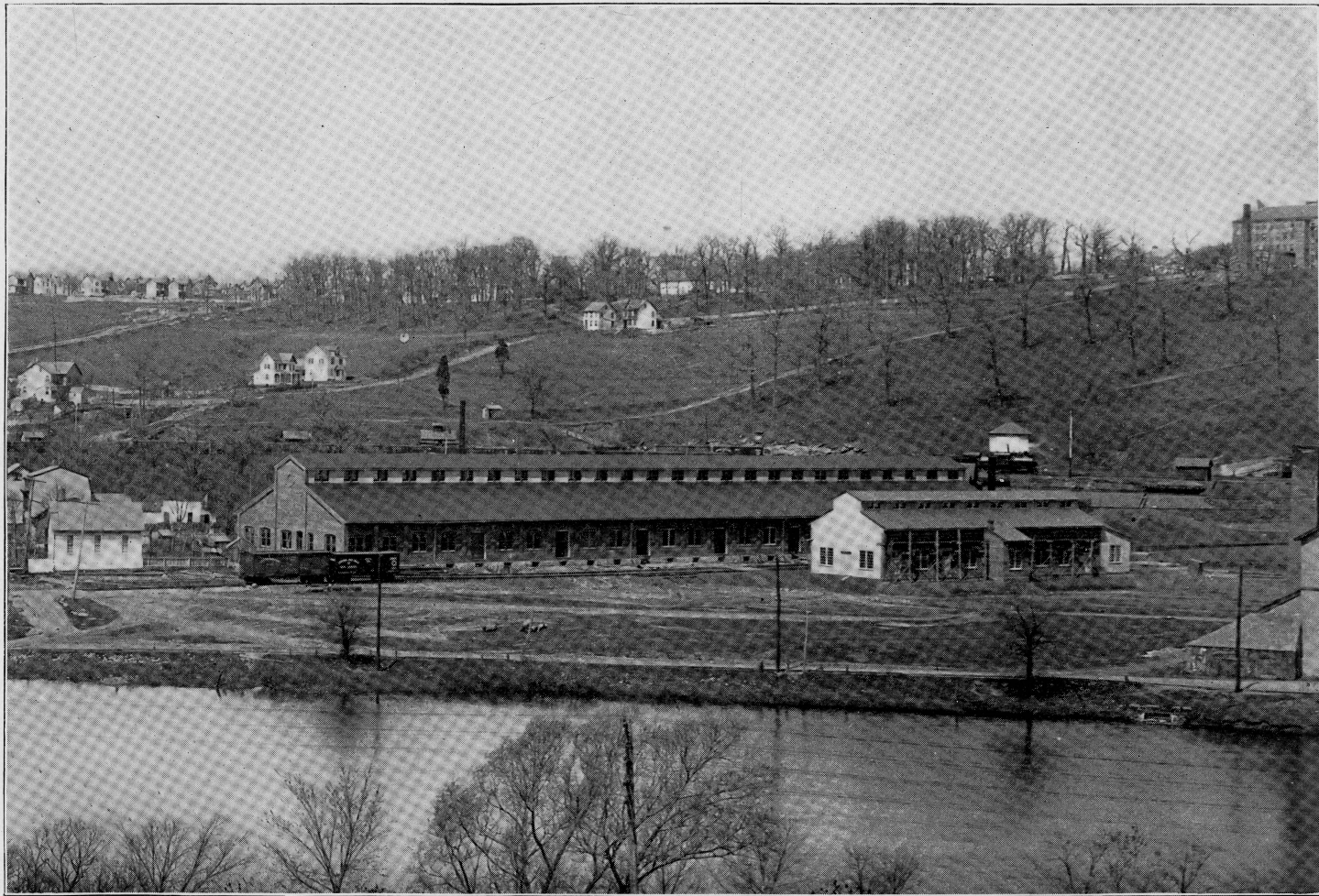


*The National
Switch & Signal
Co.*

OF EASTON, PA.

BLACK SIGNALS
INTERLOCKING
BLOCK SIGNALS



WORKS OF THE NATIONAL SWITCH AND SIGNAL CO. AT EASTON, PA.

NATIONAL SWITCH & SIGNAL CO.

WORKS: EASTON, PA.



:: ILLUSTRATIONS ::
OF
:: STANDARD APPARATUS ::
FOR
:: INTERLOCKING ::
AND
:: BLOCK SIGNALS ::



President:

OAKLEIGH THORNE,
32 Liberty St., New York.

Eastern Manager:

C. A. HAMMOND, C. E.
32 Liberty St., New York.

Western Manager:

CHARLES HANSEL, C. E.
The Monadnock, Chicago.

1894.

H. A. ROST, PRINTER, 14 FRANKFORT ST., N. Y.

THE NATIONAL SWITCH AND SIGNAL COMPANY.

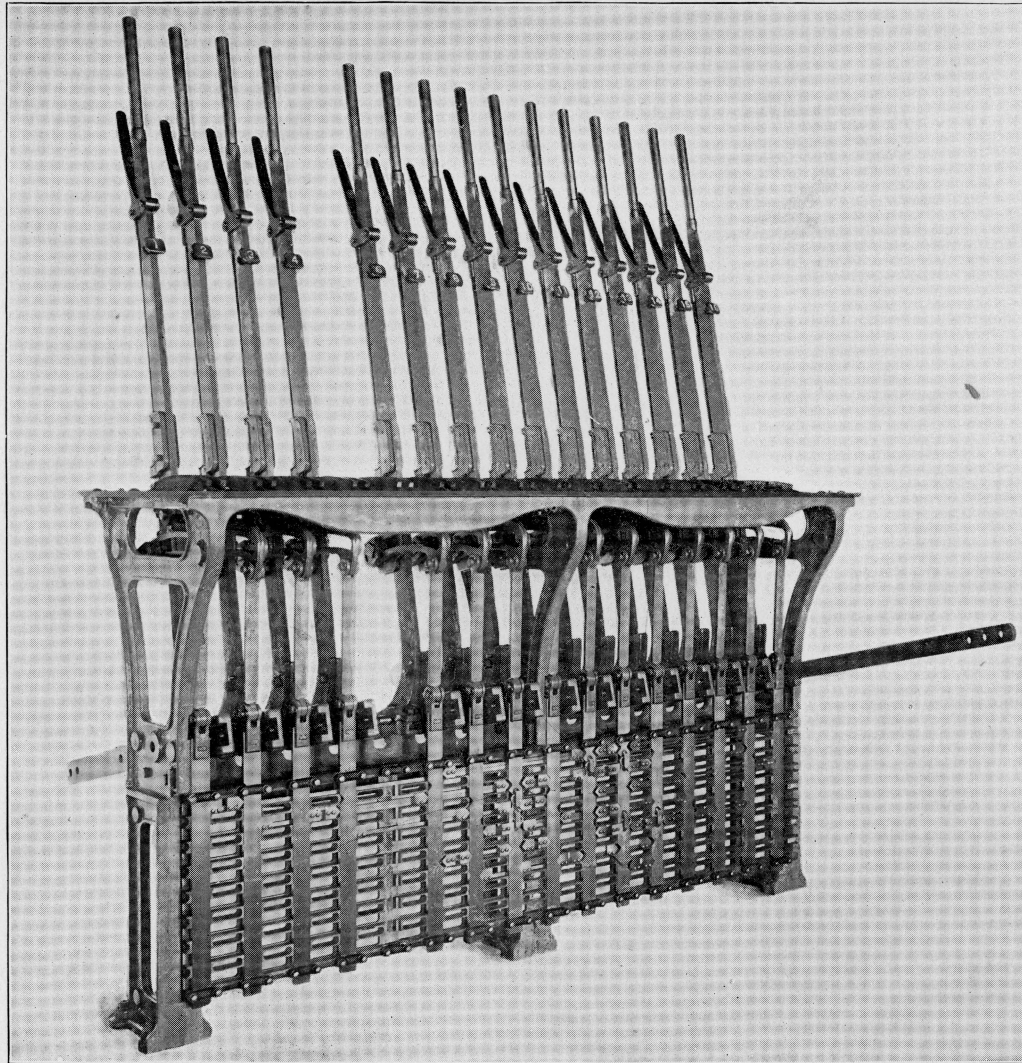
IN presenting this pamphlet giving a brief description of some of our appliances, our object is to show simply a few specimens of our work in advance of our complete catalogue (now in preparation), which will fully illustrate all our apparatus in detail, arranged in a form most convenient for reference.

Our company, having been recently reorganized under entirely new management and with greatly increased capital, has just finished the construction and full equipment of its new and extensive works at Easton, Pa., and is now prepared to manufacture and install every description of signalling and interlocking work in conformity with the highest standards of American railroad practice.

Although our apparatus is in service on many of the principal railroads of the United States, we have considered the convenience of those who would like to make a detailed examination of our devices without going to the several places where they are in use. To this end, a complete exhibition has been installed at the Chicago office, rooms 1,236-7 and 8, The Monadnock. This exhibition comprises full-size parts of a complete system of interlocking and block signalling, all of which is convenient for inspection. While we cordially ask the attention of our patrons in the West to this exhibit, we also invite examination of our works at Easton, Pa., where all our apparatus may be seen.

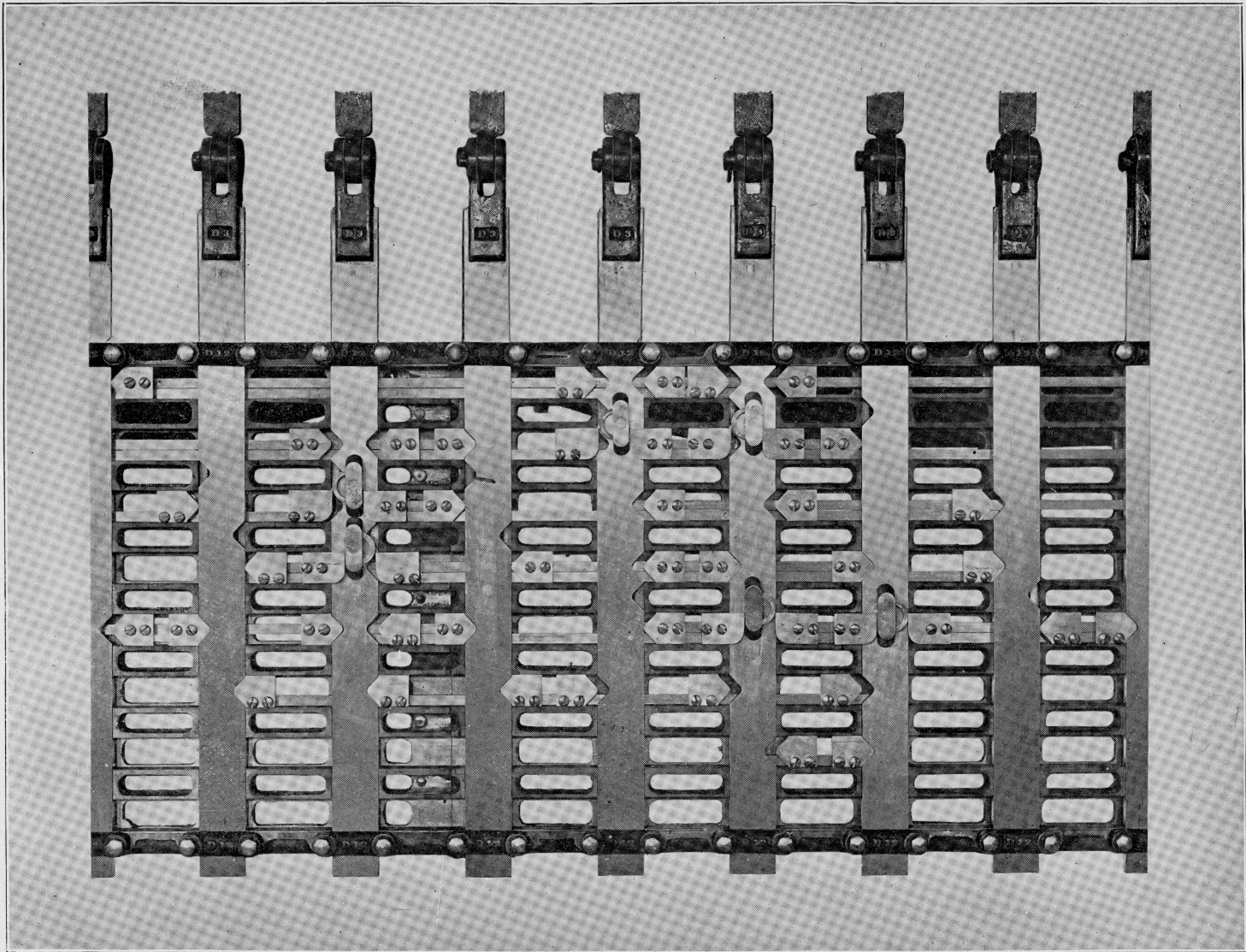
We specially desire it to be remembered that all work installed by this Company and all devices furnished therewith will be fully guaranteed, and that we will protect our customers against any claim or damage by reason of alleged infringements of patents.

