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Bulletin No. 7

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Pneumatic
Signal
Co.

ROCHESTER

NEW YORK

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GENERAL RAILWAY SIGNAL COMPANY.

PRINCIPAL OFFICE.
BUFFALO, NEW YORK.
U.S.A.

Cable Address: "TAYSIG"
WESTERN UNION CODE

February 20th, 1905.

Mr. Geo. S. Godard,
State Librarian, Connecticut State Library,
Hartford, Conn.

Dear Sir:-

Replying to your favor of the 15th inst:

We regret that we are unable to supply you with the balance of our bulletins, of which you have a number seven, as these have been out of print for some time.

Yours very truly,

GENERAL RAILWAY SIGNAL COMPANY,

Geo. S. Godard
2nd V. P. & Treas.

CSM/GW

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Pneumatic Signal Co.

OWNER OF

The Standard Railroad Signal Co.

WORKS

ROCHESTER, NEW YORK

PHONE, 1210 MAIN

Manufacturer of all Forms of

Approved Interlocking and Signaling, including Low Pressure
Pneumatic, all Electric, The Saxby & Farmer and Vertical
Style of Manual Interlocking Machines, Automatic
Signals for Steam and Electric Railways, Railway
Crossing Gates, and all the Various
Apparatus necessary to complete
installation of Interlocking
or Signaling

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WESMAN PRESS, ROCHESTER, N. Y.

PARTIAL VIEW NEW PLANT
PNEUMATIC SIGNAL CO., ROCHESTER, N. Y.

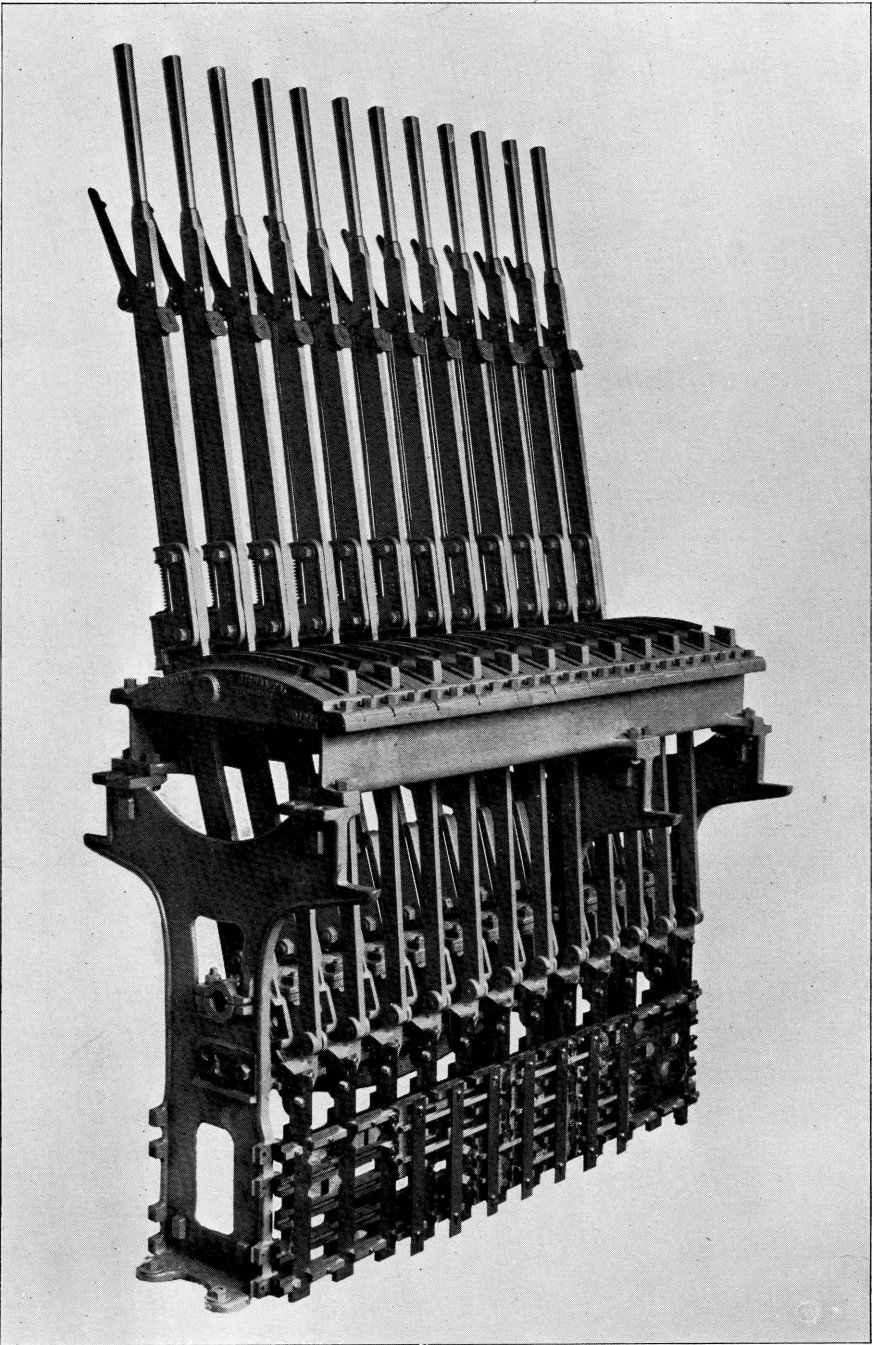
PREFACE

The purpose of this bulletin is to partly illustrate as much of the various systems of Interlocking and Signaling and General Apparatus relative thereto as is manufactured by this Company, with the exception of the All-Electric System which will be illustrated and described in a special bulletin. No effort is made to give a detailed catalogue of parts. These are given in special catalogues devoted to each division of the work. Such numbers as appear in this bulletin on cuts and in reading matter may be used in ordering material from this Company.

This Company has just completed its large works at Rochester, which stand as an example of the most modern product in Engineering Works for the manufacture of Signaling and Interlocking Apparatus. It is the owner of the Standard Railroad Signal Company, which had its works at Troy and Menands, N. Y. All of the Company's factories are now consolidated at Rochester, where we invite inspection.

It is not practicable to describe or illustrate all of the various apparatus which is manufactured by us, and we desire it understood that we are prepared to furnish all apparatus necessary for the complete installation of Power or Manual Interlocking, Automatic Block Signals for Steam or Electric Railways, Station Signals, Railway Crossing Gates, and other Signaling Appliances.

