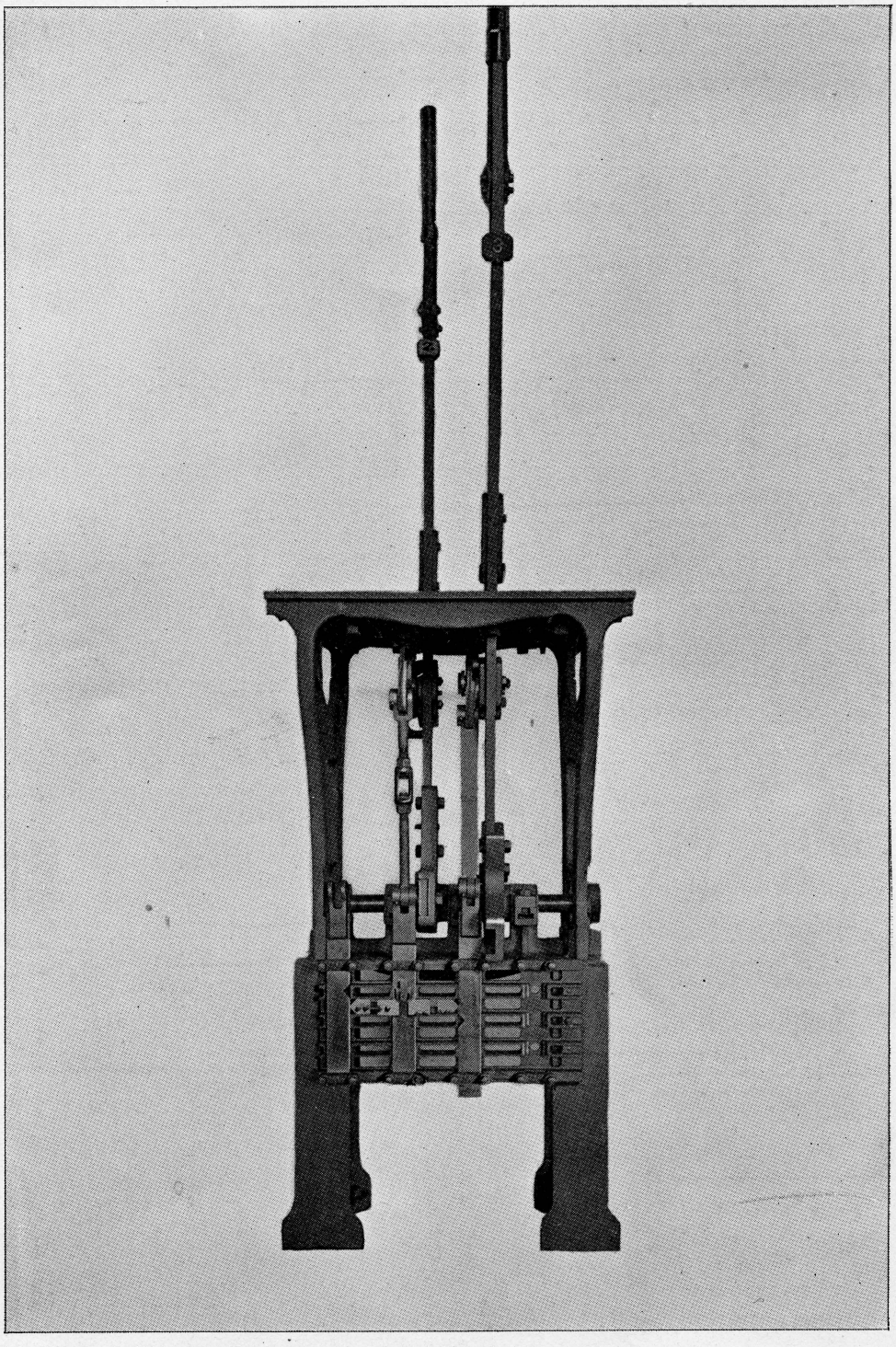

PLATE 2.
Back View, '96 Model.

is shown in plate 3. The top plate is provided with a stop "H," and the spring box "I" enlarged so as to butt against this stop, the face of both the spring box and the stop being milled so as to secure and retain accurate alignment of the levers. In the reversed position the stop is underneath the top plate. The leg is designed to receive locking on both sides "K" "K," therefore single or double locking can be used with equal convenience and accessibility.

Another improvement has also been made in the locking plate by reducing the area of metal where locking bars and tappets come in sliding contact with plate, and since we have reduced the frictional resistance in the locking bars and tappets, we have been able to reduce the power of the springs, so that much less power is needed to move the latch handle and actuate the locking. The benefit of this change is noticeable in more rapid manipulation of the levers and in the reduction of all wearing surfaces to a minimum.