ALL LIKE PARTS OF OUR APPARATUS ARE MADE TO STANDARD TEMPLATES, AND ARE ABSOLUTELY INTER-CHANGEABLE.



THE NATIONAL INTERLOCKING MACHINE.

THE NATIONAL INTERLOCKING MACHINE.



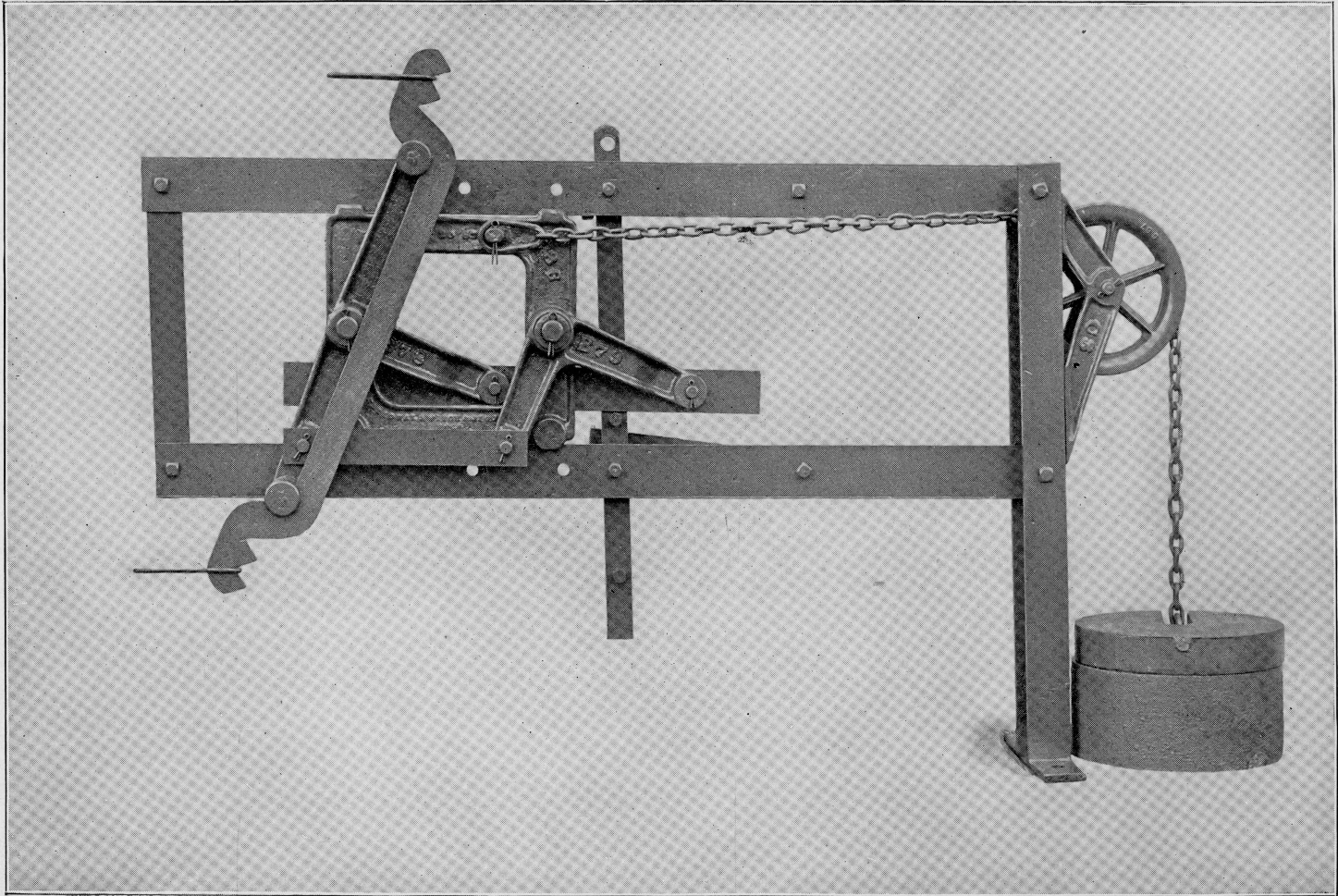
THE NATIONAL PFEIL SPECIAL LOCKING.

THE NATIONAL INTERLOCKING MACHINE.

THE general view of the interlocking machine on the page 4 is made from a photograph taken at the works, the machine being just completed and ready for shipment to the Southern California Railway. We have taken this machine for illustration in preference to larger work which we have installed, such as the 92 and 80 lever machines built for the Illinois Central Railroad at Chicago, in order to show more complete detail of locking. While the illustration is quite sufficient for the experienced signal man, we request attention to the following brief description of the apparatus:—

The locking is of the Steven's "mitre" type—standing in a vertical plane and actuated by tappets suspended from the rockers or links which are connected to the latch-rod on the lever. The construction of this machine is such, that more locking can be applied in a given space than in any other machine, an important consideration in complicated plants. We accomplish this economy by using tappets on front and rear. The compact manner of assembling the several parts, not only impresses signal men with the great care which has been exercised in working out all details so as to give great efficiency, and at the same time reduce all wearing parts to a minimum, but also renders the whole pleasing to the eye as a perfect machine.

The principal features of the locking are its exact finish, the ease with which any change may be made in the arrangement of the locking dogs, and the method of accomplishing special locking, which is known as the Pfeil National Anti-Friction Locking. By this device (see illustration on opposite page) a ring is loosely held on the tappet by a cage, so that it is capable of both rotary movement on its axis and of horizontal movement crosswise of the tappet; the operation of this special locking is thus rendered practically frictionless. It will be noticed that with this locking the notches are in the tappets only, and the rings are simply the intermediaries whereby, at the needed times, the dogs are actuated to engage or quit the notches in the tappets. We invite the most rigid test of this machine.

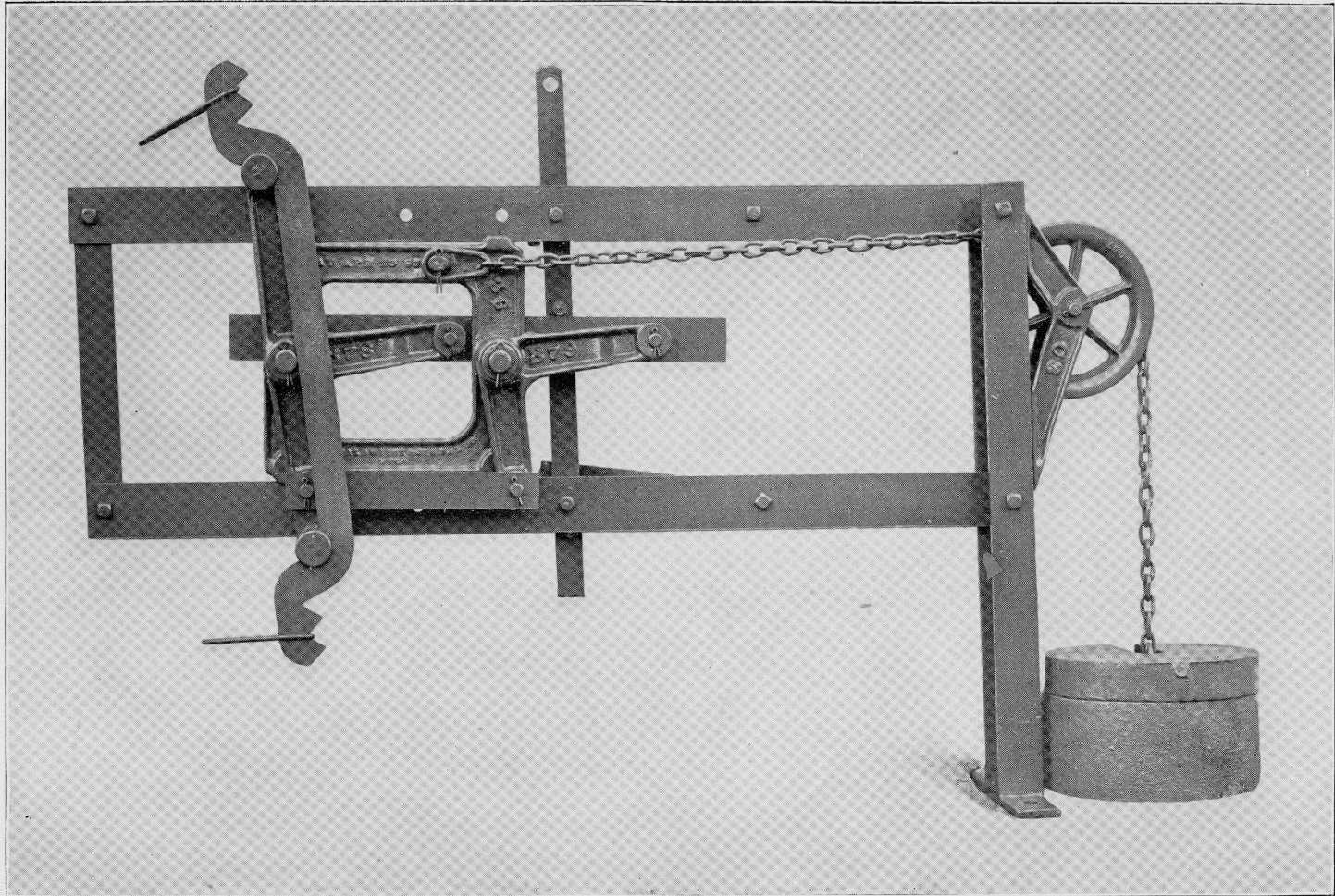


THE NATIONAL DOUBLE-WIRE COMPENSATOR.

NORMAL POSITION.

THE NATIONAL DOUBLE WIRE COMPENSATOR.

(MITCHELL AND STEVENS' PATENT.)