PNEUMATIC SIGNAL COMPANY.



Twelve Lever Style A Machine

Manual Interlocking Machine

Vertical Type

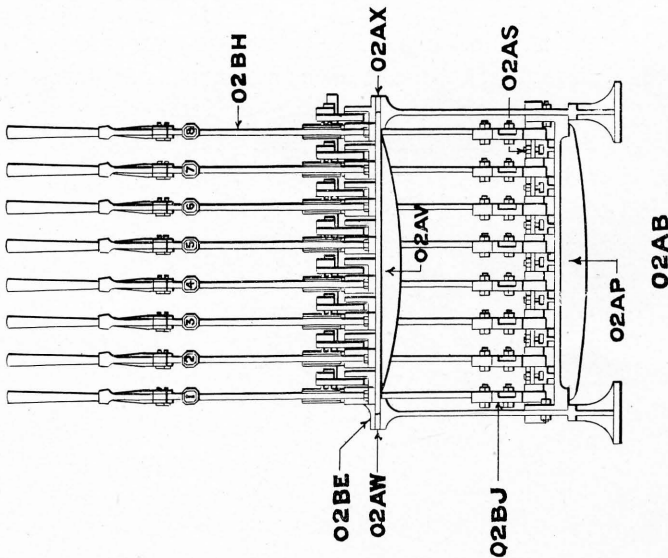
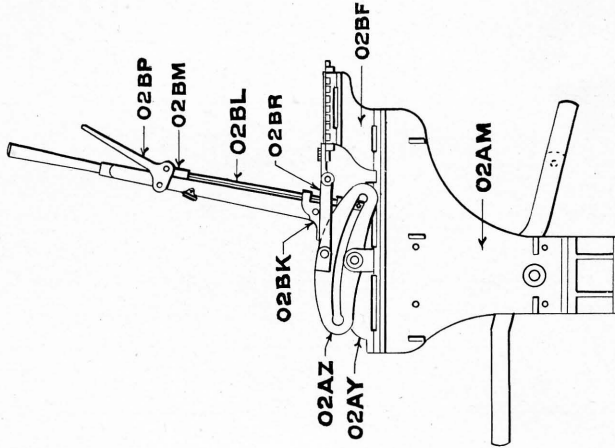
The illustration on the opposite page shows our style A Interlocking Machine, with twelve levers and the locking necessary for ordinary conditions. This style of machine is generally favored because it occupies the minimum of space in the signal cabin, and at the same time combines all the advantages of other types of Vertical and Horizontal Interlocking Machines, together with special features peculiar to itself.

The locking can be placed on either or both sides of the machine, which is a considerable advantage in many cases. All the parts are easy of access and in harmony, which produces a machine that possesses no structural weaknesses. Thousands of these machines are in service. They are to be found on every trunk line and every other railroad in the United States which would install Interlocking.

Manual Interlocking Machine

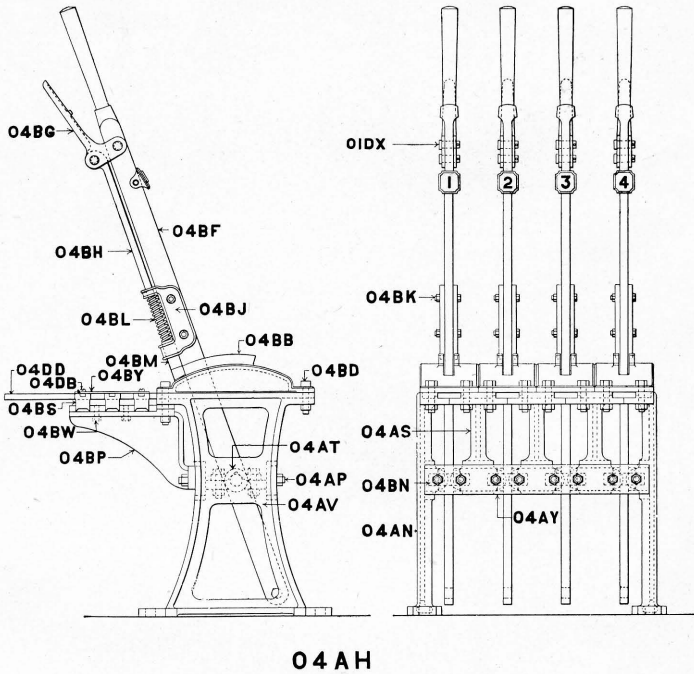
Horizontal Type

The Saxby & Farmer Interlocking Machine here illustrated was the first type installed in the United States. This machine is generally referred to as the horizontal locking type and is standard on many railroads of the United States. The Pneumatic Signal Company has installed many thousand levers of this type of machine.



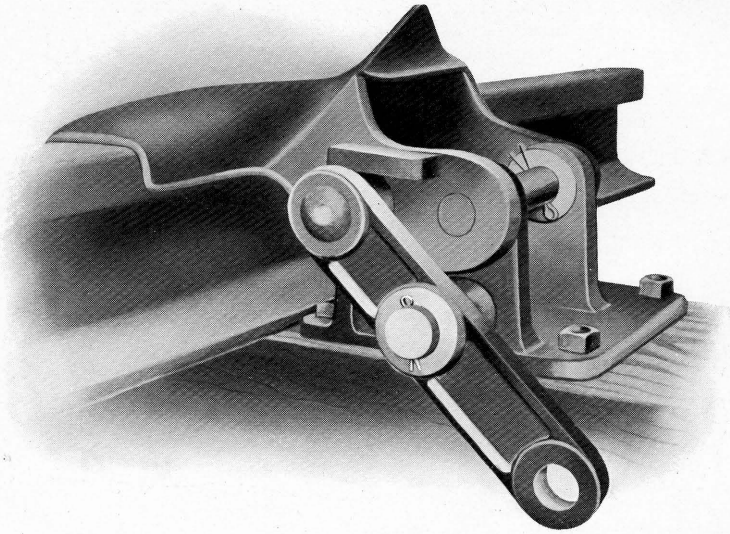
Dwarf Interlocking Machine

In this type of machine, the locking is actuated by a lever instead of providing preliminary latch locking as in the case of the Vertical and Saxby & Farmer types.