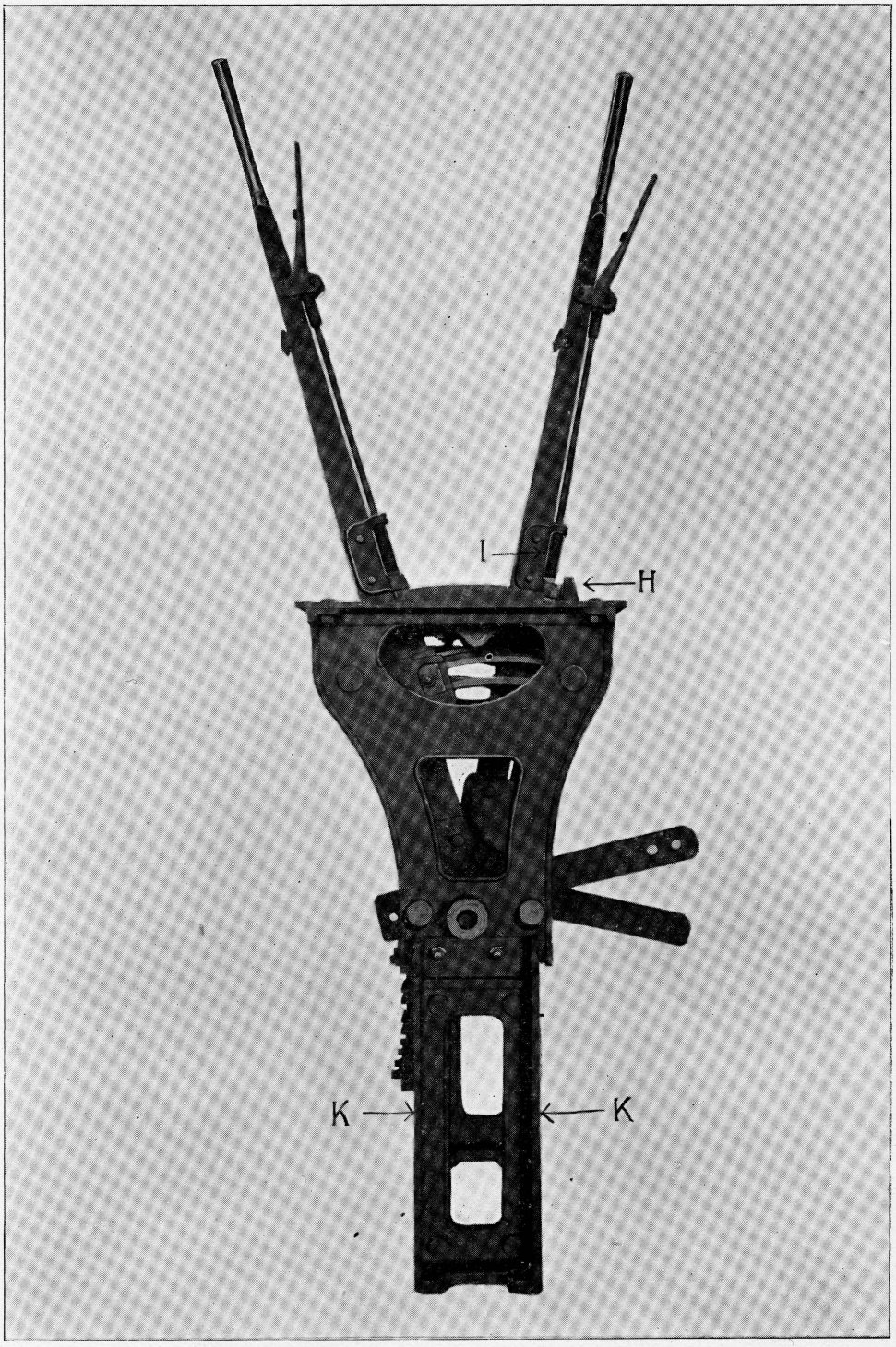

PLATE 3.
End View, '96 Model.

National Special Lock.

AN important improvement has been made in the special locking shown on plate 4. It will be observed that the movable piece "L" has been changed from a circular disc, formerly used in the "National." The piece as now made has beveled edges at the bottom and sides parallel with tappet. With this design it will be noted that there is positively no wear on the special lock when it is in place to perform its function of holding the dogs on either side to their proper position, and any wear which occurs on the beveled edges coming in contact with the special dogs does not effect in the slightest degree the efficiency of the lock for the reason that the function of the beveled edges is to drive the dogs when the tappet is thrown down; and since the dogs are separated by the action of the beveled edge of special lock coming in contact with beveled edge of dogs, the special lock simply moves into place between the special dogs, thus insuring against any lost motion that might occur where there are a number of special locks on the same line.

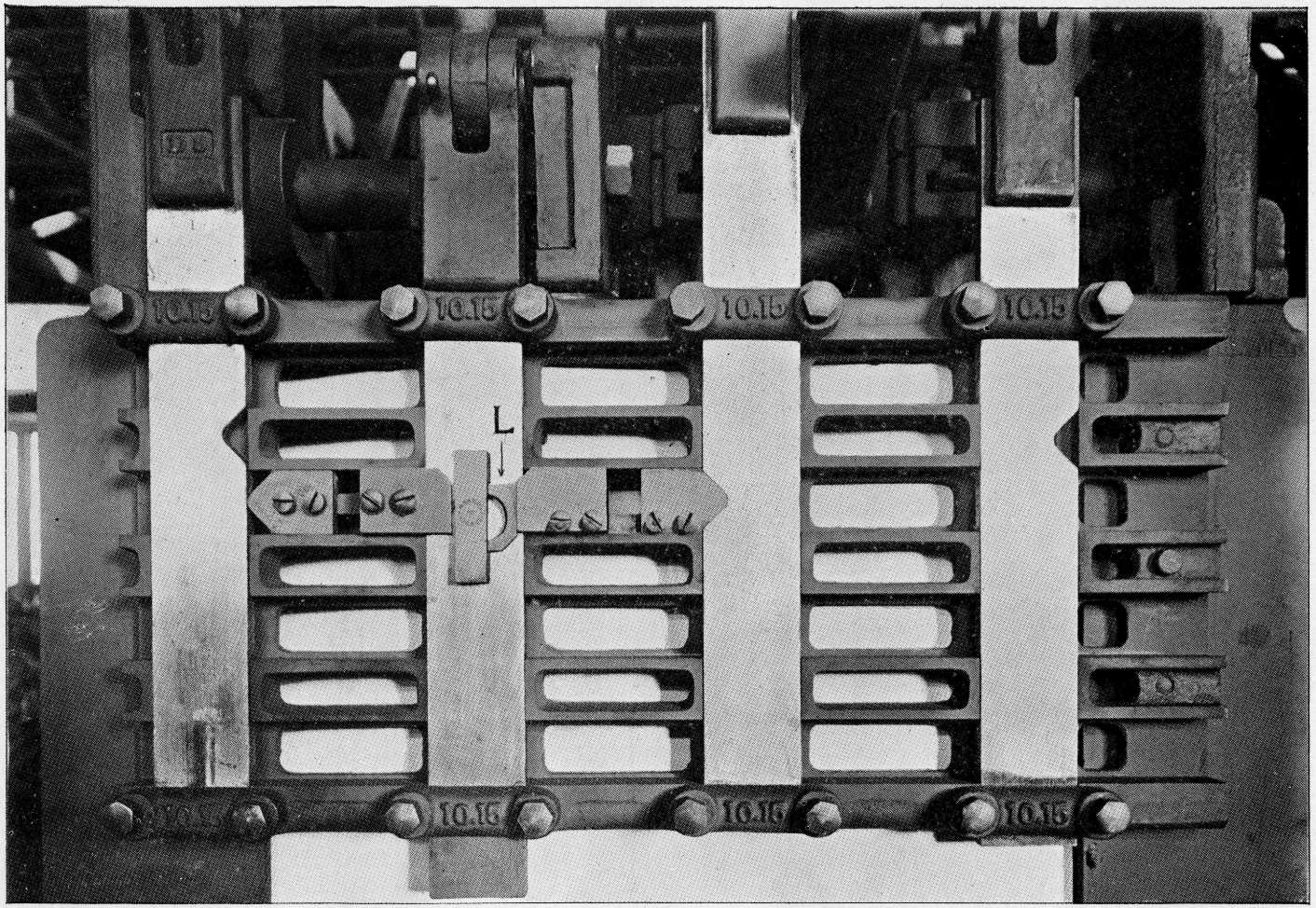

PLATE 4.
"National" Special Lock.

Lazy Jack Compensator

AND

Lock and Switch Movement

Lazy Jack Compensator.

THE illustration on Fig. 1, plate 5, shows the improvement in the Lazy Jack Compensator. The practice heretofore has been to rivet the crank pin into the casting forming the base. It was found that this pin would work loose in time and cause great annoyance, and in order to avoid this, we have given the pin a top support. We have found that this style of compensator is very much appreciated by signal engineers.

Switch and Lock Movement.

THE Switch and Lock Movement, illustrated in Fig. 2, plate 5, is also provided with a top support for the pin, instead of depending on riveting to secure the pin to casting.