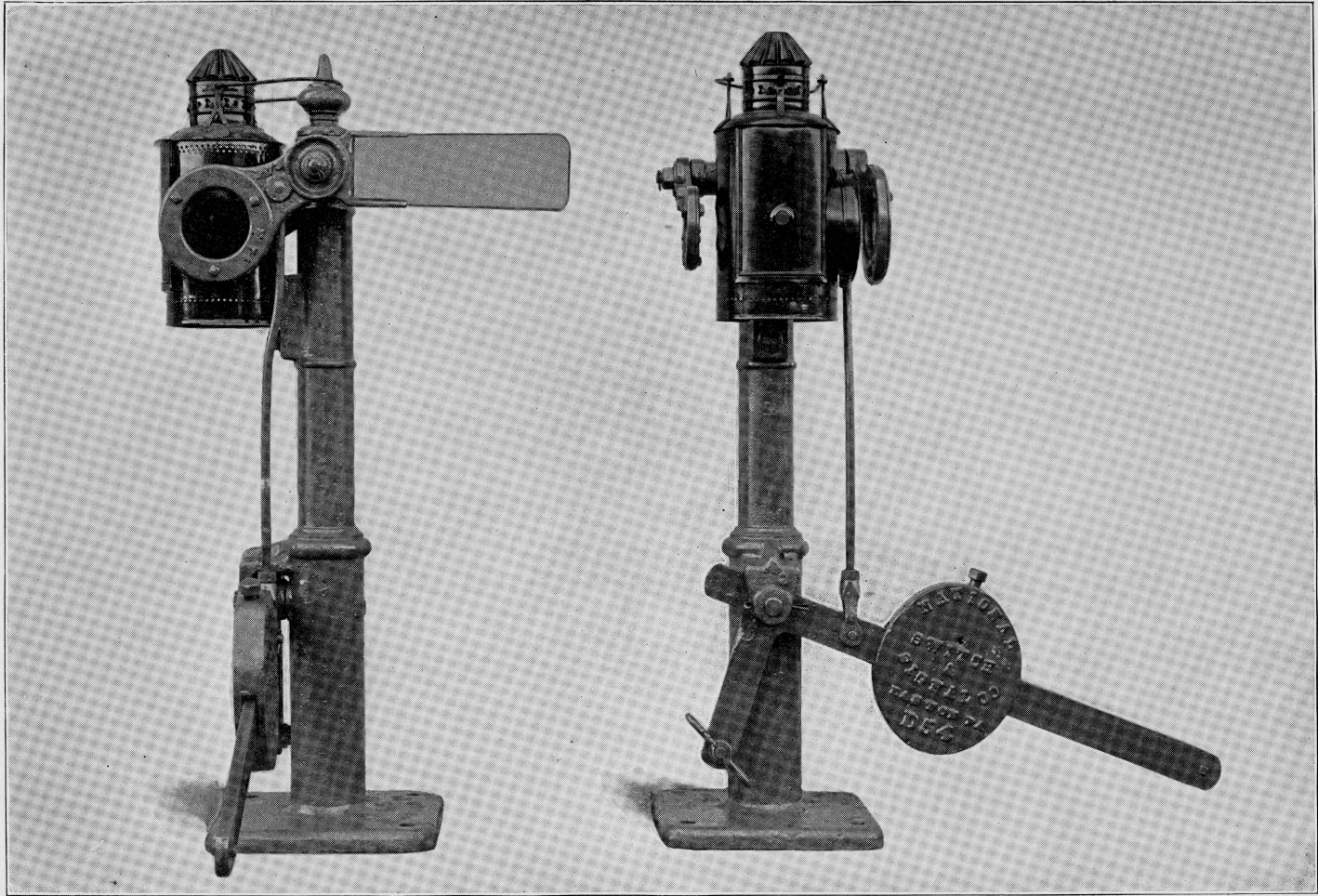


THE NATIONAL DOUBLE-WIRE COMPENSATOR.
REVERSED POSITION.

THE NATIONAL DOUBLE WIRE COMPENSATOR.

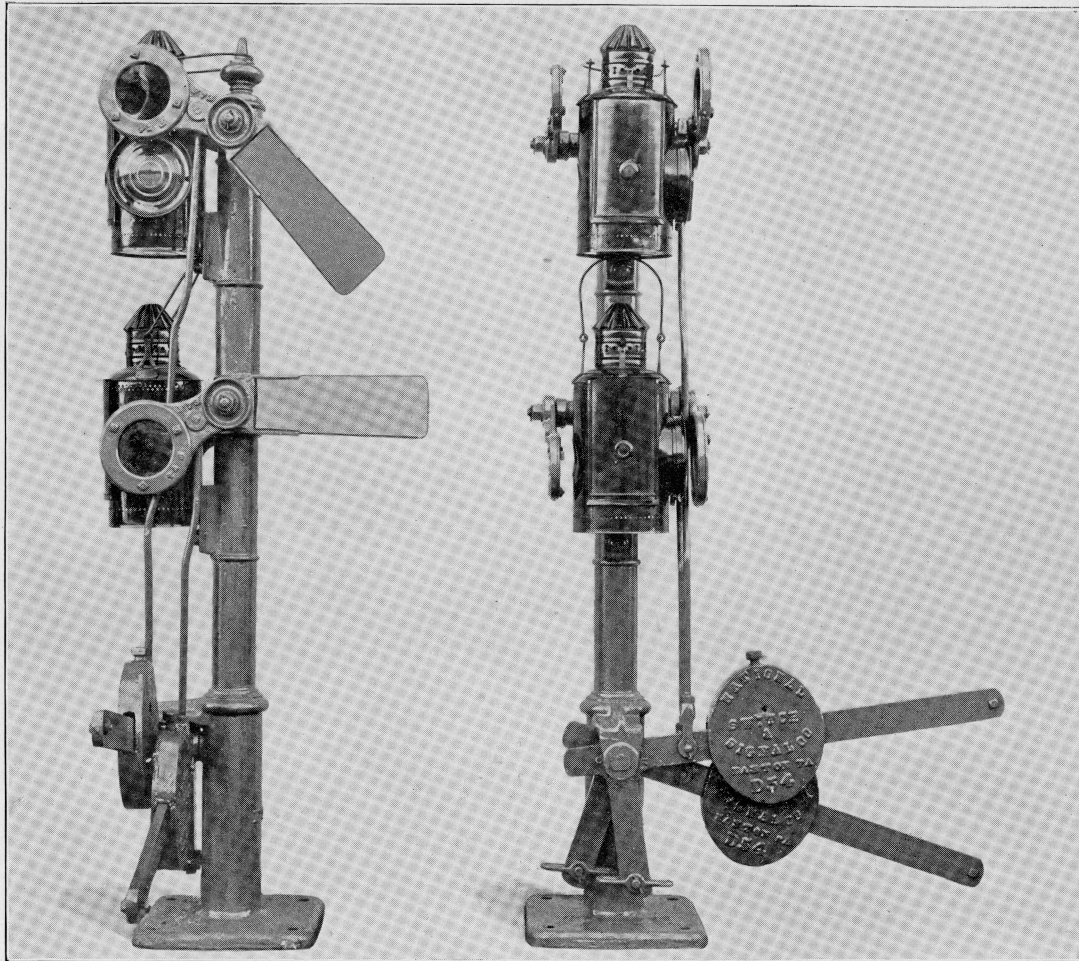
(MITCHELL AND STEVENS' PATENT.)

THE illustration on page 8 shows the National Double Wire Compensator in the normal position, the reversed position being shown on page 10. The need of a perfect wire compensator is manifest, and many attempts have been made to meet this necessity; it has been found, however, very difficult by ordinary methods to compensate even short lines of wire for operating signals, but we claim that this compensator is the only one capable of automatically adjusting any length of wire, to meet the varying conditions of temperature. As the signal is actuated by the parallel movement of the bar, and not by any particular point of contact with the bar, it is apparent that the vertical movement of the entire upper edge of the bar performs the same function relative to the position of the signal, even though it is moved longitudinally in its guide by the expansion or contraction of the signal wires. We make the claim that no other compensator will perform the same service as the "National."



THE NATIONAL ONE-ARM DWARF SIGNAL.

THE NATIONAL DWARF SEMAPHORE SIGNAL.



THE NATIONAL TWO-ARM DWARF SIGNAL.

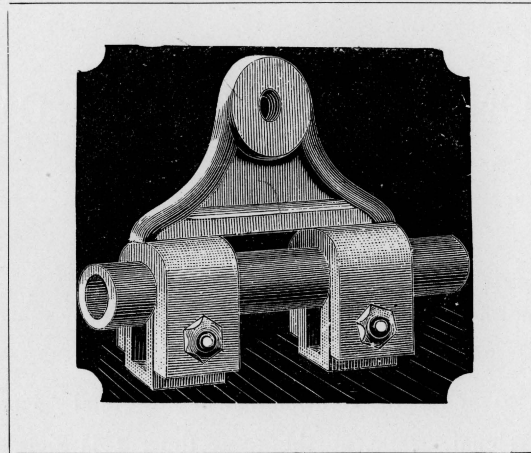
THE NATIONAL ONE AND TWO-ARM DWARF SIGNALS.



AS the Dwarf Signal generally occupies a position between tracks and near the fouling point, it is constantly in danger of being broken.

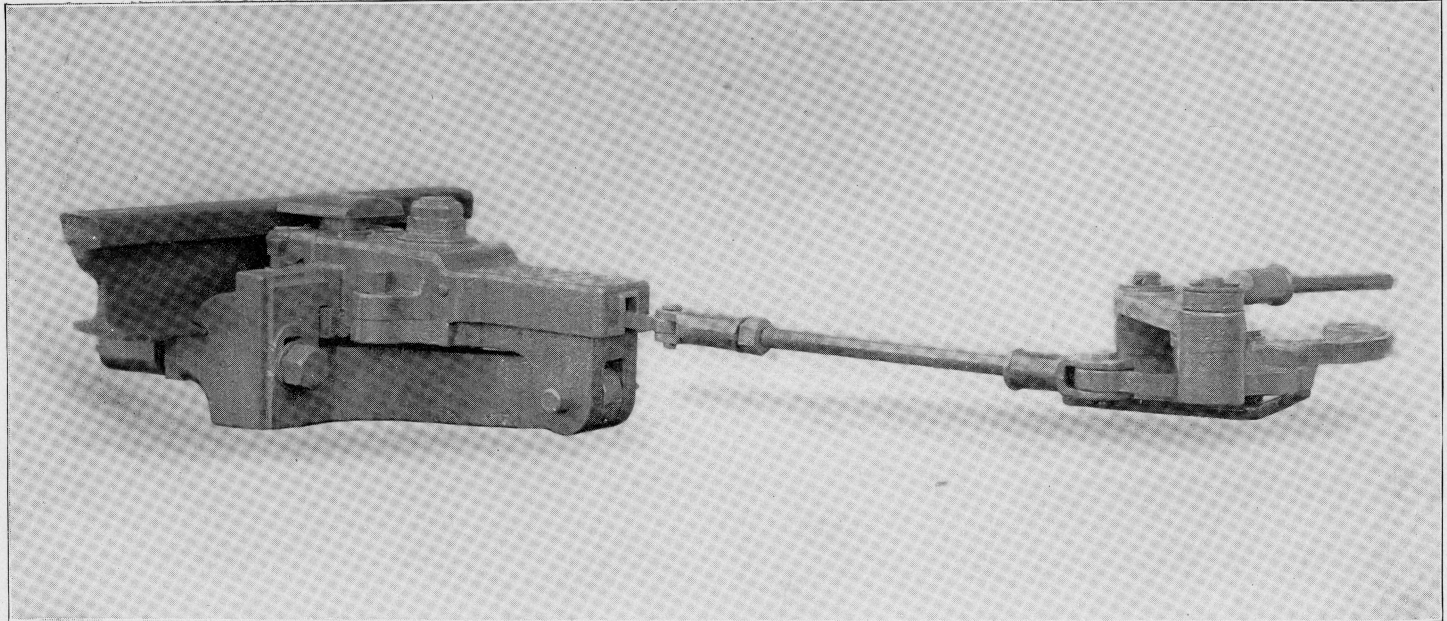
Our experience has led us to adopt the form of signal illustrated on pages 12 and 14. This signal combines all the features of a proper semaphore signal, while, at the same time, it is simple in design and very strong, and can be furnished at a low cost.

THE NATIONAL ADJUSTABLE CLAMP PIPE-LUG.



THIS neat little device has been in use for several years and has proved of great value for making an attachment to a line of pipe or for repairs. No cutting or threading of the pipe is required and it can be immediately applied without the need of accurate measurements, or of disturbing any connections; the simple tightening of the nuts fastens the lug so strongly as to transmit all the strain of which the pipe is capable. Thousands of them have been used and always with entire satisfaction.

THE NATIONAL TORPEDO SIGNAL.



THE NATIONAL TORPEDO SIGNAL.

THE NATIONAL TORPEDO SIGNAL.

SINCE the invention of the semaphore form of signal by Mr. C. H. Gregory, in 1841, and its general adoption as a visual signal, signal engineers and railway officials having in charge the safe conduct of traffic at all times and under all conditions of weather, have sought to perfect an auxiliary signal which shall appeal to the sense of hearing in the same forcible manner as the semaphore signal, in clear and unobstructed vision, appeals to the sense of sight. The general rules and regulations of railways also require the use of the torpedo as an audible signal to be placed on the rail, under certain conditions.