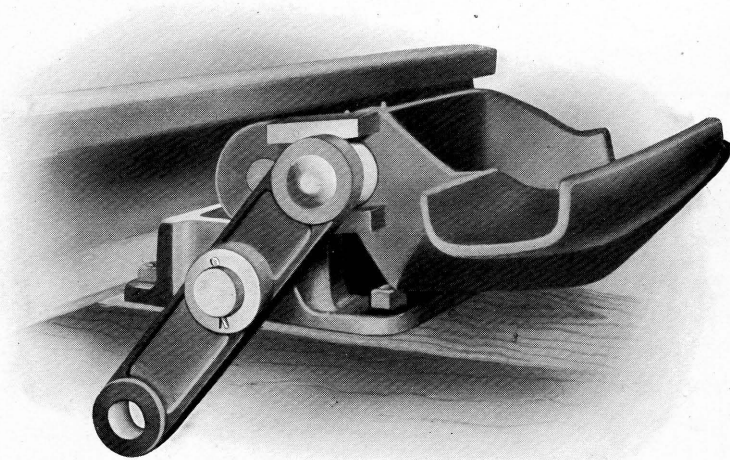


This machine is used for unimportant installations and in cases where very few levers are required. It is often installed without shelter.

Anderson-Bevan Derail



Showing Derail Closed



Showing Derail Opened

Anderson-Bevan Derail

The Anderson-Bevan Derail, as illustrated on opposite page, combines all of the desirable functions of the ordinary derails and avoids the objections. It is more easily operated and less expensive to install and maintain.

With this form of derailing device it is not necessary to break the traffic rail, and no trouble is encountered by reason of snow, ice, or other minor obstructions, as in the case of the split point. The certainty of action and ease of operation recommends this form of derail in preference to all others.

We offer two styles of Anderson-Bevan derails, one to be operated locally in the same manner as the ground switch stand, the other to be operated from a signal cabin or switch stand at some distance from the derail.

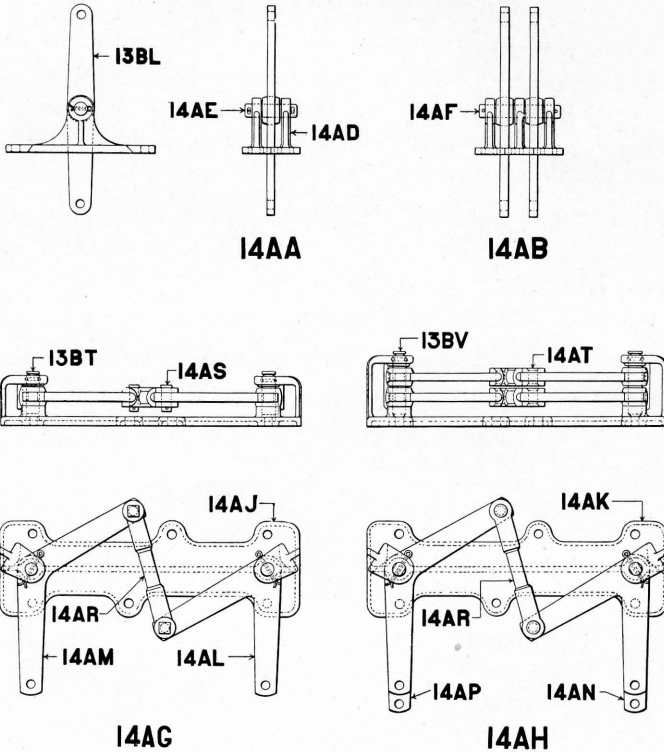
An order for these should state whether right or left-handed derails are desired.

This derail is in common use on the following named railroads:

Baltimore & Ohio R. R.
Cleveland, Cincinnati, Chicago & St. Louis R. R.
Cincinnati, Hamilton & Dayton Ry.
Cincinnati & Northern Ry.
Central Indiana Ry.
Chicago & Great Western Ry.
Columbus, Sandusky & Hocking Ry.
Fort Wayne, Cincinnati & Louisville Ry.
Grand Rapids & Indiana Ry.
Great Central Ry.
Illinois Central Ry.
Indiana Harbor R. R.
Louisville & Nashville R. R.
Lake Erie & Western R. R.
New York, Chicago & St. Louis R. R.
New York Central & Hudson River R. R.
Pittsburg, Bessemer & Lake Erie R. R.
Southern R. R.
Terra Haute & Logansport Ry.
Terra Haute & Indianapolis R. R.
Terminal Association of St. Louis.

Ground Work for Manual Interlocking

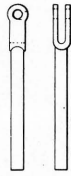
Compensators for Pipe Connections



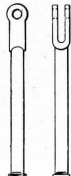
Owing to the variation in temperature and the expansion of the connection between the lever and the switch or signal to be operated, it is necessary to provide a device which will automatically take up expansion or contraction. These devices are generally designated Compensators. Vertical and Horizontal types are here illustrated.

Ground Work for Manual Interlocking

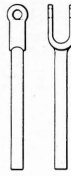
Standard jaws, adjusting screws and turn-buckles are illustrated here below.



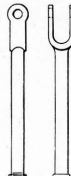
26AA



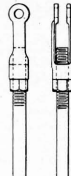
26AB



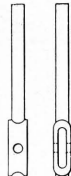
26AD



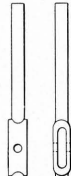
26AE



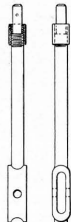
26AJ



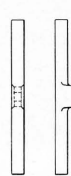
26AF



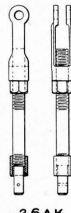
26AG



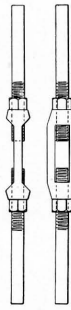
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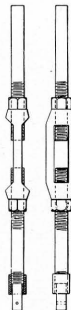
26AR



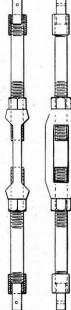
26AK



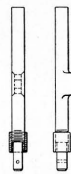
26AM



26AN



26AP



26AS



26AL



26AT



14AS



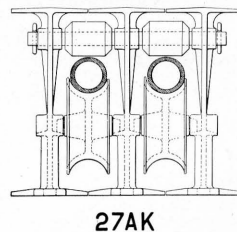
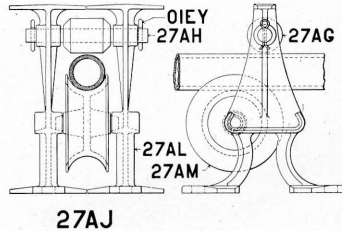
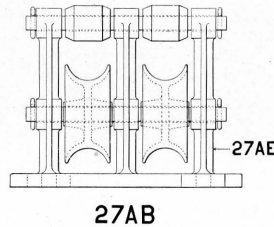
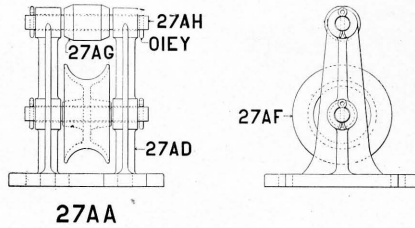
26AV

Ground Work for Manual Interlocking

Pipe Carriers

The various forms of pipe carriers are here illustrated. 27AK illustrates a 2-way pipe carrier built up of three sides with top and bottom rollers. This is about the first form of universal carrier. A more improved style is known as our 27EZ carrier, which is so designed that any number of ways can be assembled from the standard parts for the single carrier, no special bolts or parts being necessary in order to group any number of ways. This is fully illustrated on the following page.