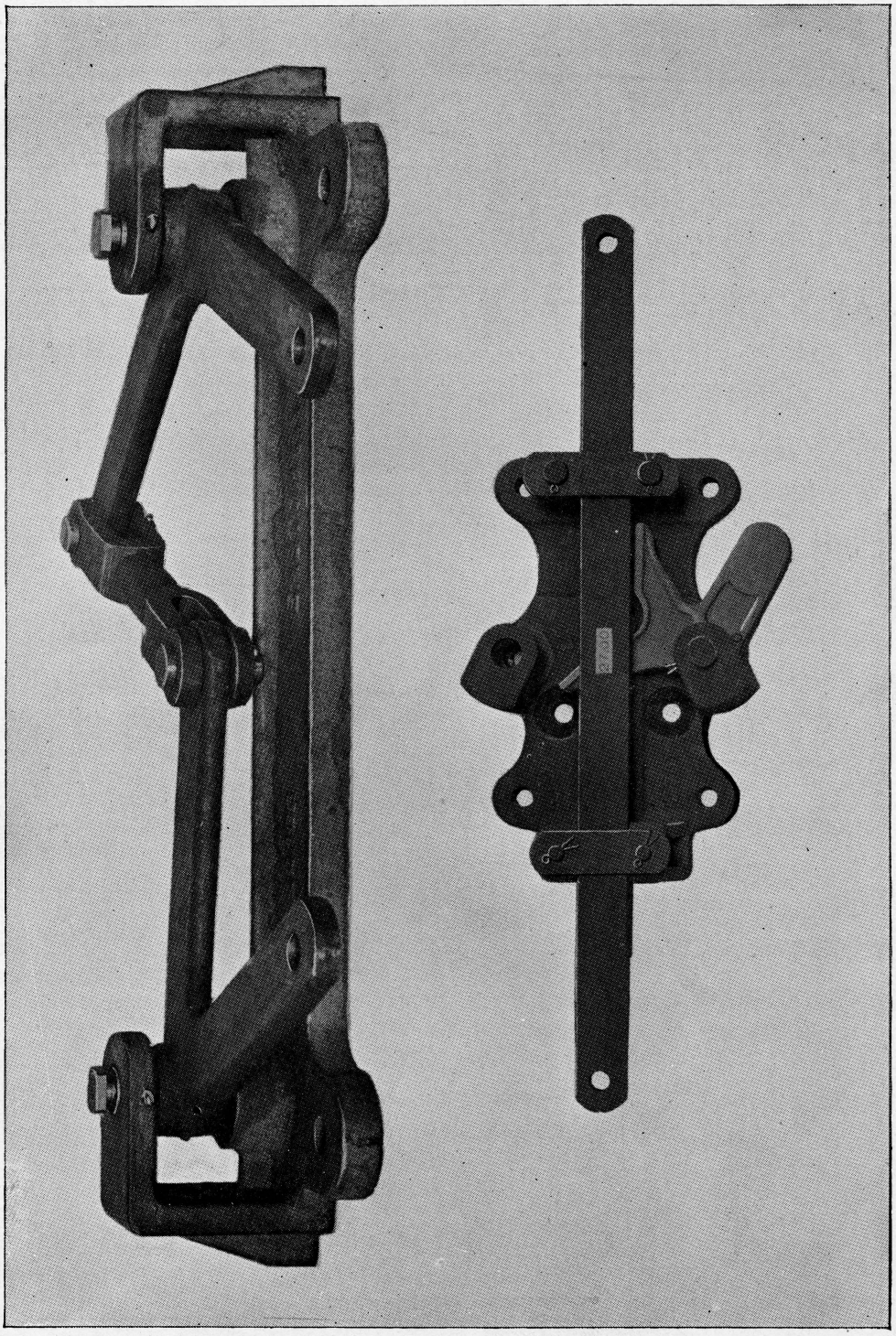

PLATE 5.

FIG. 1.
Lazy Jack Compensator.

FIG. 2.
Switch and Lock Movement.

Descriptions and Views

OF

Recent Installations

Signaling of Elevated Railroads.

THE Metropolitan West Side Elevated Railroad of Chicago is perhaps the finest example of Elevated Rapid Transit in the world. This line begins at Franklin Street, between Van Buren and Jackson, and extends west, crossing over the Chicago River and the several tracks of the surface railroads using the Union station. The crossing of the river is made on the new type of Rolling Lift Bridge, which is built in two independent structures, divided in the middle, and when open it assumes the position in plate 6, which is a view of the bridge looking westwardly from the East bank of the Chicago River. The interlocking tower is shown on the left hand, and from this tower all the signals west of the bridge are worked, as well as all the mechanism connected with the locking of the bridge and the signals and switches at the Market street terminal of the road.

There are four lines of pipe connections crossing this bridge, and in opening the bridge this line of connections is broken at *three points*, which, together with the lifting of the pipe lines to an angle of about 80° from the horizontal, made it extremely difficult to design and install the signal work in such a manner as to provide for expansion and contraction due to changes of temperature, at the same time automatically couple when the bridge is lowered into place.

The records of the operation of this plant show that **NO** failure of the interlocking apparatus has occurred since it was put in service.

The bridge is opened and closed very rapidly, consuming about thirty-five seconds to reverse all signals, release bridge locks and open bridge to full extent for the passage of vessels. The bridges are operated by electricity. The controlling mechanism is located in the signal tower, and is so arranged in relation to the interlocking machine as to make it impossible for the operator in charge of bridge to apply any power until all signals are set at danger and bridge unlocked by means of the interlocking mechanism. The traffic at this point probably exceeds that of any other terminal at Chicago in number of train movements. The four tracks crossing the bridge converge into two at Market Street