The first practical form of applying the torpedo automatically and to correspond to the position of the signal, was found in the Palmer "Automatic" Torpedo Signal. It was placed on the Elevated railroads in New York City in 1891, and subjected to the most severe test, running from 2,500 to 5,000 movements in 24 hours, and has given entire satisfaction. This Torpedo Signal is now owned by the National Switch and Signal Company, and, with improved appliances for its manufacture, can be furnished at much lower cost than has been possible heretofore.

The illustration on page 18 shows the apparatus in position. It is securely attached to the rail and actuated by the same connection that operates the signal with which it works. The mechanism of the torpedo is so devised that when the signal is put to the danger position, a torpedo is moved forward from the magazine and placed in position where it must be exploded by the first wheel passing it, and when the signal is "cleared," the torpedo is withdrawn from its former position and returned to the magazine. The magazine, when full, contains five torpedoes of powerful detonating composition. The anvil of the torpedo being made of glass, nothing remains of the torpedo after explosion except the two thin plates forming the case, which are automatically ejected from the chamber.

The Torpedo Signal, equipped with a definite number of torpedoes, stands as a monitor to warn the engineman that, should his engine pass the signal when it is set against him, the act will be known by the absence of a torpedo from the magazine. Thus we not only furnish an auxiliary signal to aid the engineman in foggy and stormy weather, but we also give him the assurance that any negligence on his part to observe the signal will be recorded.

We refer to the railroads using this signal for a record of its efficiency, among which we mention the following:

Manhattan Elevated Railway.

Lehigh Valley Railroad.

Staten Island Rapid Transit Railroad.

Chicago, Rock Island and Pacific Railroad.

Burlington and Missouri River Railroad.

Philadelphia and Reading Railroad.

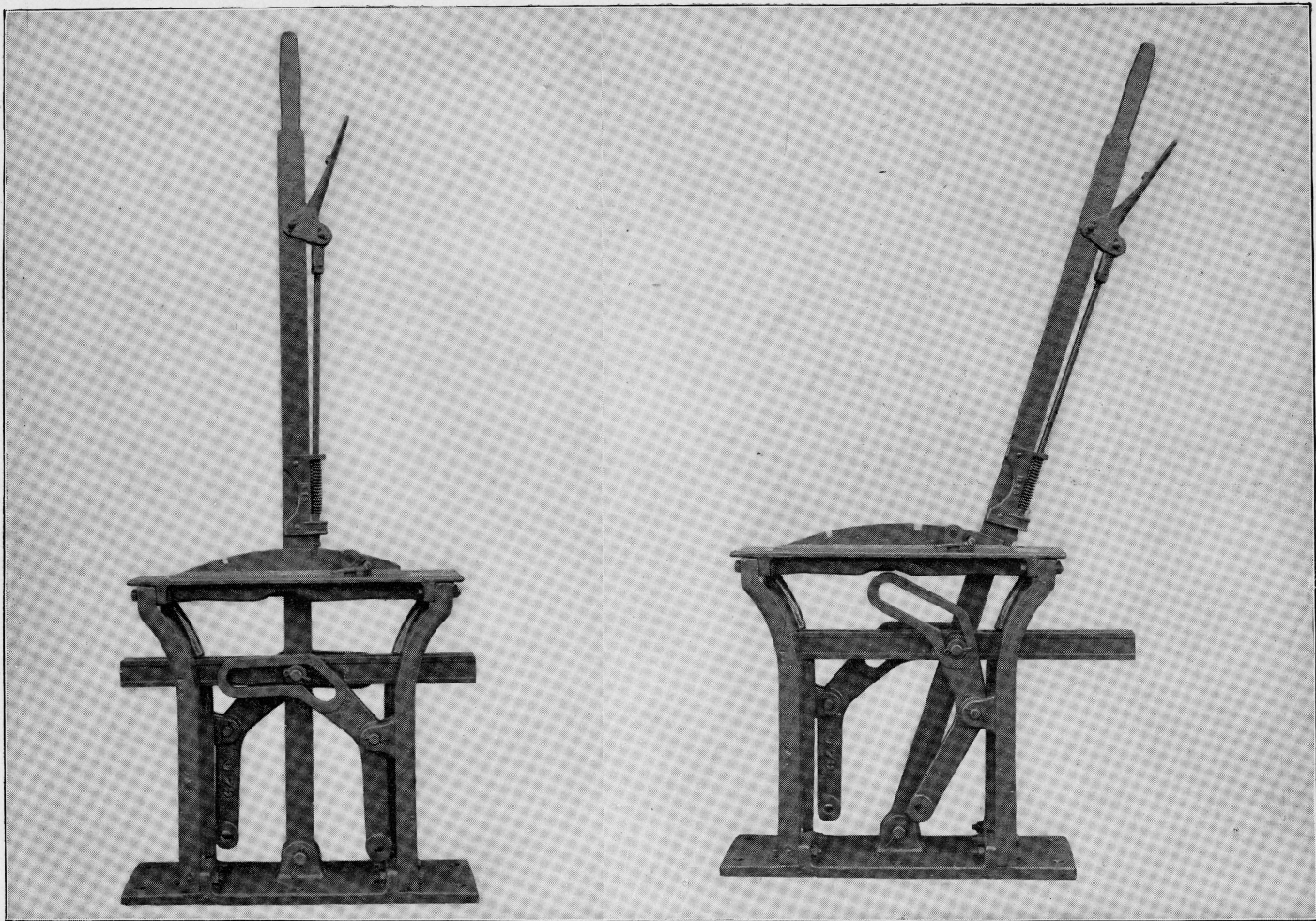
Savannah, Florida and Western Railroad.

The Fourth Avenue Tunnel of the New York Central Railroad near Grand Central Station, New York City, is entirely equipped with this signal.



NATIONAL COMBINED SWITCH AND SIGNAL STAND.

(RAUB PATENT.)



CENTRE POSITION.
SIGNAL DANGER, SWITCH CLOSED.

NORMAL POSITION.
SIGNAL CLEAR, SWITCH CLOSED.

THE NATIONAL COMBINED SWITCH AND SIGNAL STAND.

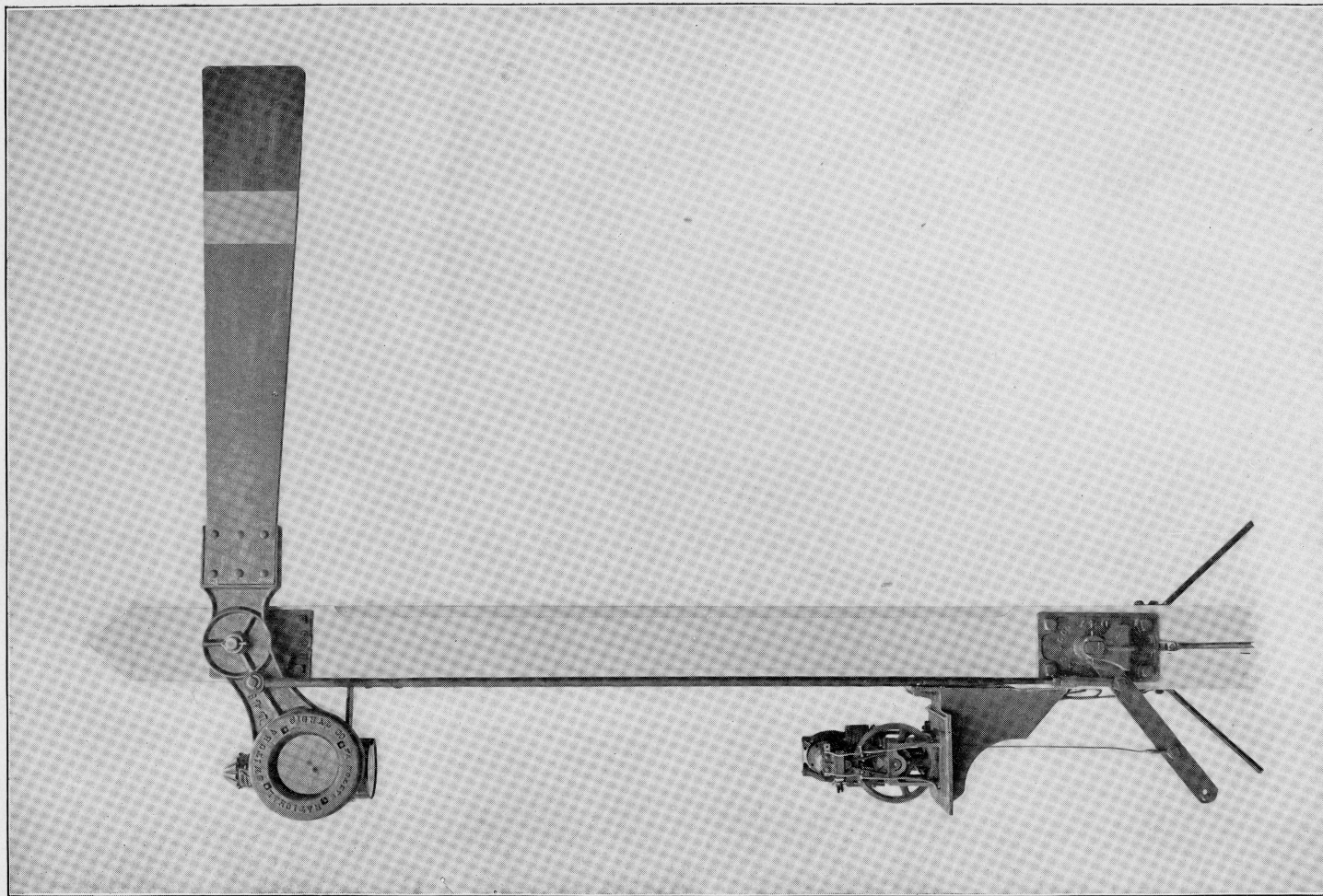
THE NATIONAL COMBINED SWITCH AND SIGNAL STAND.

(RAUB PATENT.)



THE illustration on page 22 shows this stand in the normal position. For example: We will suppose one crank attached to a signal located one or two thousand feet in advance of an outlying switch, and the second crank coupled to the switch points, set for main track and signal clear. It is desired to reverse the switch to let engine out on to main track, and it is also desired to warn an approaching train that the track is occupied. The first half of the lever stroke puts the signal at danger; completing the stroke opens the switch. The reverse movement closes the switch first; then returns the signal to "clear."