The "EZ" pipe carrier is standard on many railroads on account of the simplicity of design and adaptability for assembling. In order to remove a pipe it is only necessary to withdraw two cotter pins and take out the short connecting piece which supports the top roller.



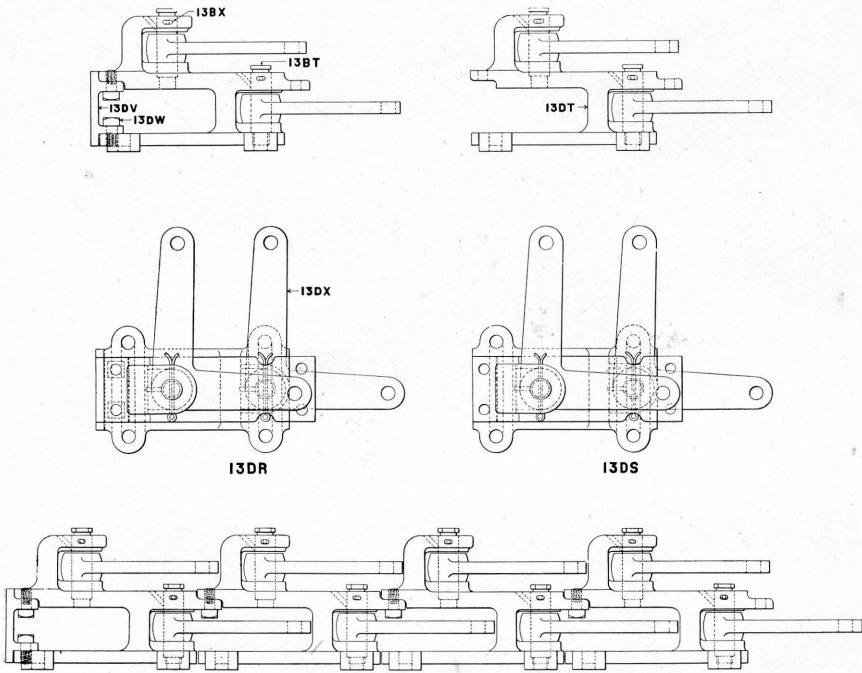
“EZ” Pipe Carrier



Ground Work for Manual Interlocking

Multiple Box Crank

Where the Rocking Shaft form of lead-out from the signal cabin is in use, a Sectional or Multiple form of Horizontal crank stand is desirable. The illustration shows

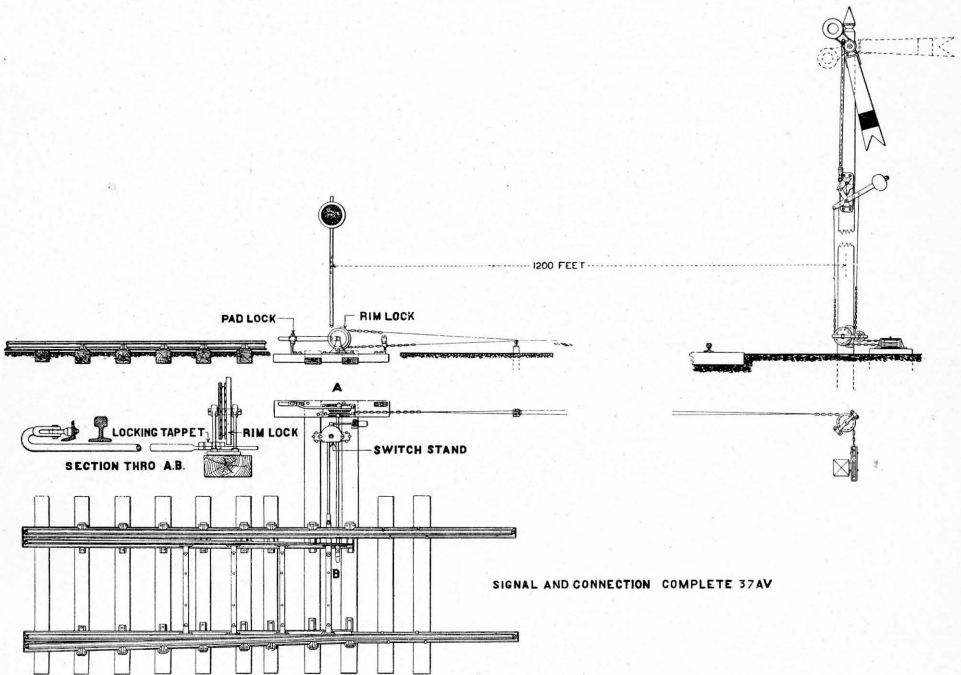


several parts as well as the grouping of our standard form of Multiple Box Crank. It will be observed that with this system any number of ways may be assembled as desired thus avoiding the necessity of carrying several different numbers of ways in stock, as has been the practice.