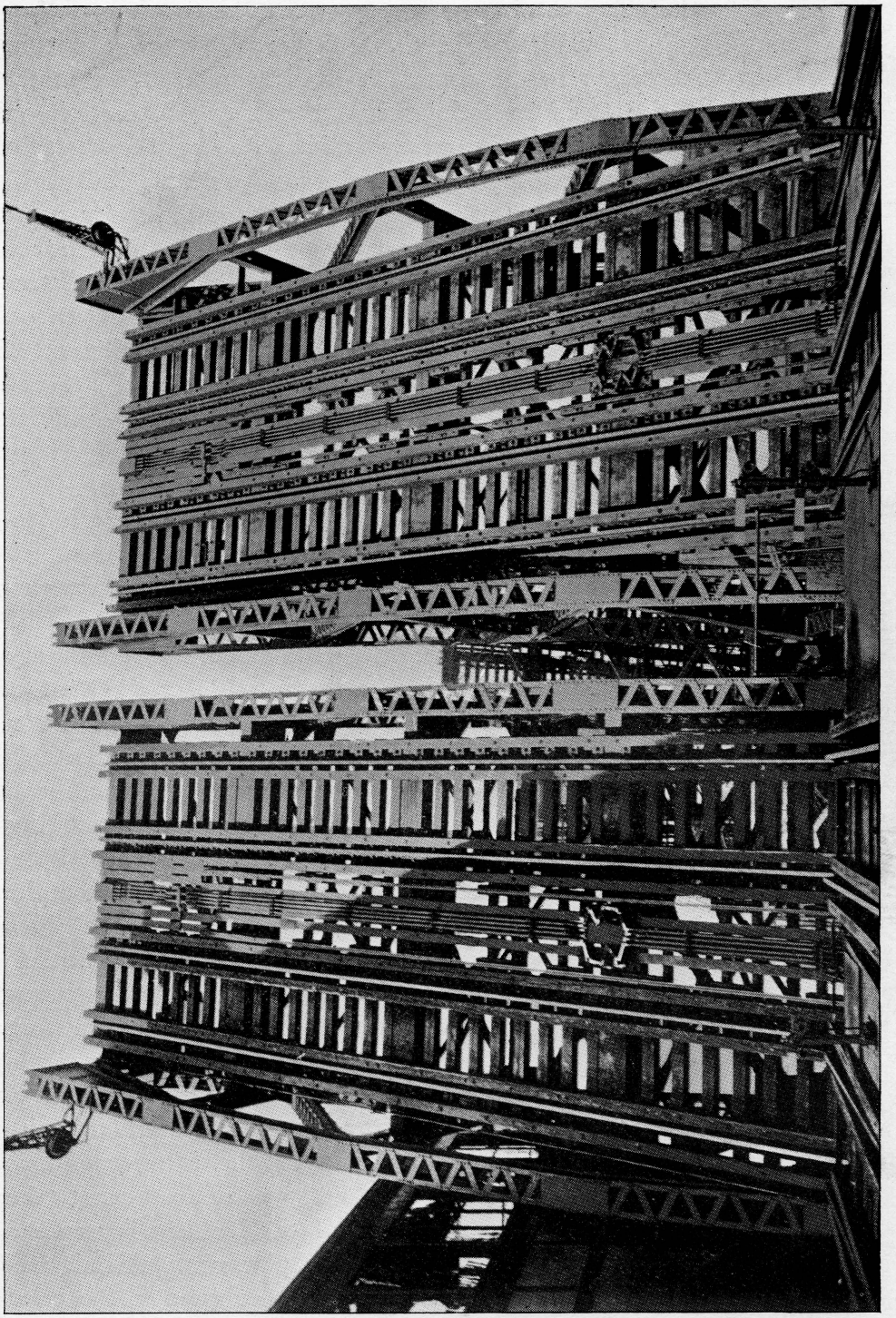

PLATE 6.
Metropolitan West Side.
Rolling Lift Bridge, Open.

station. From each of these two tracks, a short spur is run to accommodate the relay engine or motor car. These relays follow the inbound train so rapidly that the train is ready to go out in about thirty seconds after it comes to a full stop. The motor which brought the train in follows it out and takes position on the spur ready for the next incoming train. The aggregate train movements at this point average about 2800 per day, and this, together with the manipulation of signals and switches to protect the bridge when it is open, requires a rapid manipulation of the levers in the signal tower, and is probably the most severe test that has ever been put upon an interlocking plant in this country.

Plate 7 shows a view looking westward from the west end of bridge, and shows the three spans carrying the four tracks of the elevated structure over the surface roads. In the middle of the most westerly span there is a double crossover, requiring four double slip switches with movable point frogs.

The motive power of this railroad is electricity, which is delivered to the motor by means of a shoe on the motor car which comes into sliding contact with the rail carrying the electric current. This rail is placed nineteen inches outside of, and six and one-quarter inches above the traffic rail, and since the machinery of the motors hangs very low, it is necessary to lower the contact rail where same passes through the system of slip switches when the signals are set for the straight route. The introduction of this contact rail into the system of slip switches before mentioned very much complicated this work, necessitating special interlocking mechanism.

The space between the outside rail and the uprights of the bridge were not sufficient to permit us to carry our pipe lines horizontally, and the connections were changed from horizontal to vertical carriers at the end of the bridge, the vertical carriers being made out of angle iron, as shown on plate 7. We believe that this, together with the work at Market Street, is the most complicated signal work that has ever been carried out in this country.

The signal towers are fireproof, having steel frames, a sheeting of metal, and slate roofs. Plate 8 shows the interior of this tower below the operator's floor. It will be noticed that the machine is set on a steel beam and that all the locking is exposed so as to be conveniently examined from the platform. All signals are operated by pipe, and the work has been designed and carried out in the most substantial manner known to the art.

PLATE 7.

Metropolitan West Side Bridge.

Crossing Pennsylvania Railroad Tracks.

October 20, 1896.

THE NATIONAL SWITCH & SIGNAL CO.—
MR. H. M. SPERRY, Sig. Eng. and Western Agt.,
1237–1238 Monadnock Block, City—

Dear Sir:

I take great pleasure in testifying to the extremely satisfactory manner in which your company designed and installed the interlocking of the Metropolitan West Side Elevated Railroad Company of this city.

We have four plants: Market Street, 44 lever frame; Canal Street, 64; Marshfield Avenue, 60; and Robey Street, 32.

The Market Street plant is particularly intricate, due to the complicated set of switches, which have to handle 1286 trains per day. During the busy hours trains are operated at one-and-a-half minute intervals, from the four tracks, to the stubs of the Terminal. This interlocking also controls the operation of our roller lift River Bridge, which is situated directly at the entrance to our Terminal Station.

Our interlocking is necessarily more complicated than the ordinary work, for the reason that when we adopted electricity for our motive power—using the third rail system,—we necessarily introduced complications in our track system, such as movable contact rails, etc.

All of the above plants have been in service for over a year, and our records show that there has been no delay whatever chargeable to the failure of the interlocking apparatus.

I think it is due your Company to commend the prompt and efficient manner in which the work of installation was prosecuted, as well as the satisfactory service the interlocking system has since given us.

Yours truly,

D. MACALLISTER,
Chief Engineer.

THE WEST SIDE CONSTRUCTION CO.,
258–260 Franklin Street,
Chicago.