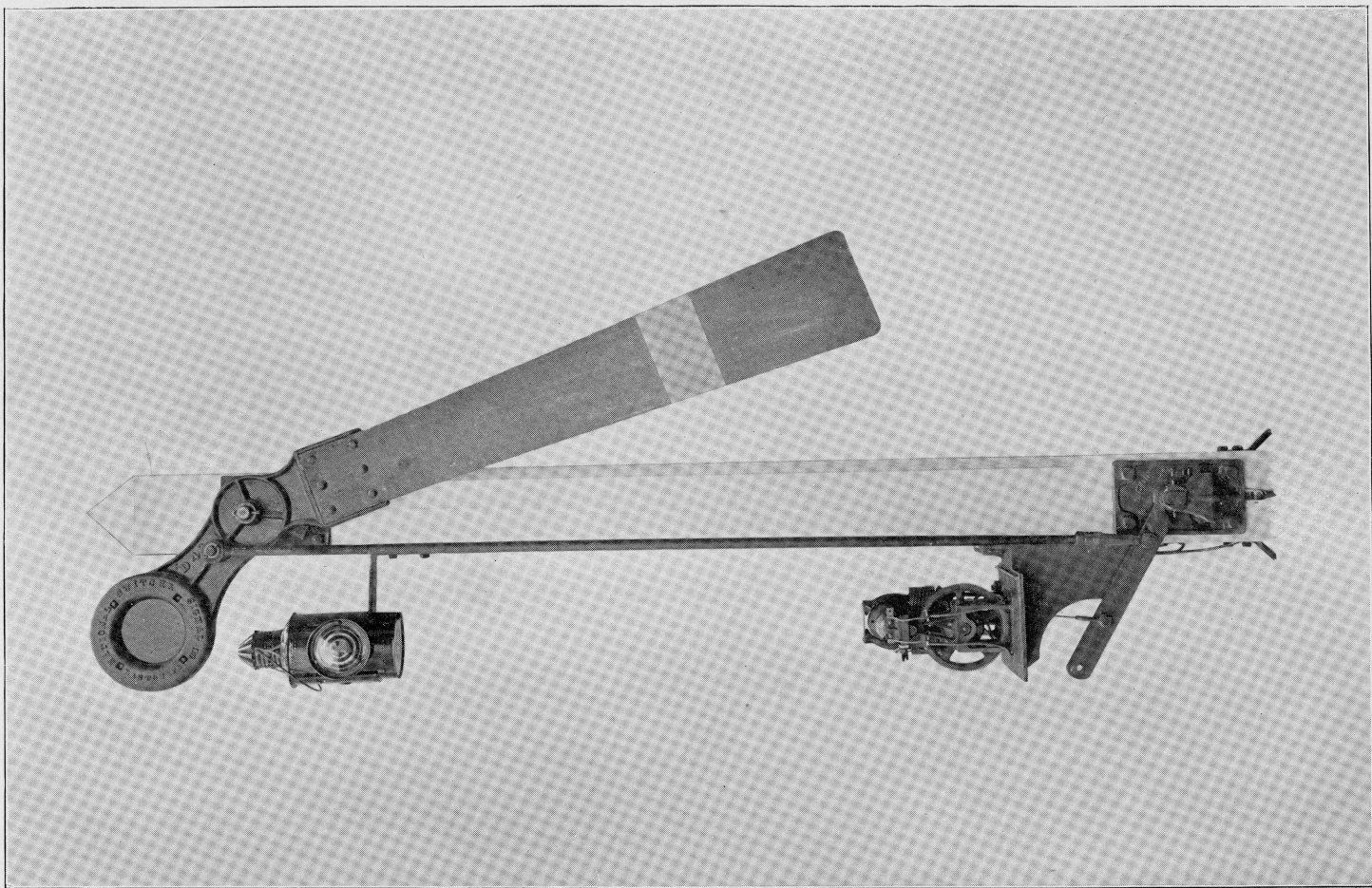
This stand costs no more than any regular first-class switch stand, and performs the double office of a switch and signal movement.



THE NATIONAL AUTOMATIC SEMAPHORE.
NORMAL POSITION

THE NATIONAL AUTOMATIC BLOCK-SIGNAL.

(LATTIG PATENT.)



THE NATIONAL AUTOMATIC SEMAPHORE.
SAFETY POSITION.

THE NATIONAL AUTOMATIC BLOCK SIGNAL.

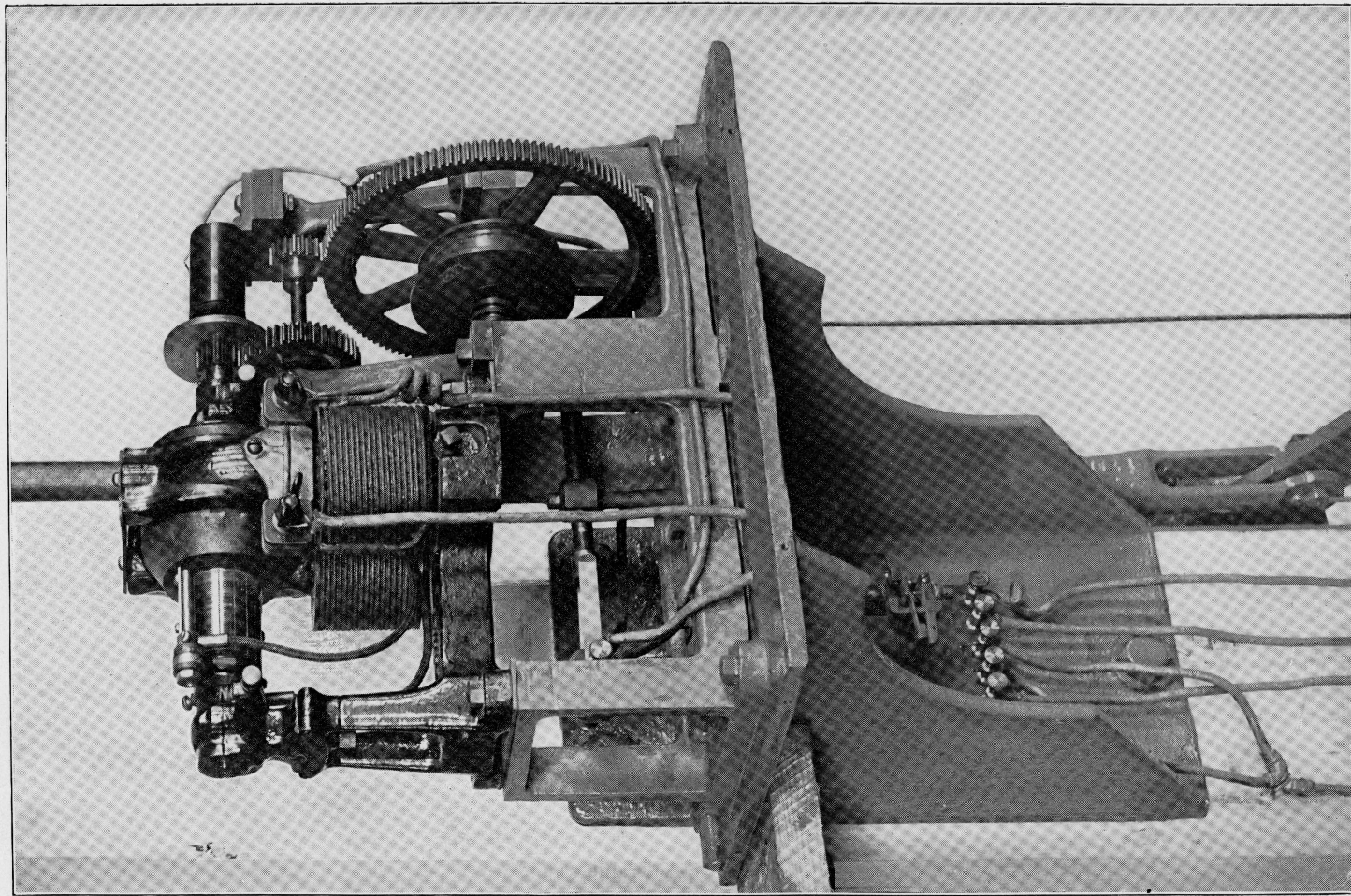
(LATTIG PATENT.)

THE introduction of the semaphore blade or arm undoubtedly marks the first important step in the development of a consistent system of visual signals. Its great advantages were soon recognized, so that for interlocking work no other kind of signal has been found that will satisfy all the conditions of such practice. Many years of experience have demonstrated the correctness of the principle upon which its indications depend, viz.: that *position* signals are in every way safer than mere *color* signals. It may, therefore, be called the universal railway signal, whose indications are substantially the same the world over.

The desirability of applying the semaphore principle to automatic signals is very widely admitted, even by railroad officers who have used other forms of such signals. Until quite recently, however, an automatic semaphore signal has not been devised that is reasonably cheap, both in first cost and in maintenance, nor has there been suggested, up to this time, any method of economically applying the requisite power for its operation.

After much experiment, the National Switch and Signal Company has brought out what is known as the Lattig Automatic Electric Semaphore for block signalling and other purposes. It has been thoroughly tested under all conditions of wind and weather with unfailing success. In offering this system to the railroad public, we call attention to the fact that we are the only company which undertakes to install an automatic block-signal system, using standard semaphore blades and castings, operated upon the "NORMAL DANGER" principle, and without the necessity of using expensive power plants. The signal is worked by a simple electric-motor mechanism, the current being derived from a battery placed in a well, conveniently near the signal, consisting of cells specially designed by us, and capable of generating very high electro-motive force.

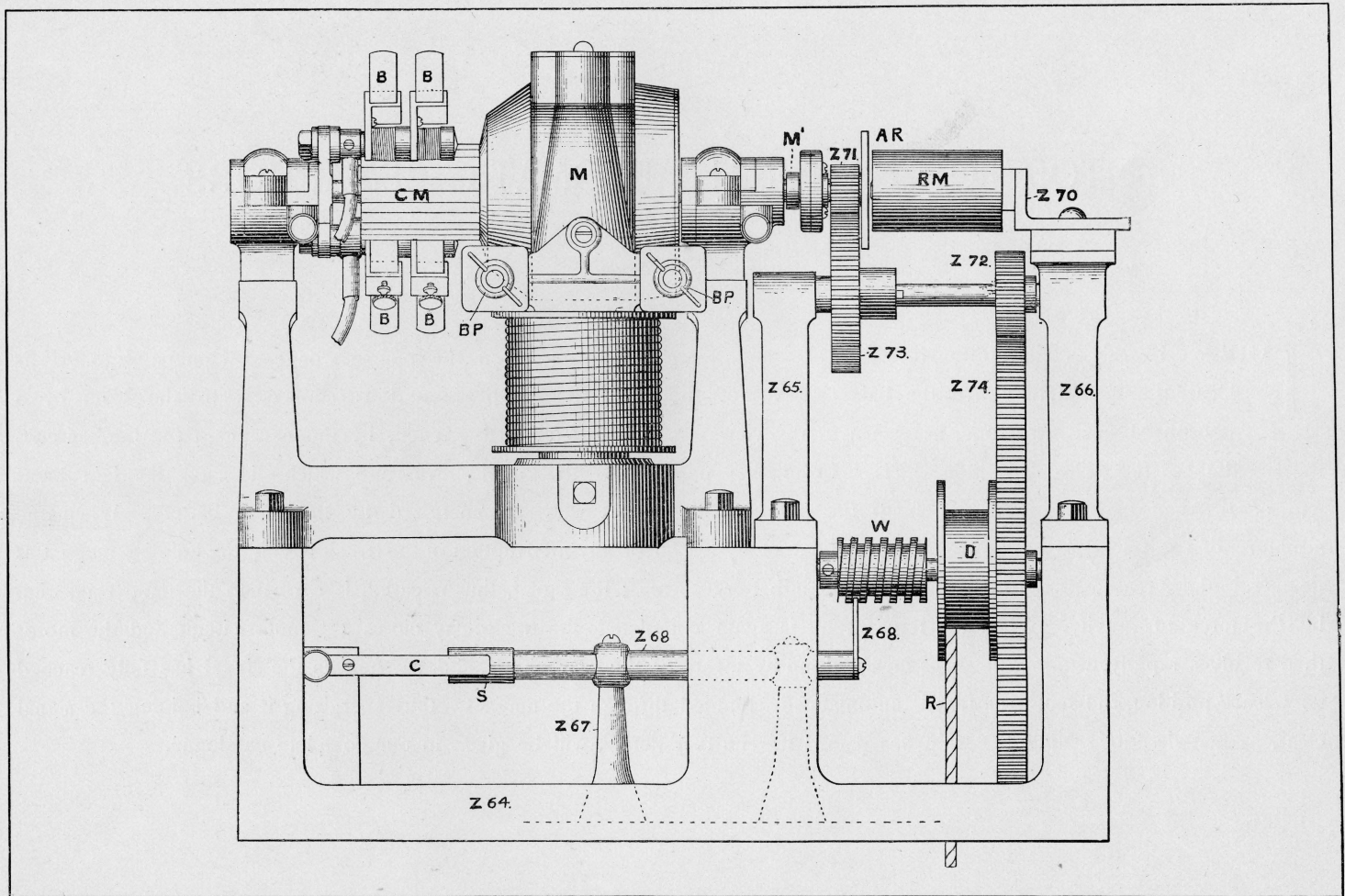
The ordinary track-circuit is used, with low-tension gravity battery, which, by the usual track-relay, completes the circuit of the local battery so as to give at the proper distance a clear signal to the approaching train, provided the block ahead is clear, while the signal returns immediately to the danger position as soon as the train enters the block it governs, and remains in the *normal danger* position, nor can it be "cleared" by the next train until the preceding train has passed entirely out of the block ahead. As with this system of installation, we work the batteries on the "open circuit" principle, for operating both the track-circuit and the signal, we are able to obtain the greatest possible economy in maintenance. We can, of course, install this system on the closed-circuit principle, with the signal standing normally in the safety position, but we recommend the other method, as above described, as far preferable, since it conforms to what is now recognized as the fundamentally correct principle of all modern railway signalling.