Ground Work for Manual Interlocking

Facing Point Switch Protection

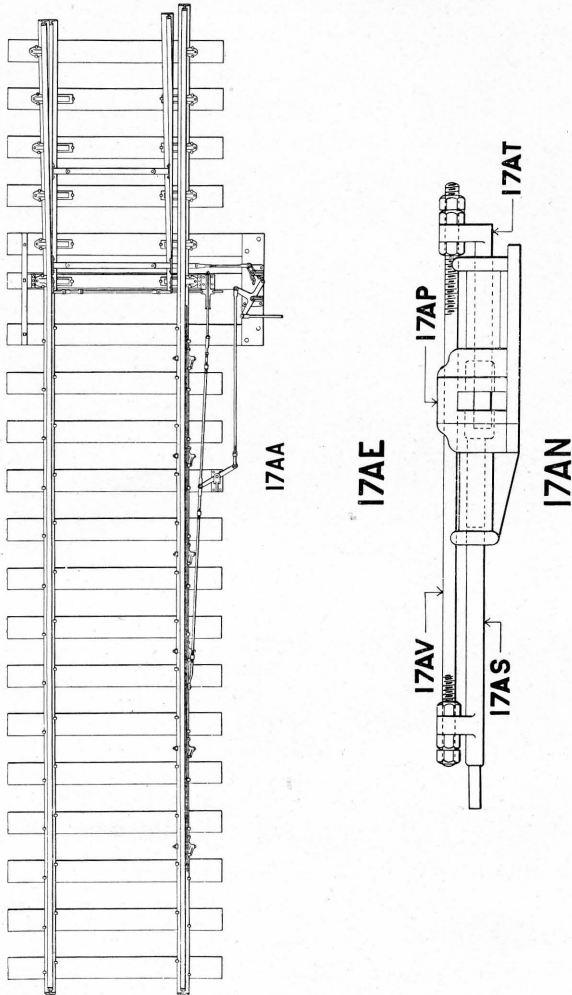
The illustration shows a simple method of providing for the operation of a distant signal in connection with a switch, so arranged as to make it necessary for the distant signal to be in the danger position before the switchman can change the point from the normal position.



The necessity of providing a signal a considerable distance in advance of the switch is appreciated by all operating officials, and this can be done with small expense for installation. Since the switch and signal is to be operated by trainmen, there is no operating charge to be considered, consequently it is believed to be the most valuable initial step to take in the installation of signals on any line of railway.

Ground Work for Manual Interlocking

Switch and Lock Movements – Switch Mechanism

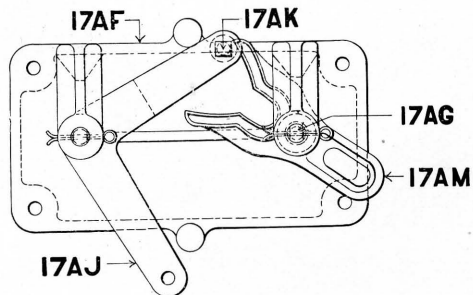
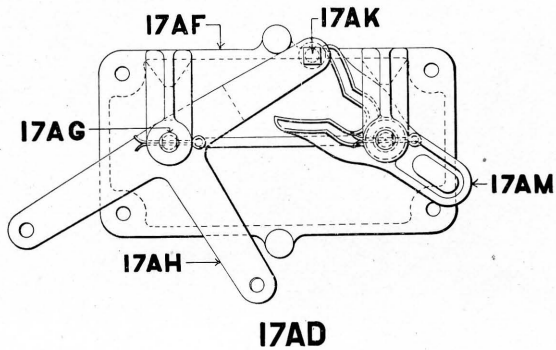


Ground Work for Manual Interlocking

Switch-and-Lock Movements—Switch Mechanisms

On this and the opposite page are illustrated the standard switch-and-lock movements, 17AD and 17AE, with duplex plunger, 17 AN, which are used where it is desired to minimize the number of levers. The best practice, however, is to use a separate lever for performing the locking.

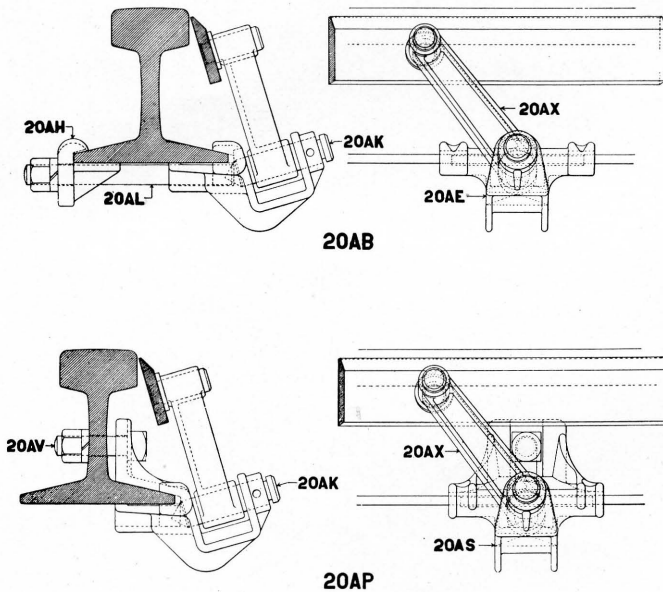
The general layout illustrating the apparatus necessary for operating a switch with the switch-and-lock movement is shown by 17AA.



Ground Work for Manual Interlocking

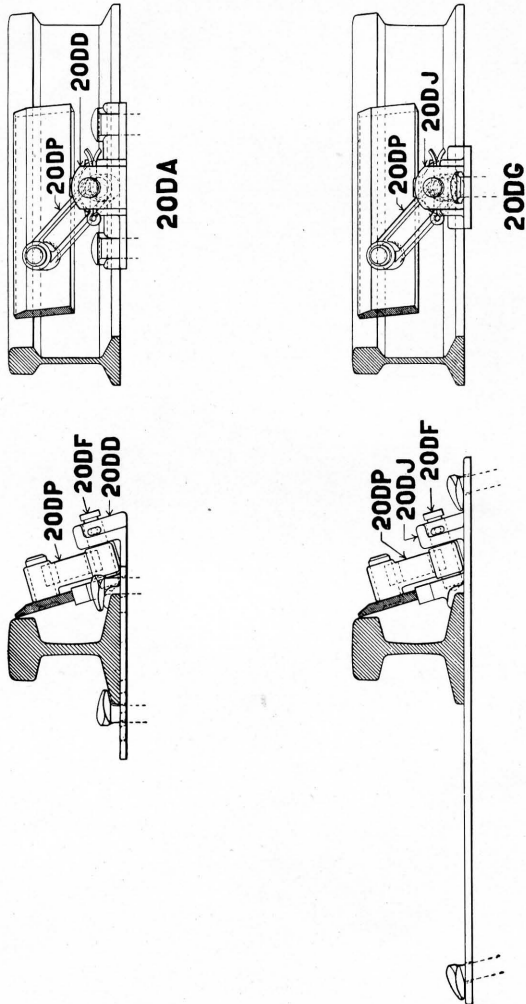
Detector Bars and Fittings

On this and the opposite pages are illustrated two forms of detector bar clips, 20AB and 20DA, those illustrated by 20AP and 20DG being the same styles but arranged to be used where the detector bar is carried along the switch. The first form (20AB) is the standard usually adopted for manual interlocking, and is furnished to suit any section of rail. The style illustrated by 20DA is generally used for power plants