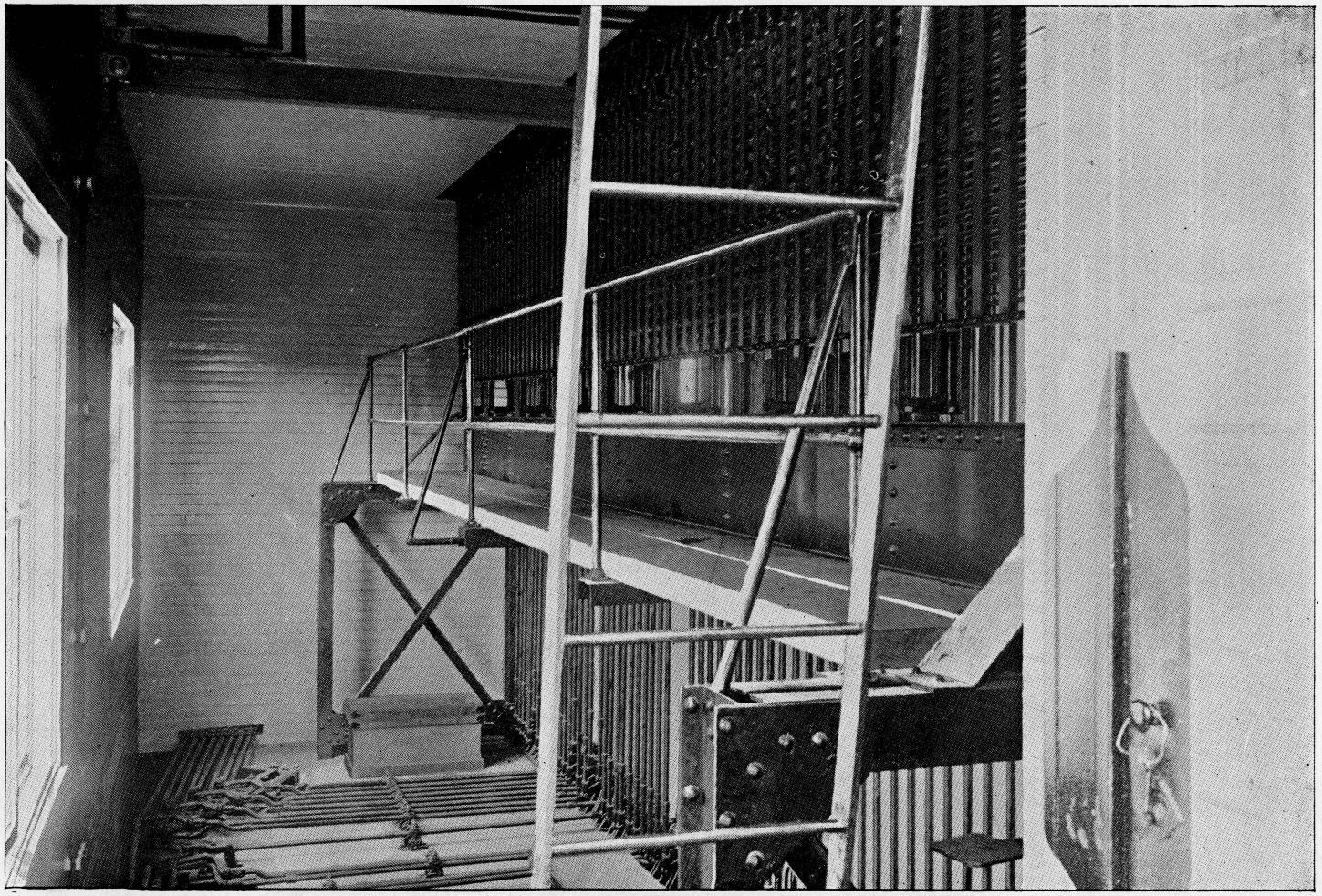

PLATE 8.

View of Tower Below Operator's Floor.

Showing Locking and Crank Lead-Out.

Shorb Interlocking Plant.

SOUTHERN PACIFIC R'Y.

AN interior view of signal tower above the operator's floor is very clearly illustrated in plate 9. This machine was built for the Southern Pacific Railway and is in service at Shorb, California. It has 68 levers, and the economy of space necessary for the National machine is very clearly shown in this illustration.

This is the largest interlocking machine in service West of Chicago, and the entire plant was designed and installed by this company.

PLATE 9.

Operator's Floor in Tower.

Hartford Interlocking Plant.

N. Y., N. H. & H. R. R.

PERHAPS the oldest style interlocking machine in the United States is to be found among the relics of the N. Y., N. H. & H. R. R. at Hartford. This machine was put in service in 1883 by the Pennsylvania Steel Co. It has been lately supplanted by the appliances of The National Switch & Signal Co., and the following description is from a paper* by the Signal Engineer of the N. Y., N. H. & H. R. R., who had charge of the installation of the work:

"In 1896 it was found necessary to build a more modern plant, and the first "National" machine of 1896 was put in, and has *attracted considerable attention.* It is built by The National Switch & Signal Co., of Easton, Pa. I believe it is as *nearly perfect* as one can be made. A description of it appeared in the *Railroad Gazette* of August 14, and in the *Railway Review* of May 16, 1896. At the slips "National" rocker shafts are used for operating the locks and bars. One-way Lazy Jack Compensators were used of the latest "National" design. Electric locks of the Hansel patent are used in such a manner that the lever can be put home at any time, but while any wheels are on the track circuit between the distant signals and the frogs, the latch cannot be put normal, the result being that the route cannot be changed until the train is over the interlocking."

It will be noted that a few of the latest specialties of this company have been mentioned by the Signal Engineer, Mr. A. H. Rudd. The view of this installation is illustrated on plate 10, and gives a general idea of the character of the track layout. The machine has fifty-eight active levers with six blank spaces.

* Read before the Signal Club of Chicago.

PLATE 10.
Hartford Plant.

17th Street Interlocking.

PHILA. & READING R'Y.

WE believe the longest double slip switches ever made, and certainly the longest ones ever operated through an interlocking plant, are to be found at Seventeenth Street, Philadelphia, on the Philadelphia & Reading Road, at what is known as Germantown Junction. The Railroad has lately put in a completely new system of tracks here, in order to complete its four-track system at this point. These slip switches are known as No. 15, and are 112 feet long, and although there is an unusual amount of detector bar, owing to the great length of switch, the operation of these switches has been entirely satisfactory from the first. Owing to the great amount of traffic, the changing of tracks, and the removal of an interlocking machine which formerly existed at the Junction, there were many difficulties to be encountered in the satisfactory installation of this plant.

This work is illustrated by plate 11. The new design of tower known as the '97 Model is used here, and it will be observed that the exterior is perfectly plain and covered with metal. The window sill is very near the floor, and the windows slide horizontally instead of vertically. The top of window is 6′ 6″ from the floor. Attention is called to this point, for the reason that it has been the practice in the past to have a great amount of unnecessary window surface above the line of vision; and although we have called attention to this point from time to time, we have not been able to change the standard plans adopted by some of the railroads. We find that in the old style the first requisition from the operator was for awnings or window shades, and to avoid this we have designed this tower, which has been highly approved by the Reading officials at Seventeenth Street.

As another instance of the care exercised by us in installation, we are pleased to quote from a letter received from an official of the Reading Railroad, which is as follows:

"I take pleasure in saying that everything is entirely satisfactory, and a good share of the credit belongs to your foreman, whom we found to be thoroughly competent and always ready and willing to do the right thing."

PLATE 11.

17th Street, Philadelphia, Pa.

Signaling of a Through Passenger Station.

TROY UNION R. R.

THE passenger station at Troy, N. Y., is of the design known as a through station. There are seven tracks within the station shed, and these converge into double tracks at either end. The grade at this point is such that it is desirable to have through freight trains pass without stopping, and in order to accomplish this, as well as to protect traffic and facilitate the operation of same through this station, we have installed a complete system of interlocking, controlling all the switches and necessary signals at each end of this station. The illustration in plate 12 shows the signal tower located on a steel bridge spanning the tracks; also gives a view of the south end of passenger station, with the signals carried on a bridge across the portal. Similar signal tower and signals are located at the north end of passenger station. The space allotted to the installation of this signal work was very much confined, requiring very careful design and location. Each track within the passenger station is equipped with the rail circuit connected with indicators in each tower in such a manner that the presence of a train or any portion of a train within the limits of the passenger shed is indicated to the operator in the tower. This plant has been in operation since September, and has demonstrated the economy of such work by reducing the cost of manipulating switches, and avoids the necessity of stopping any through trains at this point.

TROY, N. Y., September 12, 1896.

MR. OAKLEIGH THORNE,
PRESIDENT, THE NATIONAL SWITCH & SIGNAL CO.,
Easton, Penna.—

Dear Sir:

With this I hand you check for $20,000.00 in full payment for the installing of interlocking plant at Troy, as per plan A–736. Will you kindly receipt the enclosed voucher and return to me?