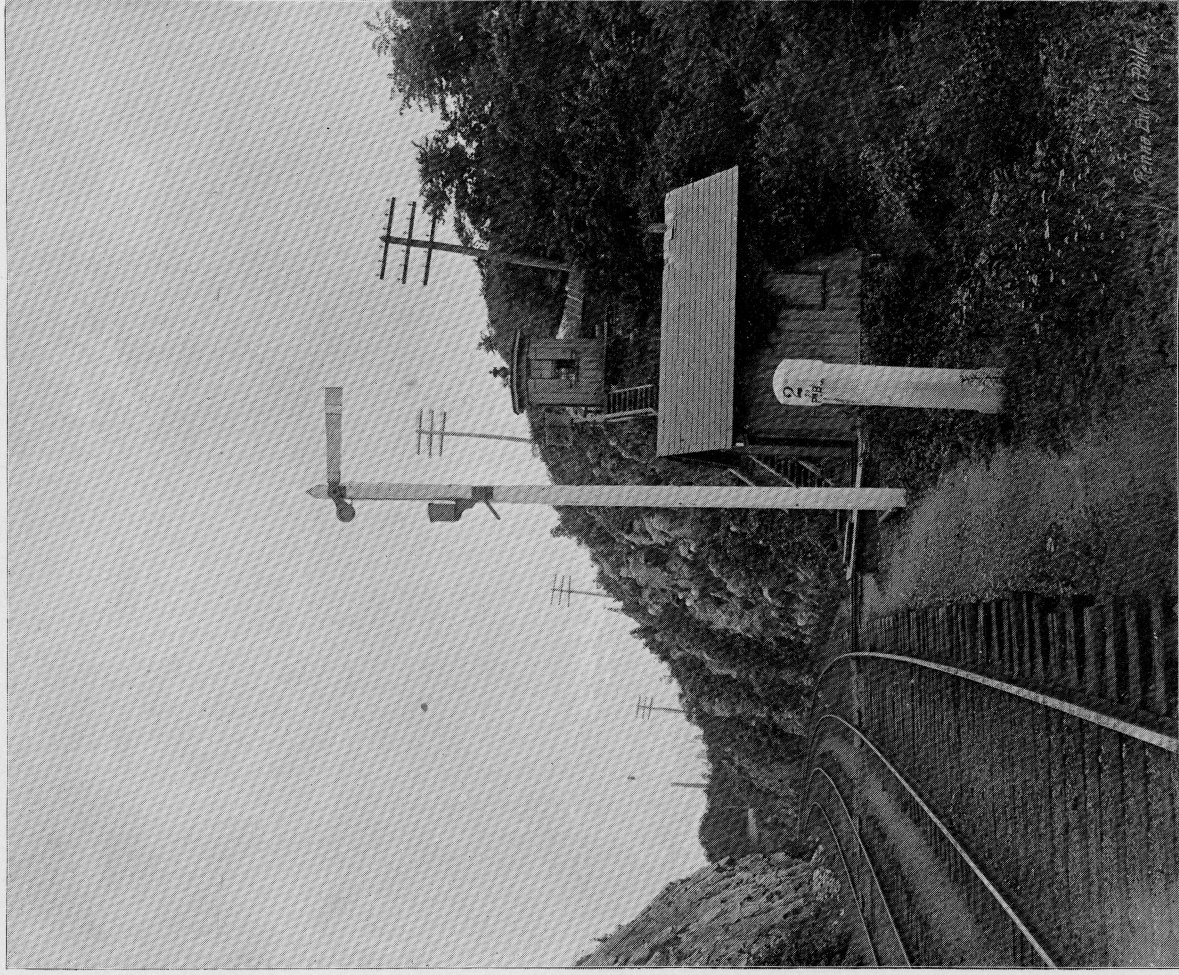
MOTOR FOR NATIONAL AUTOMATIC SEMAPHORE.

MOTOR FOR NATIONAL AUTOMATIC SEMAPHORE.

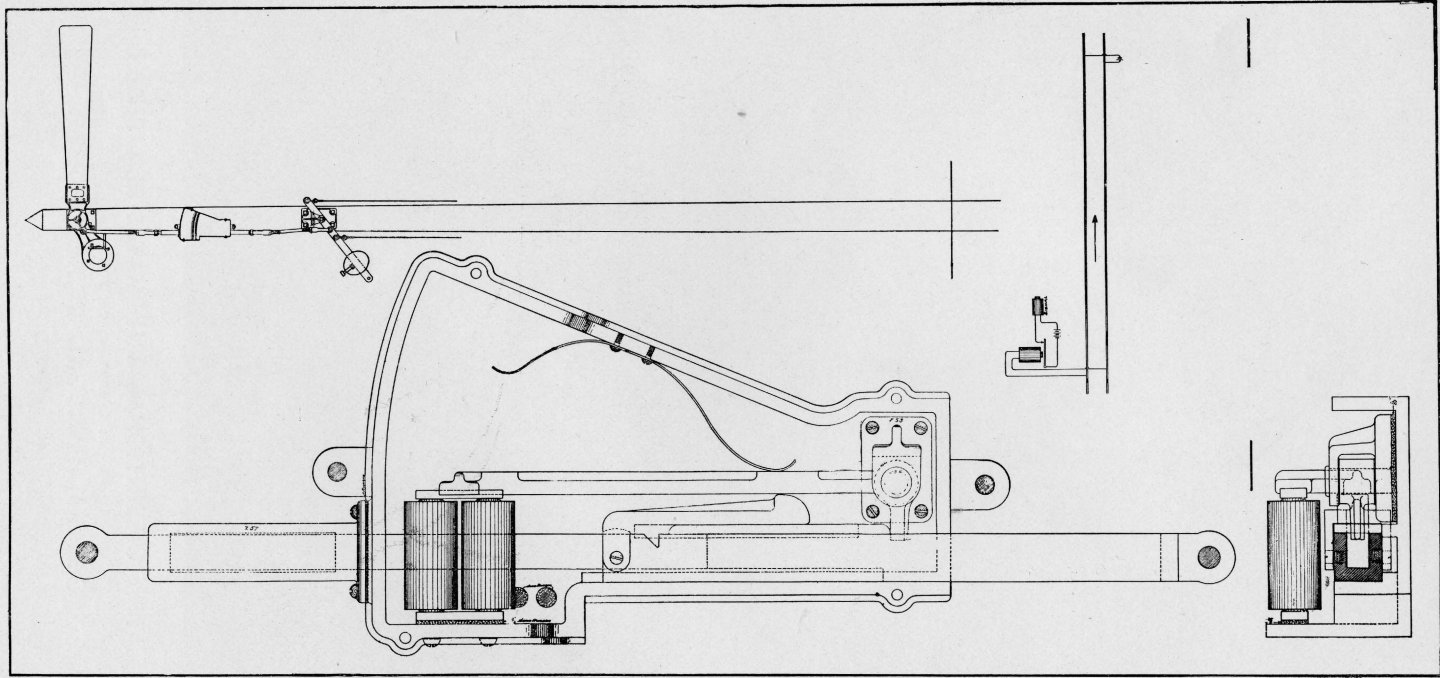
THE mechanism of the National Automatic Block Signal is illustrated on the opposite page and on page 30. It is located immediately above the balance lever of the standard semaphore and is connected to the lever by a phosphor-bronze wire rope, as shown in the views on pages 26 and 28. When, by the closing of the track-circuit, the signal takes the "clear" position, it is held in that position by the circular armature which slides on the right hand end of the motor-shaft, and is drawn to the pole of the magnet which is energized by the main battery. When the armature of the track-relay falls from its front contact by reason of any interruption in the track-circuit, the holding magnet is de-energized by reason of the breaking of the main-battery current; the signal, thus released, is carried to the danger position by the force of gravity. When the track-circuit is again completed, the track-relay closes the motor-circuit and the motor then revolves rapidly, winding the rope on the drum by means of the gear-wheels, and, as soon as the signal has fully reached its "clear" position, the motor current is automatically shunted through the magnet—thus energizing it and holding the signal clear, as first described, until the train has passed it. Further details will be given in our complete catalogue.



DETAILS OF ELECTRIC MOTOR FOR NATIONAL AUTOMATIC SEMAPHORE.

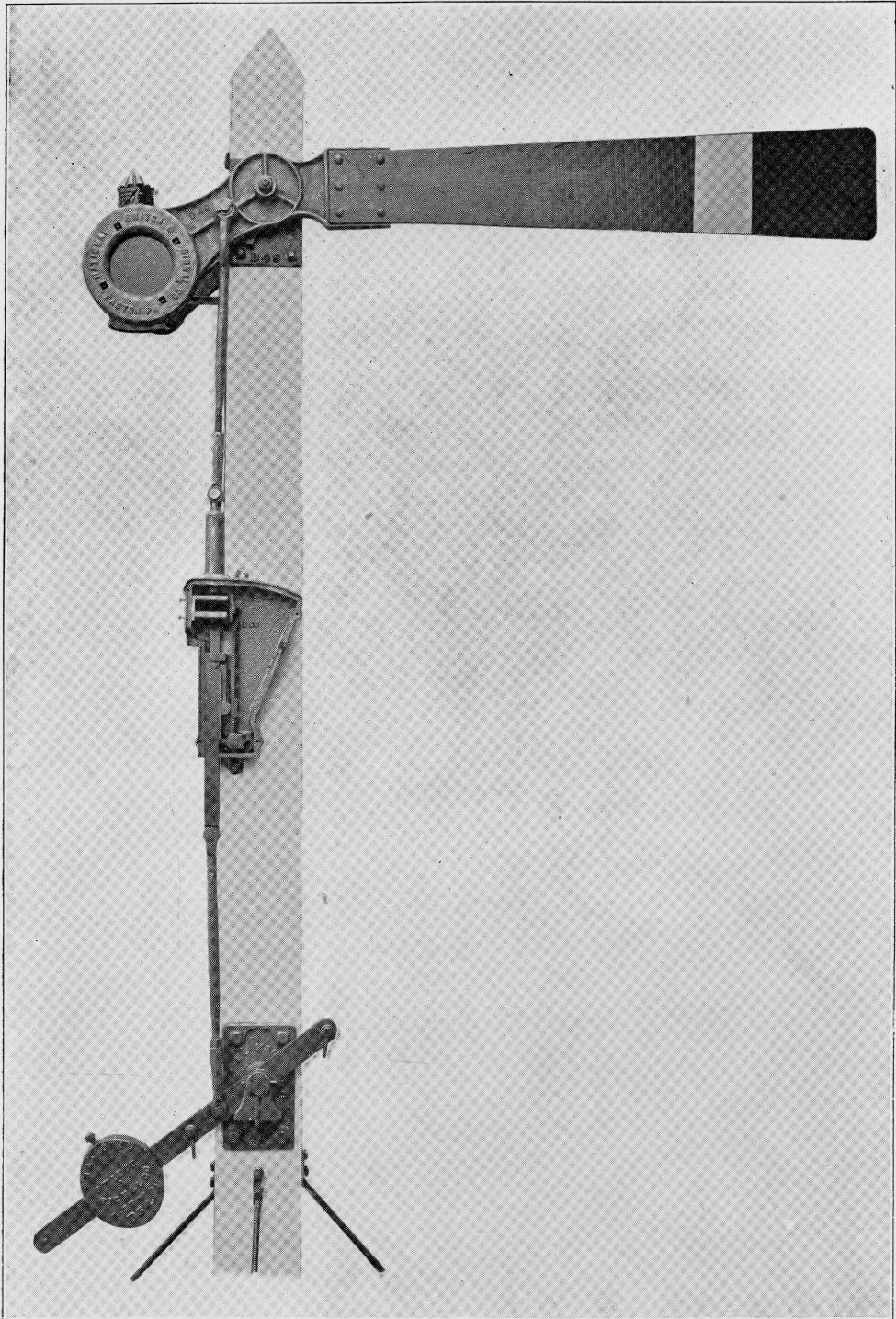


VIEW OF NATIONAL AUTOMATIC SEMAPHORE
IN OPERATION ON THE
CENTRAL RAILROAD OF NEW JERSEY.