Detector Bars and Fittings

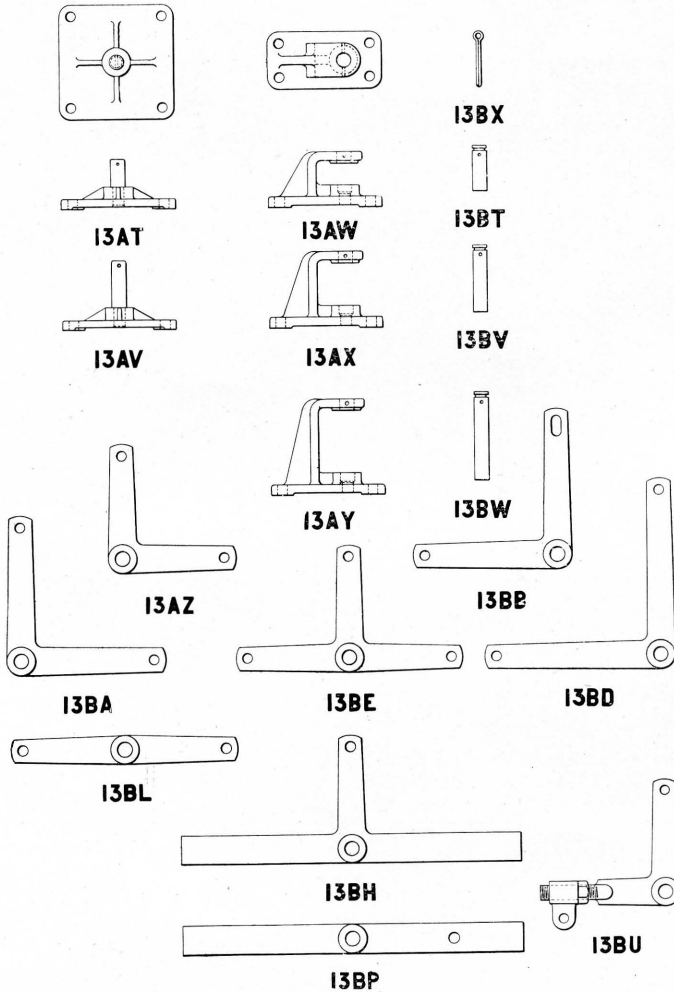
where it is desired to have additional support. It will be observed that the base which supports the link is carried under the rail and is a combination, therefore, of tie plate and detector bar clip. These are made of malleable iron and the patents of same are controlled by this company.



Ground Work for Manual Interlocking

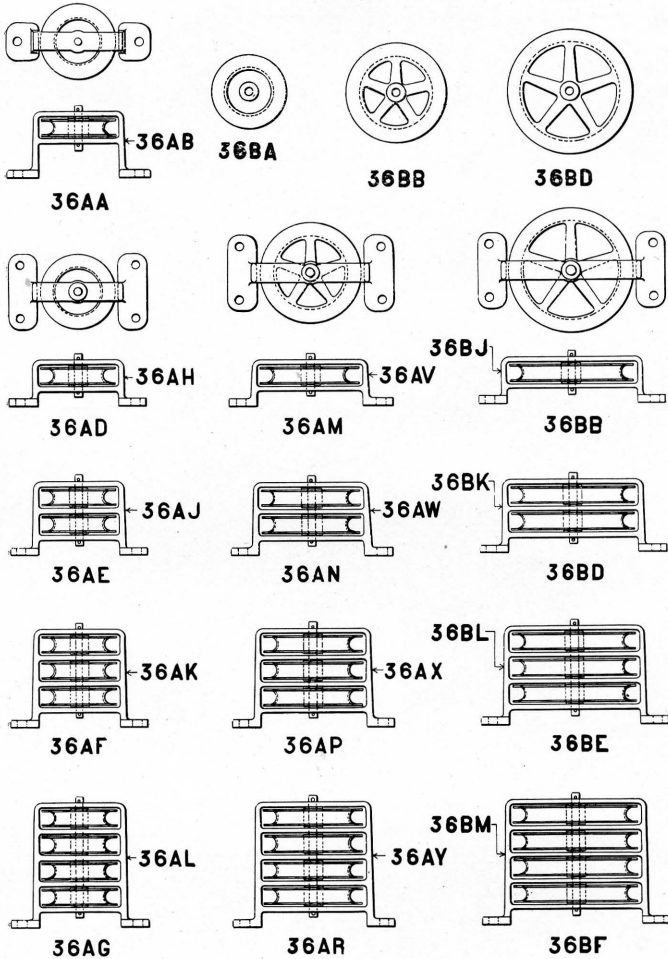
Cranks and Fittings

The various forms of standard horizontal crank stands and cranks are here illustrated.