It gives me pleasure to say that this plant is working smoothly and gives entire satisfaction. Believe me,

Very truly yours,

[Signed,] E. A. HARRINGTON,
Managing Director, T. U. R. R.

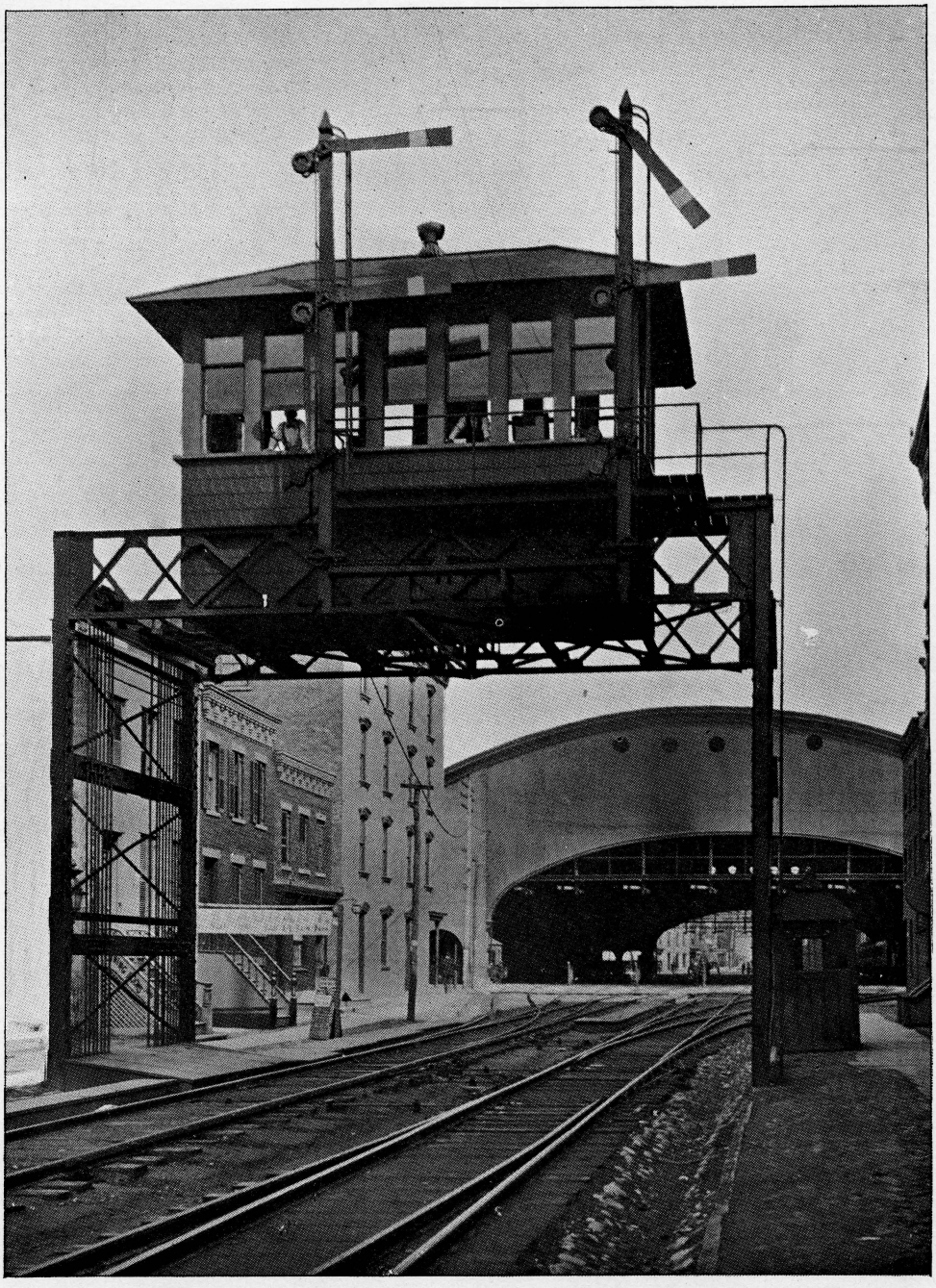

PLATE 12.

Troy, N. Y., Through Station.

Protection of Draw Bridges.

P. & P. U. R'Y.

A VERY good illustration of the protection of traffic over a grade crossing and drawbridge is shown in plate 13. The bridge shown in this view crosses the Illinois River at Peoria, Ill., and since the state regulations provide that in case a grade crossing or drawbridge is properly equipped with interlocking and signaling devices, trains need not come to a full stop before crossing same, the value of such equipment is appreciated. The physical condition and track arrangements surrounding this work were somewhat complicated. The bridge is about 1000 feet long, and is crossed by gantlett, separating into a double track at each end of the bridge. The approach to the bridge on the opposite side of river from crossing is protected by derails and signals operated from the tower shown in this view, and a rail circuit is carried from these derails across the bridge to a point opposite the two-arm home signal. This circuit controls an electric lock attached to the locking frame of the machine and connected in such a manner that the presence of a pair of wheels any place on the track circuit locks the machine so that the operator cannot unlock the drawbridge. The draw span is moved by steam power, which is also controlled from the signal tower by a positive connection. The pipe lines and rail circuit are automatically coupled at each end of the draw, and while they are controlled from the tower, they are lifted by the steam power, which operates the bridge so that the signal man is relieved of the work of raising these connections, at the same time he absolutely controls their movements.

Mr. F. L. Tompkins, Superintendent of the Peoria & Pekin Union, which Company controls this interlocking plant, writes us, under date of November 20, 1896: "The signals both at L. E. & W., the Terminal and Drawbridge are working to our perfect satisfaction, and there is a vast difference in the movement of our trains between Peoria and Pekin, and a much better feeling on the part of all the train men."

There can be no question but that signaling and interlocking, when properly designed and installed, not only decreases the cost of operation of all grade crossings, drawbridges and junctions, but also facilitates traffic and guards against the destruction of life and property.

November 23, 1896.

PLATE 13.

Protection Draw Bridge, Peoria, Illinois.

Protection of Street Railways Crossing Steam Railroads.

THE rapid growth of street railways has greatly increased the danger of travel both on the line of the street railway and the steam railroad, and careful managers have sought to surround this new danger with the most approved appliances. Where these crossings occur in thickly populated cities, the value of such protection is more apparent, at the same time the difficulty of accomplishing it is increased. The crossing illustrated on plate 14 is one of sixteen erected in Chicago for the Yerkes lines, and is made by the crossing of the lines of the North Chicago Street Railway with the C. M. & St. P. R. R. at Chicago Avenue, Chicago. The space for the erection of signal tower was so limited that it was necessary to build same on an iron pillar. The gates which were formerly operated by a man on the ground are now controlled and operated by the signal man in the tower, so that no additional operating expense is incurred, while at the same time the operator has a better view of the situation, and also controls the approach of trains and cars on either line, thus facilitating traffic and securing safety to life and property. We have installed a large number of these plants during the past year, and our records indicate that they are entirely satisfactory, and no accidents have occurred where these plants have been installed, and when we consider the frequent fatal accidents at such grade crossings, it would seem that all such crossings would be protected in similar manner.