NATIONAL CONTROLLED MANUAL SYSTEM.

THE
NATIONAL CONTROLLED MANUAL SIGNAL SYSTEM.



34

THE NATIONAL ELECTRIC SLOT.
CONTROLLED MANUAL SYSTEM. NORMAL "DANGER" POSITION.

THE NATIONAL CONTROLLED MANUAL BLOCK SIGNAL SYSTEMS.

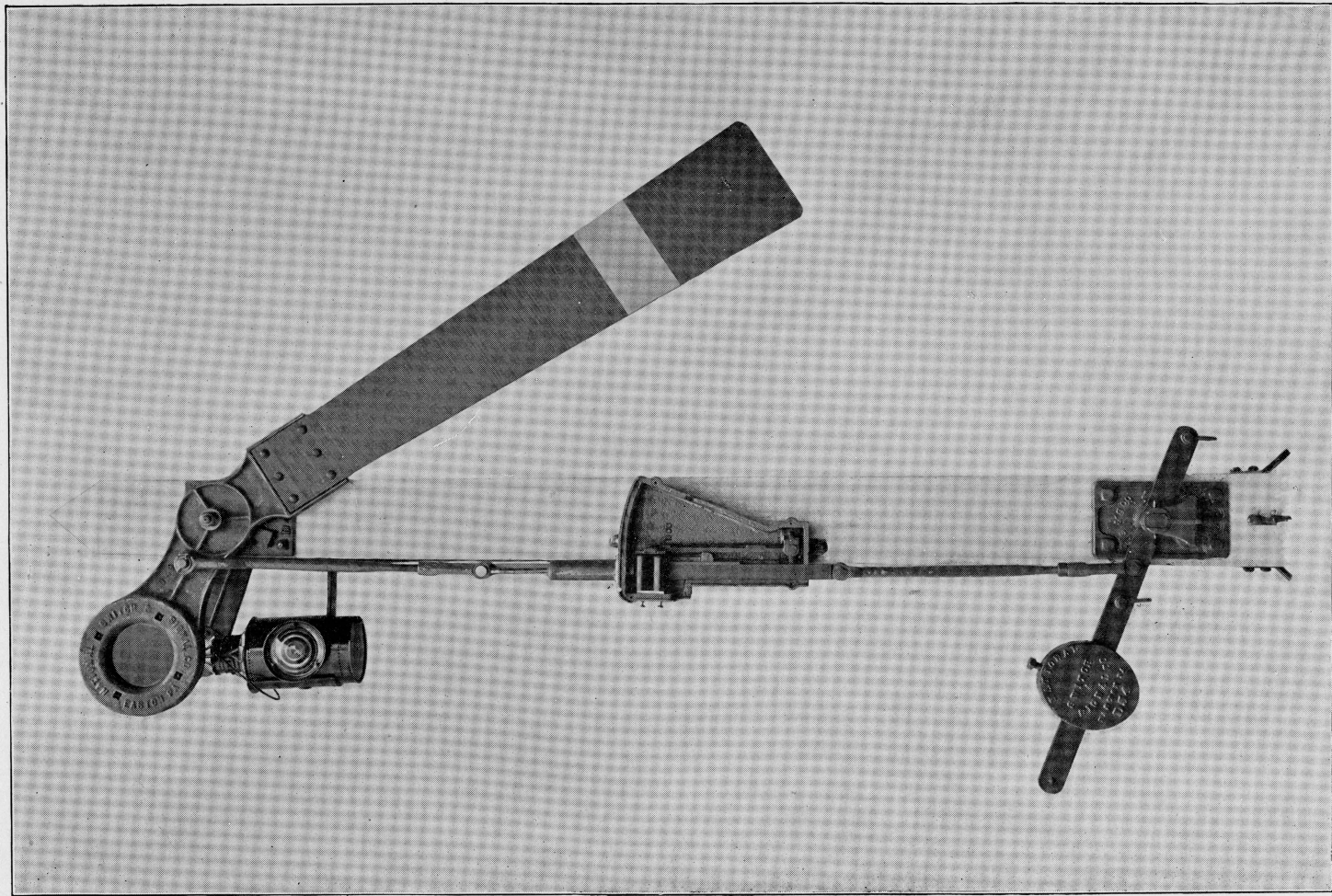
THE Committee on Interlocking and Block Signalling of the American Railway Association has defined a Controlled Manual Block Signal System as follows:—

“A Controlled Manual Block Signal System is one which is operated manually, but by its construction prevents the display of a ‘clear’ signal while the block is occupied by the train.”

The National Switch and Signal Company has three methods of installing a controlled manual system, of which we illustrate only the simplest form, necessarily reserving for our full catalogue (now in preparation) a description of our other systems, in which we use either a plunging instrument of an approved and simple design, overcoming several difficulties now found with the Sykes and similar apparatus, and presenting novel features for indicating the position of the train; or we employ, in addition to the indicators, the correct principle of a continuous track-circuit, by which not only is the position of the train or any part thereof, should it break in two, at once known at the tower in advance, but also there is a complete control of the instruments by which the signals at any tower are manually operated.

The form of the controlled manual system which we here show is a thoroughly reliable application of the electrical slot principle, the action of which by our apparatus, as illustrated on page 32, is positive and certain. The track circuit operating this mechanism may be applied to any portion of the block, although we recommend for full protection that the entire block be thus wired. So long as the track-circuit remains unbroken, the magnets continue to be energized and the lifting-rod is continuous; but as soon as any interruption occurs in the circuit, by reason of the train being in the block or of any metallic obstruction upon the rails, the magnets are de-energized, the continuity of the lifting-rod is broken and the signal goes at once to “danger,” nor is it possible for the signalman to give another clear signal until the train or obstruction is out of the block, which fulfills the definition of the Committee given above.

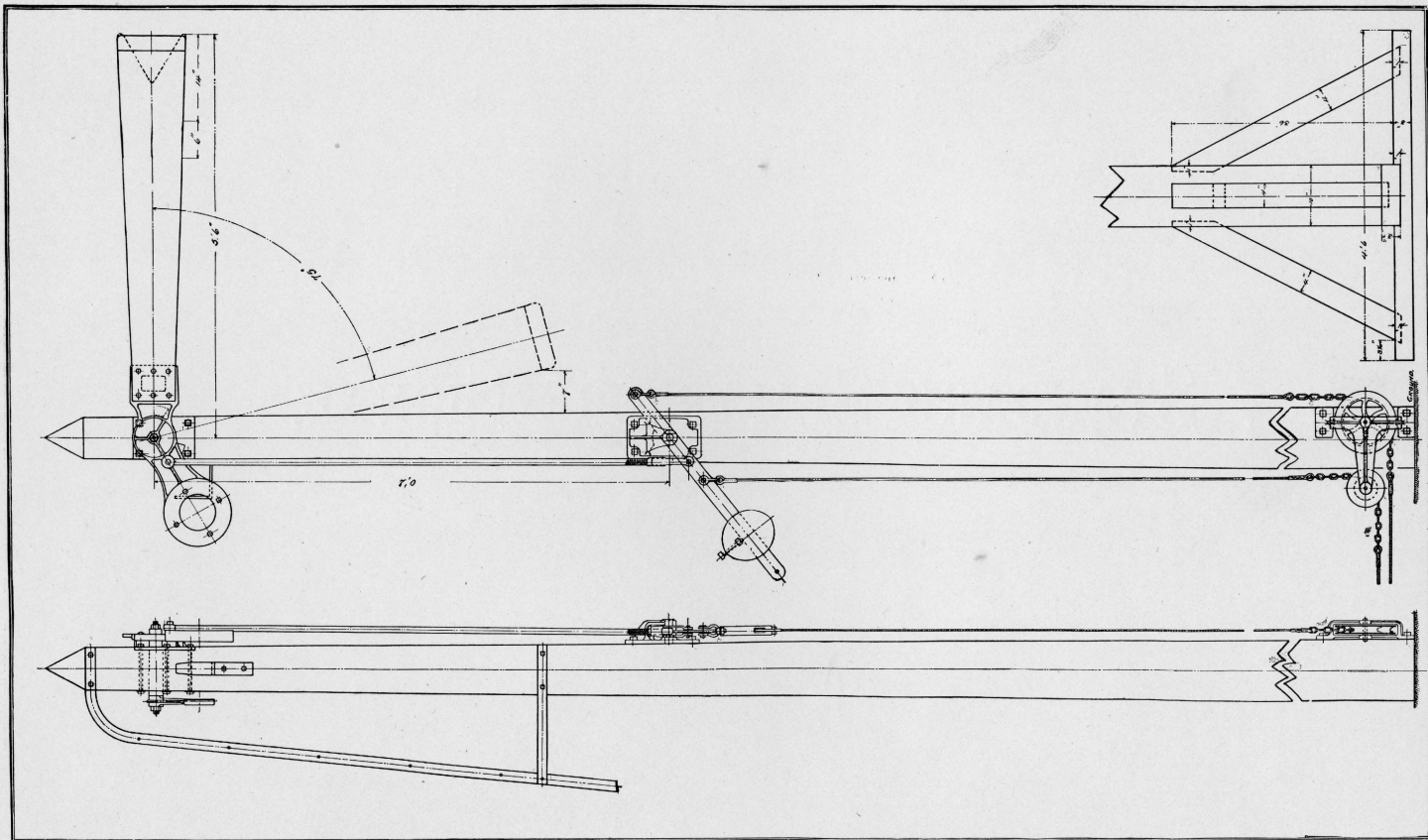
We claim for this controlling device unailing action due to the strength and simplicity of its construction, and the smallest possible number of working parts. The shock which would be caused by the sudden return of the signal, is overcome by cushioning the connecting-rod in a small air-chamber—a device which we apply to all our automatic semaphore signals.



THE NATIONAL ELECTRIC SLOT.

CONTROLLED MANUAL SYSTEM. TRACK-CIRCUIT UNBROKEN, AND SIGNAL "CLEAR."

STANDARD SEMAPHORE SIGNAL.