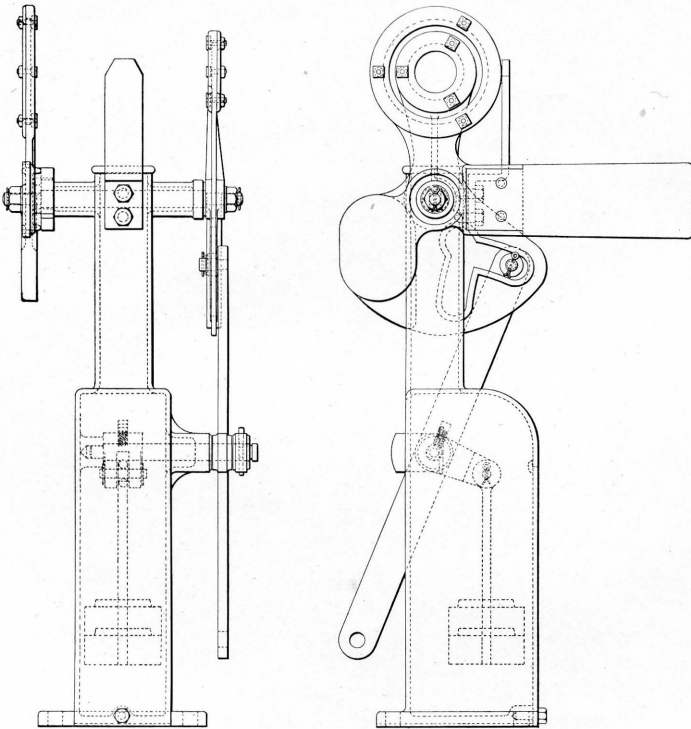
Ground Work for Manual Interlocking

Horizontal Wheels and Frames



Dwarf Signals

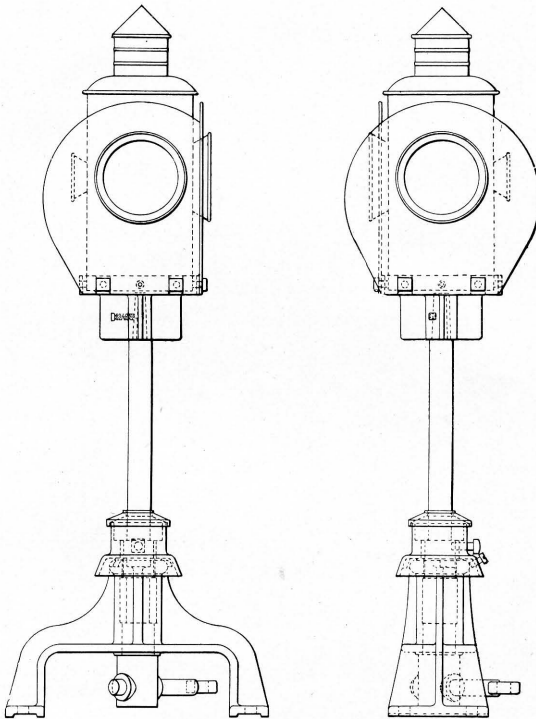
The Dwarf Semaphore here illustrated is self compensating and can be fitted with one or two-light spectacles. It is adapted for operation by either pipe or wire connections and is now standard on many of the railways.



42BB

Pot Signals

The Pot Signal here illustrated is designed to be operated by pipe connection, and is generally used where sufficient space is not available for the operation of either the high or dwarf signal.

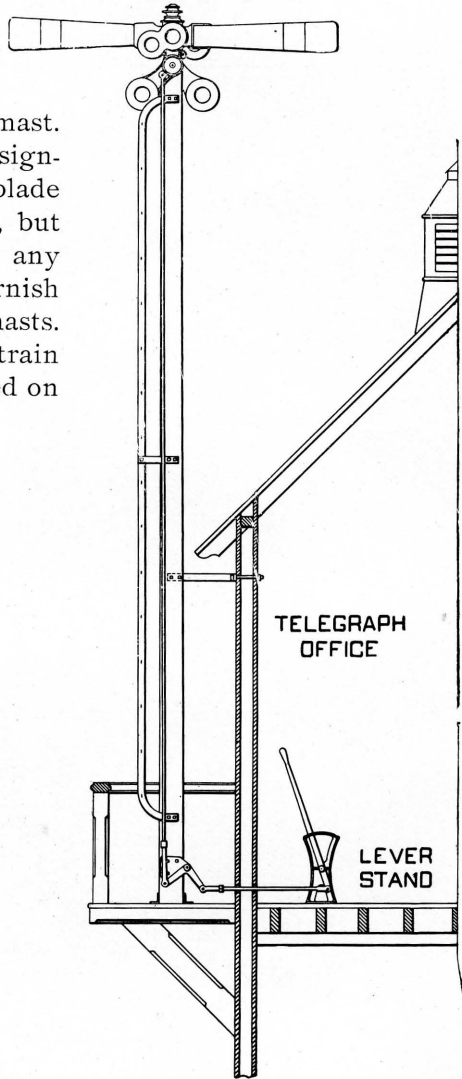


43AA

Station Block or Train Order Signals

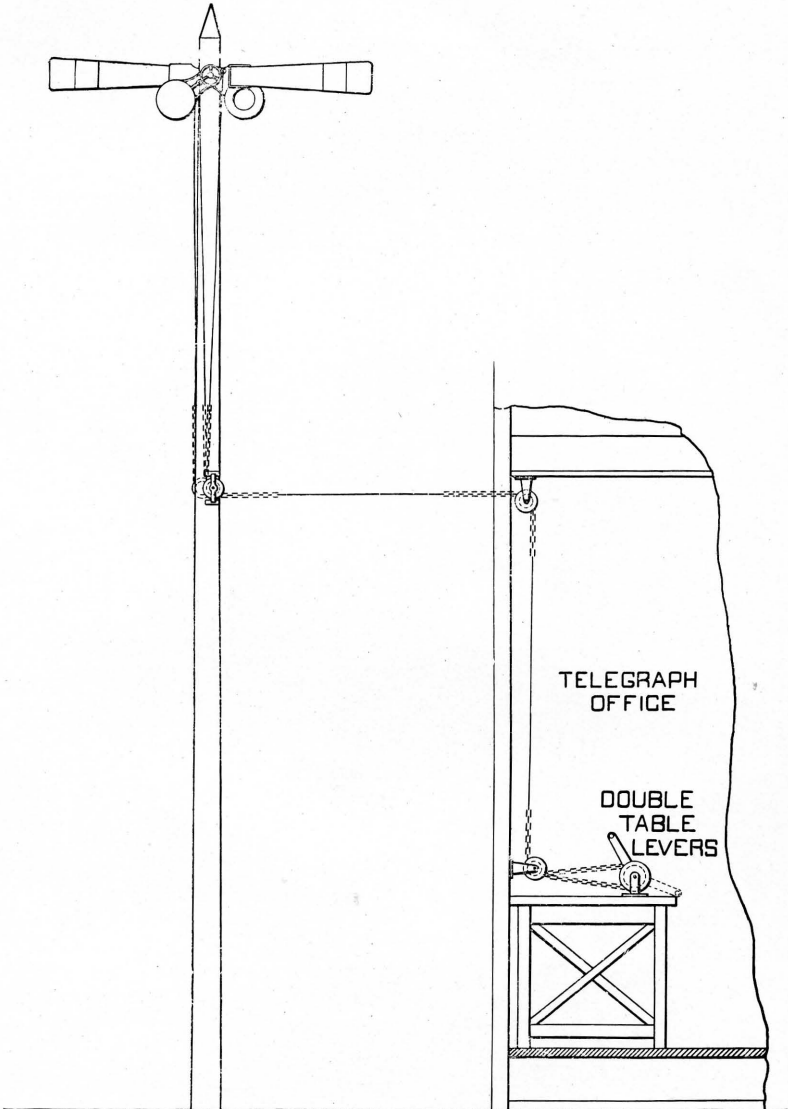
The illustration shows the double arm 3-position Block Signal of the Pennsylvania standard. This is intended to be placed at the telegraph office and handled by the operator.