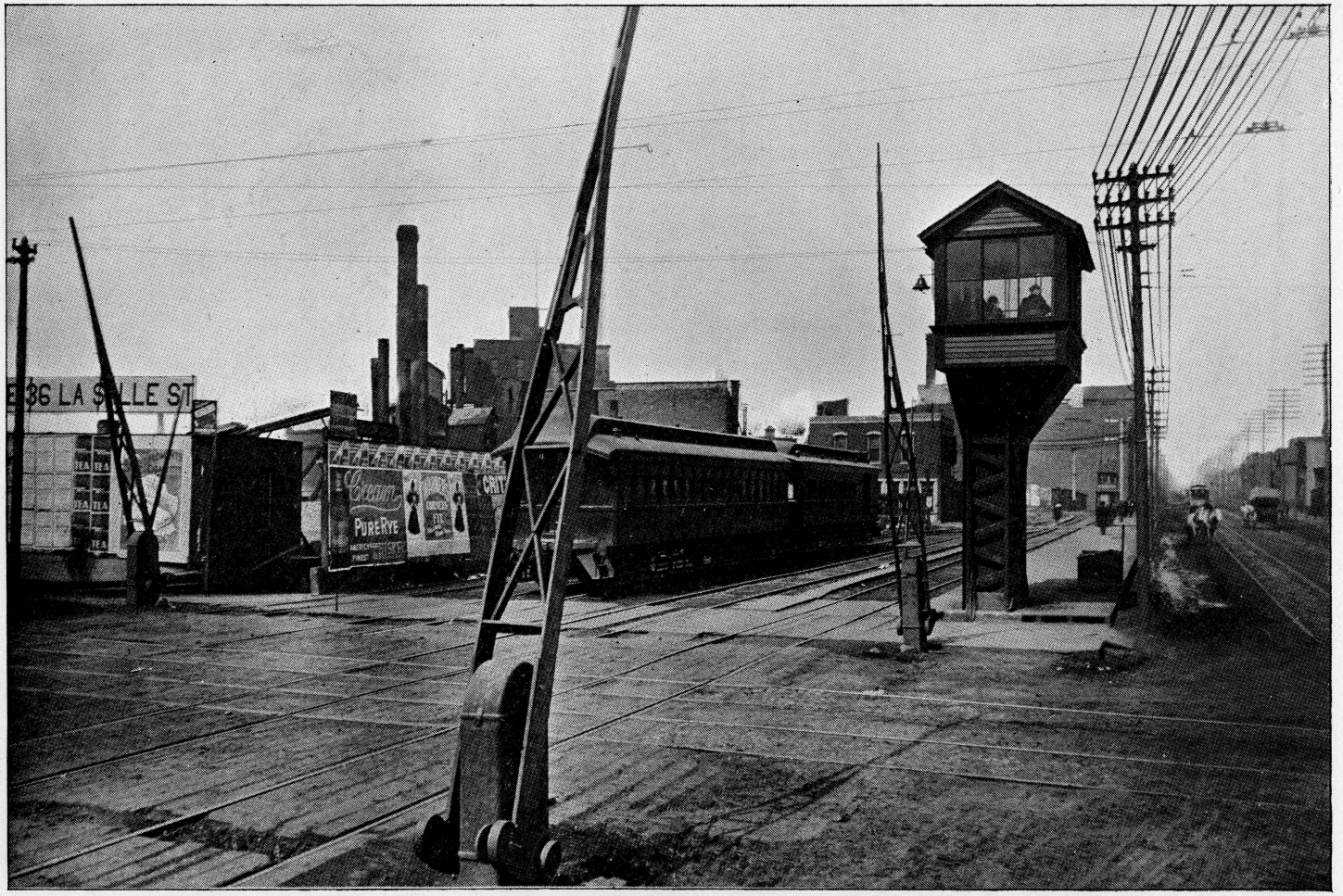

PLATE 14.

Chicago Avenue, Chicago, Illinois.

Plant at Seattle, Wash.

N. P. AND G. N. R'YS.

A VERY difficult piece of interlocking and signaling is illustrated on plate 9, which gives a view of tower and tracks with the connections to interlocking mechanism, as lately installed at Seattle, Wash. It will be noticed that narrow gauge tracks are evolved in this plant, and that it is in a very busy part of the city, being located in a street near the wharves. All the tracks are carried on piling, and the whole is covered with heavy planking, in order to permit teaming in all directions. The planking coming flush with the top of rail prevented the installation of the interlocking work in the ordinary manner, as all connections had to be placed below the planking to give clear passage to team traffic. It will be seen that this greatly complicated the work and necessitated the hanging of all switch and lock movements, bell cranks, etc., below the ties.

The machine for this work has 47 active levers and 21 blank spaces, the blank spaces having been provided to permit the incorporation of levers for the operation of other tracks and switches which it may be found desirable to include.

Owing to the great distance, the Signal Company was not able to send a representative to examine the physical conditions, and made the plan and estimate on the data furnished by the Railroad Company. Considerable difficulty was anticipated in installing this work, and it was necessary to depend largely on the skill of the foreman in putting in this plant. It is our practice to secure the best talent in the field, and the following extract of letter from the representative of the Railroad Companies to our foreman shows the necessity of employing none but the best:

"*Dear Sir:* Now that we are parting, and the interlocking is completed, I want to express to you my appreciation of the thorough manner in which you have done this work, and to compliment you on the ingenious and workmanlike manner in which you have surmounted the many difficulties peculiar to this particular job. I do not believe there is another like it anywhere."