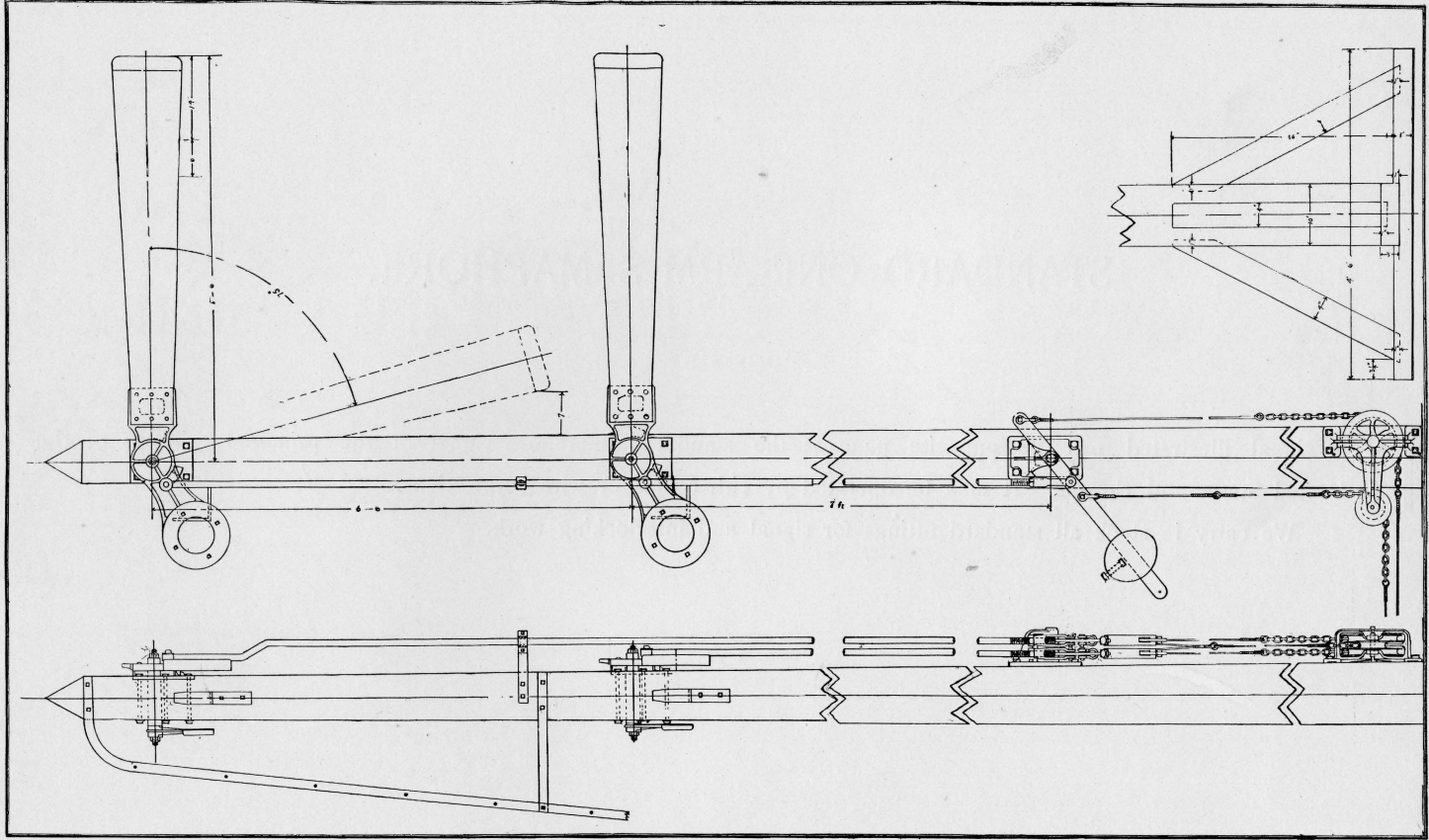
STANDARD ONE-ARM SEMAPHORE.

STANDARD ONE-ARM SEMAPHORE.



THE signal illustrated on the opposite page is the standard semaphore signal of the principal railways of the United States and Europe. It may be operated by either pipe or wire connections.

We carry in stock all standard fittings for signal and interlocking work.

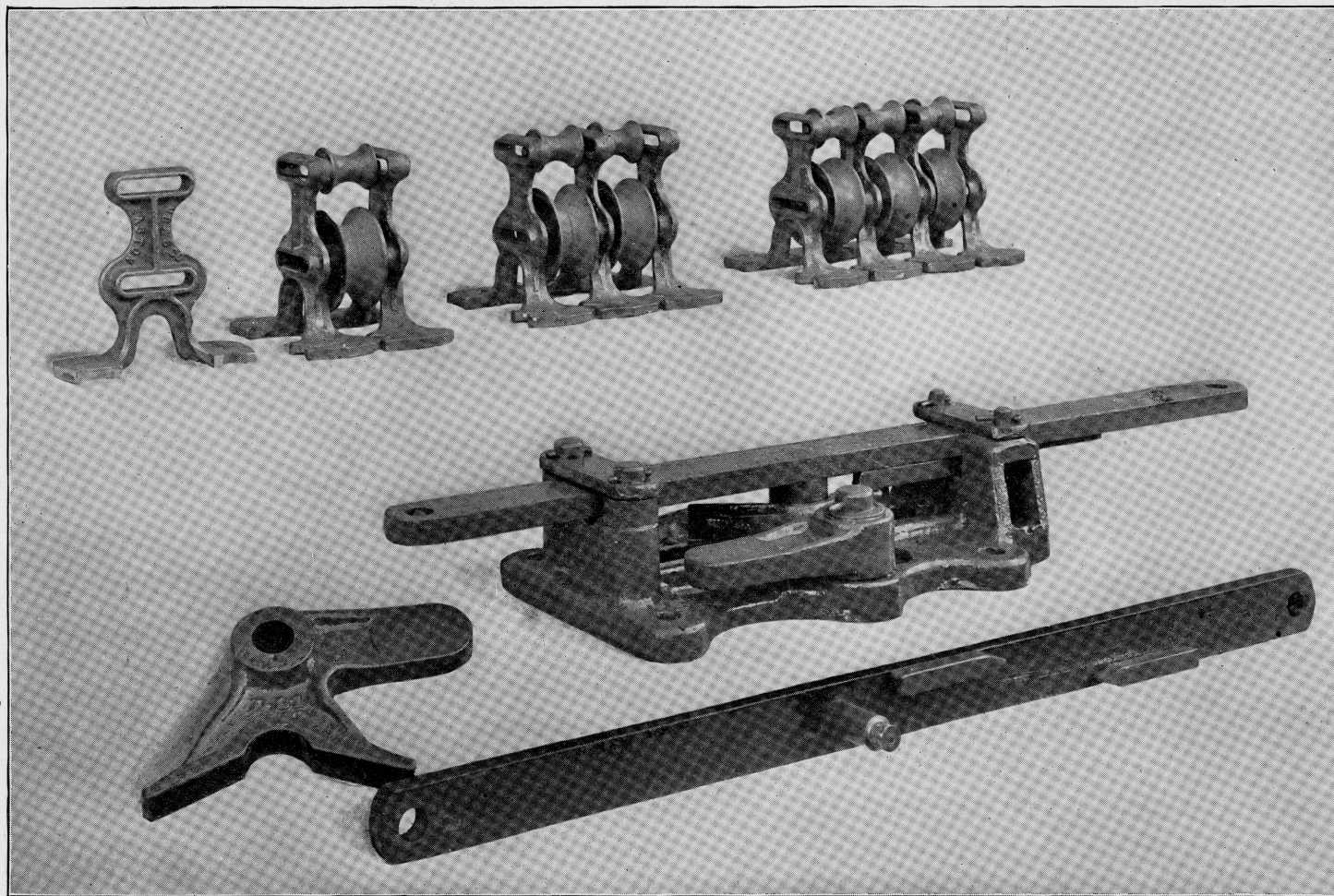


STANDARD TWO-ARM SEMAPHORE.

THE NATIONAL ANTI-FRICTION PIPE CARRIERS

AND

LOCK AND SWITCH MOVEMENT.



NATIONAL ANTI-FRICTION PIPE-CARRIERS AND LOCK AND SWITCH MOVEMENT.

NATIONAL ANTI-FRICTION PIPE CARRIERS.

(EVANS' PATENT.)

THE Anti-Friction Pipe Carriers illustrated on page 42 are manufactured exclusively by this Company. The special claims made for this pipe-carrier are: first, that a perfect anti-friction movement is accomplished by top and bottom rollers moving horizontally; second, that, because of the design, they can be nested to carry as many pipes as desired. With this style of carrier we avoid the necessity of carrying a stock of certain styles to meet special conditions, such as one-way, five-way, fifteen-way, etc. Our patrons may order any number of stands and rollers, without regard to the particular place or number of pipes to be carried, and may assemble them to meet conditions required.

This carrier was designed by a well-known signal engineer of London, to meet the conditions as described above, and has been adopted as a standard in England. This result is most gratifying, and we recommend it in preference to the ordinary single anti-friction wheel, which we furnish, if desired.

NATIONAL LOCK AND SWITCH MOVEMENT.

THE Lock and Switch Movement illustrated on page 42 has the merit of having but few parts, all of which are plainly seen. The design is so simple as to avoid any difficulty in assembling the parts; the movement is anti-frictional; the whole device is complete and perfect; and, in every way, it fulfills all the functions of its office.

ADDITIONAL DEVICES.

THE urgent requests for our forthcoming illustrated catalogue, compel us to issue the foregoing simply as advance sheets, the necessarily limited time at our disposal forbidding a more complete presentation of our devices, of which the following, in addition to those illustrated, are briefly mentioned.

THE NATIONAL LOCK AND BLOCK SYSTEM CONTROLLED BY TRAIN. This system, which has been tested on an important line of road for several months, we have now perfected, and believe it to be one that satisfies the definition of a controlled manual block signal system, adopted by the American Railway Association as given on page 35. A complete track-circuit is used, because in no other way can the conditions be fulfilled. We find no trouble in installing a continuous track-circuit so as to ensure perfect efficiency and reasonable cost of maintenance under all conditions; we have used it successfully on cinder-ballasted road and even with track under water,—in fact, there are no difficulties which skill and good workmanship cannot overcome. In our system of train control, we render it impossible for the signalman in any tower to “clear” a block signal, if a train, or any part of a train, is in the block ahead. A series of indicators in each tower locates a train, or any part of it, within one or more of the several sections into which the block is subdivided. The indicators are arranged in the form of miniature semaphores, normally at “danger,” the successive indications of which show the progress of the train and the position of the signals. We provide that, when a “clear” signal is given at any tower, the lever movement automatically and electrically locks the tower in the rear, but it is impossible for the tower in advance to give any “clear” signal until the train received in the rear section has passed said tower. The train thus performs the operation known as “plunging,” after which and until the train has fully cleared the block ahead, no “clear” signal can possibly be given by the rear tower-man without actually destroying the mechanism of control.

NATIONAL LIGHT INDICATOR. This is a beautiful application of the expansion of mercury under heat operating an electrical indicator, both visual and audible. An inverted glass syphon or 'U' shaped tube, is placed directly over the flame of the lamp, which causes the mercury to ascend in capillary tubes in such a way as to make a perfect electrical contact, which, when the light is out, is broken, thus giving within a few seconds an indication of the fact to the tower-man, causing a bell to ring and the indicator to show the word "out." A peculiar merit of this device is that the indication, not being dependent upon the slow cooling of an expanded metal, but upon the rapid fall of mercury in a fine tube, is conveyed almost immediately to the tower.

SIGNAL TRIPPING DEVICE OR MECHANICAL SLOT. It has long been considered of first importance that a signal which has been "cleared" for a train should, beyond the possibility of failure, return to its normal danger position as soon as the train has passed it, and that this should be effected regardless of any action or possible neglect on the part of the signalman. Although we accomplish this very perfectly by electrical means, where a track circuit is used, there are many places where it is better and simpler to employ the mechanical method. Being fully in accord with the recommendations of the Committee on Safety Appliances of the American Railway Association, that a device should be used which will automatically and in due course restore the signal to "danger", we are able to furnish an apparatus which can be easily applied to any semaphore signal and which consists of a positive mechanical movement of the simplest and strongest character, requiring no intervention of springs and having no part likely to break or become disarranged. It is very simply operated by a cam movement, actuated by the motion of the bell-crank at the end of the connecting pipe from the tower, but without in any way interfering with the working of the same. The apparatus possesses the additional merit of presenting the least possible resistance to the wheel of a train, and furthermore, but a single depression of the track-cam is necessary to operate it.

THE KOYL PARABOLIC SEMAPHORE. The discussion which is now engaging the earnest attention of the railroads of this country as to the proper indications for night signalling, demonstrates the great difficulty which is experienced in adapting any scheme of mere color signals to American practice. If, as has been suggested, green be substituted for the white light indicating "safety," the chief difficulty is to find a sufficiently distinctive color for the caution signal which forms

so distinguishing a feature of American practice as compared with European. We meet this difficulty when we suggest the parabolic illuminated blade, which enables a *position* signal to be as clearly displayed by night as by day, whatever colors may be selected for the different indications; in fact, the present standard code of night signals may be retained with great advantage, using red or green for "danger" or "caution" and white for the clear signal; and if the principle of normal danger be adopted for all classes of fixed signals (and there are indications that this is not far distant), then, as the engineman will in nearly all cases see the change of position accompanied by change of color, we shall secure by night all the advantages which the semaphore position signal gives by day, with the striking addition of a change of color signification at each movement.

Where this signal has been properly installed and cared for, it has not failed to give satisfaction. With improvements now under way for increasing its efficiency, we commend it to the careful consideration of railroad managers who desire to see the vexed problem of night signalling solved by methods which shall be consistent with the long established and well-tried principles of giving signal indications invariably by form or position, rather than by color only.