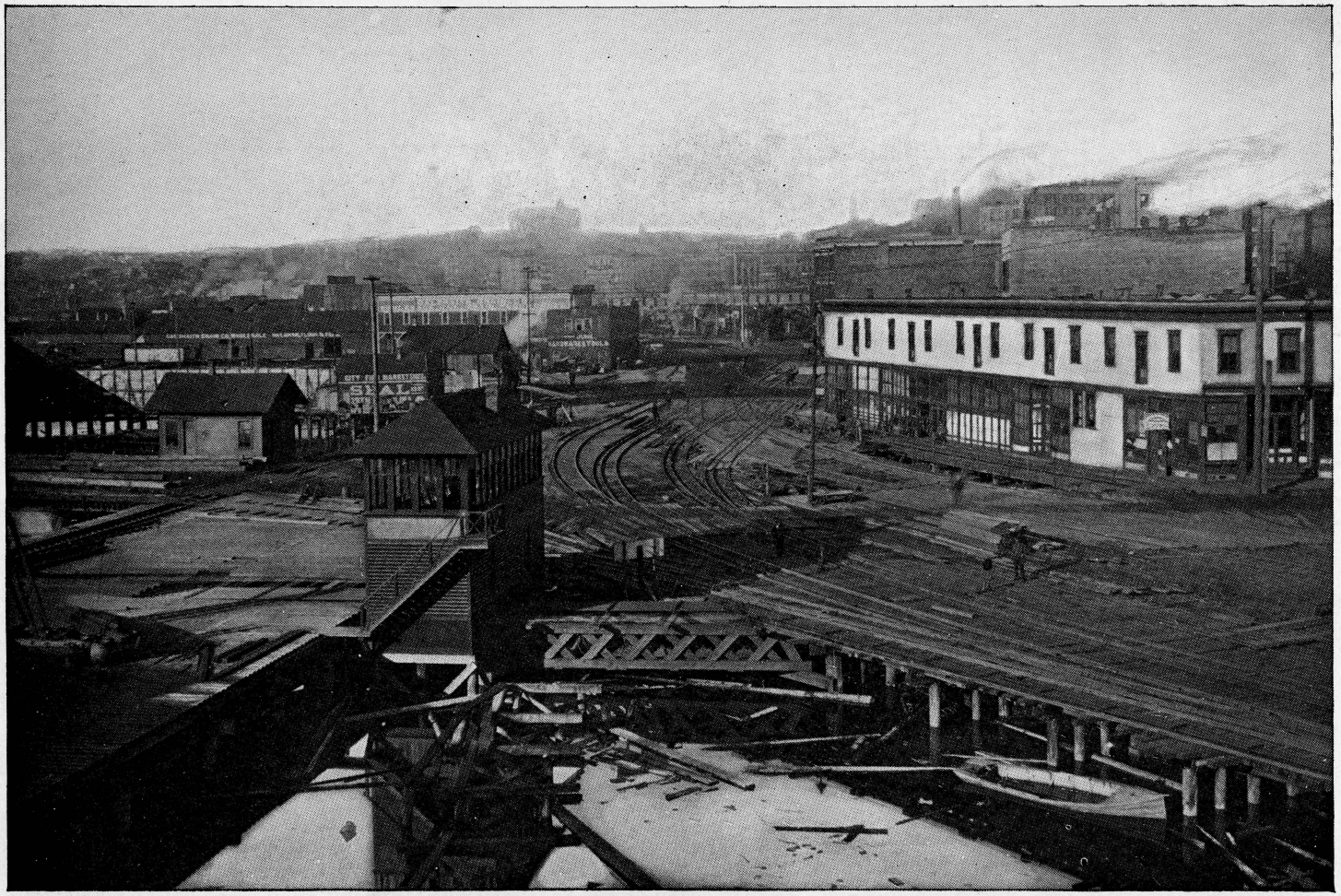

PLATE 15.

Seattle, Wash.

Low Tower for Outlying Crossings.

WHILE all railroad managers appreciate the necessity of protecting grade crossings by a suitable system of signals and interlocking, the financial condition of their property does not always warrant them in making these expenditures, and often when they are permitted to install these appliances, they are restricted and limited to the cheapest possible plan, considering first cost. And while it is true that this may prove false economy, it seems better to secure some protection, rather than to provide nothing until such time as a complete plant can be installed. In order to meet this condition, we have designed a new tower, which reduces the cost of a simple grade crossing. This style of tower is illustrated by plate 16, and if the traffic on either of the roads interested is such that it is not desirable to maintain an operator there for convenience in moving trains over crossing more rapidly, it is sometimes found desirable to equip the tower with our patent door lock, which we have described in a pamphlet issued some time since. The office of this door lock is to provide against the operator leaving the signals set against the high-speed route. In opening the door, he locks the machine, and cannot move the lever to clear his signal until he shuts the door. After he clears the signal, he cannot open the door until he returns all the levers to the position in which he found them.

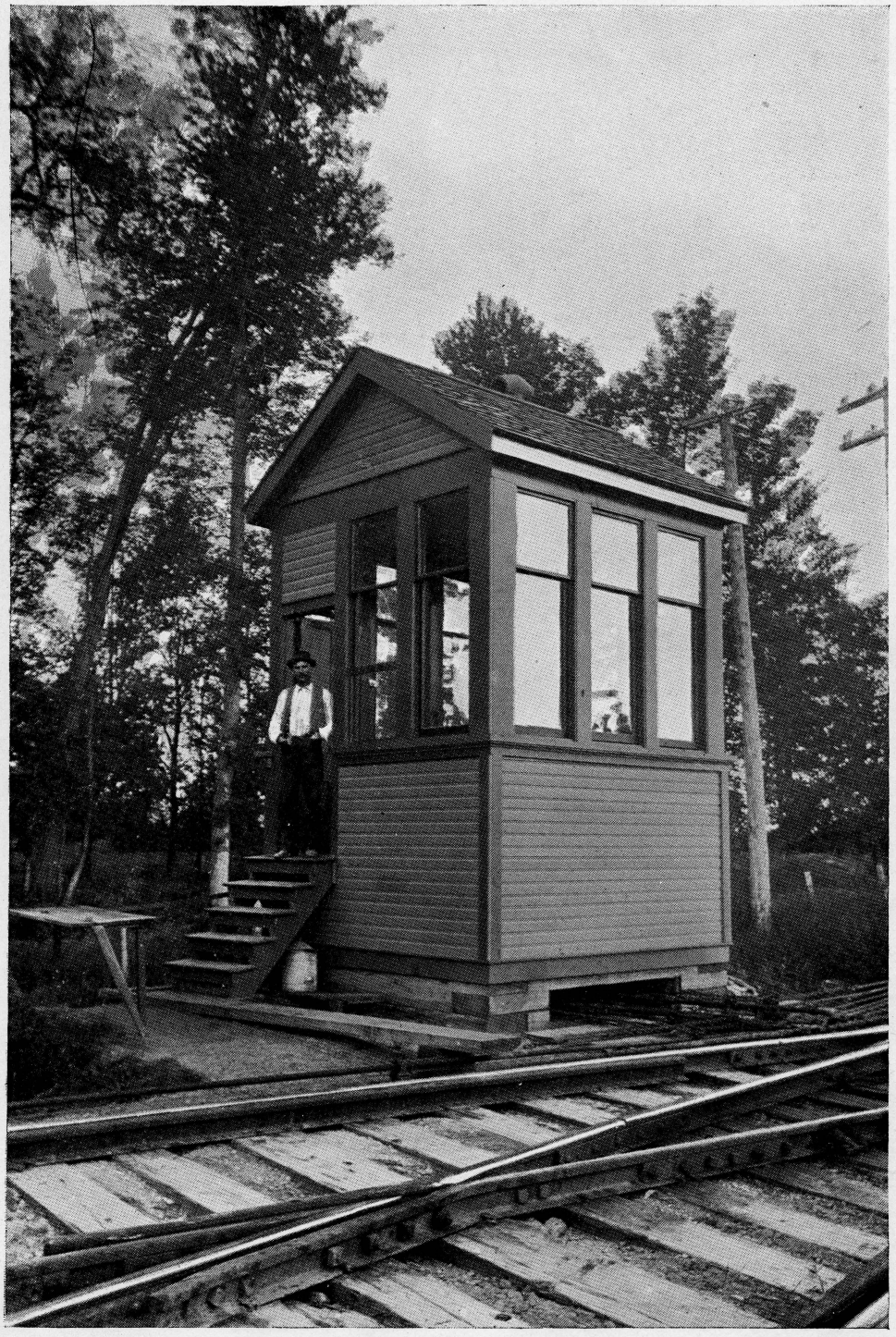

PLATE 16.
Low Tower.