The advantage of this form of train order or block signal is that it requires but one lamp located on the top of the mast. This particular style is designed to move the signal blade 90° from the horizontal, but fittings are furnished for any angle desired. We also furnish either iron or wood masts. Various other forms of train order signals are illustrated on the following pages.



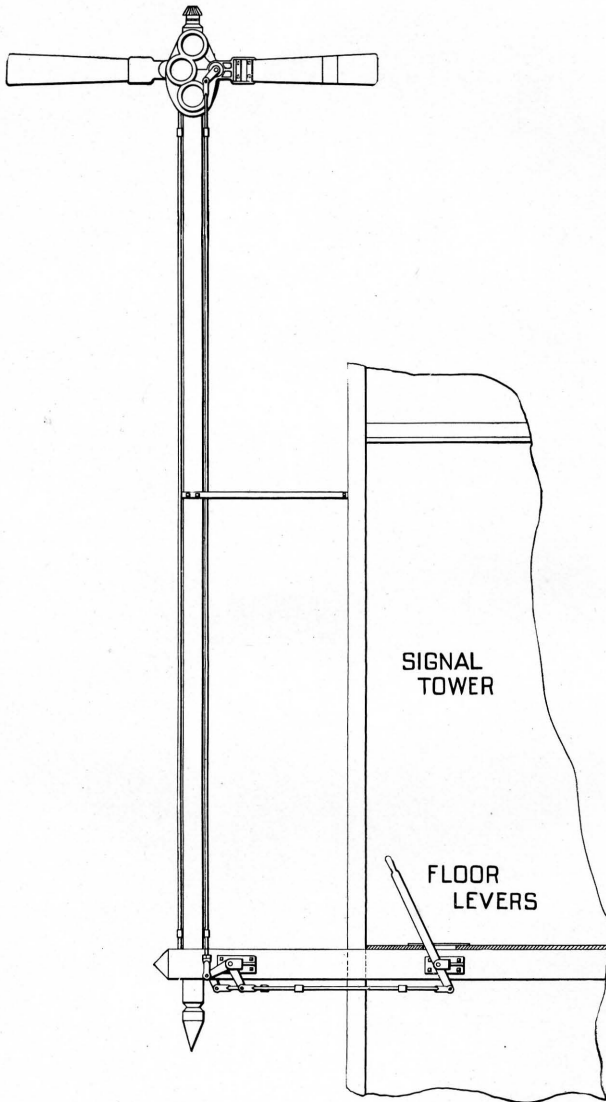
Double Arm, Three-Position Block Signal
Pennsylvania R. R. Standard

Station Block Signals



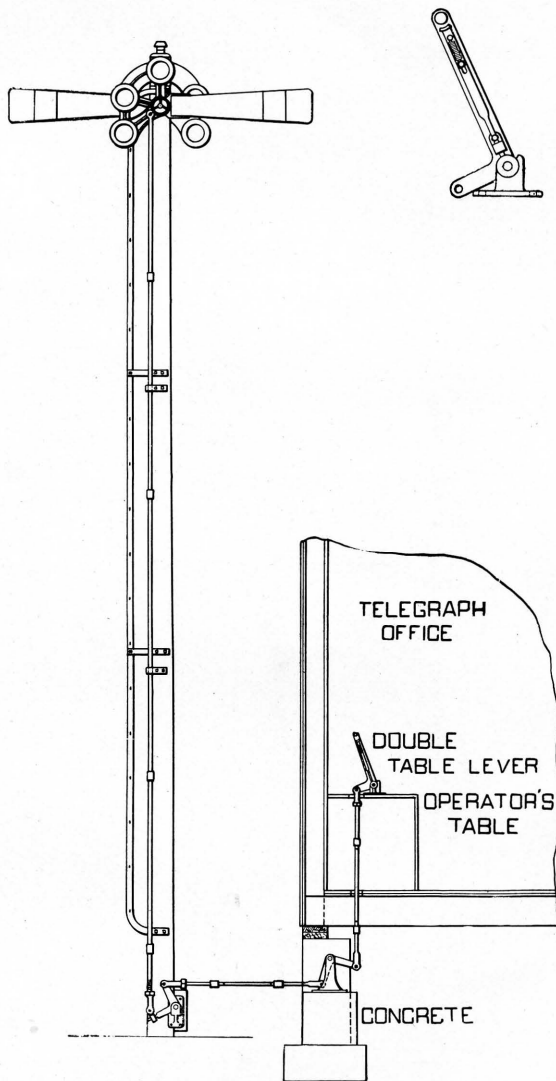
Double Arm, Two-Position Signal
With Table Levers

Station Block Signals



Double Arm, Three-Position Block Signal
Baltimore & Ohio R. R. Standard

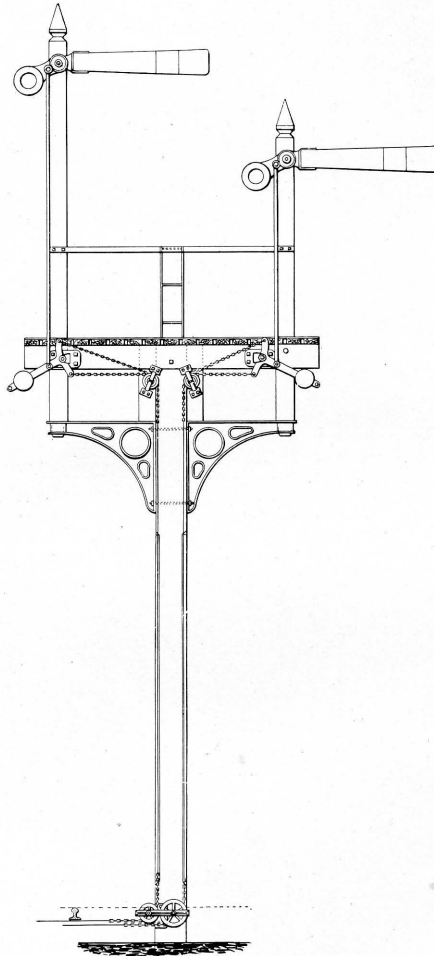
Station Block Signals



Double Arm, Three-Position Signal
Union Pacific R. R. Standard

Bracket Signals

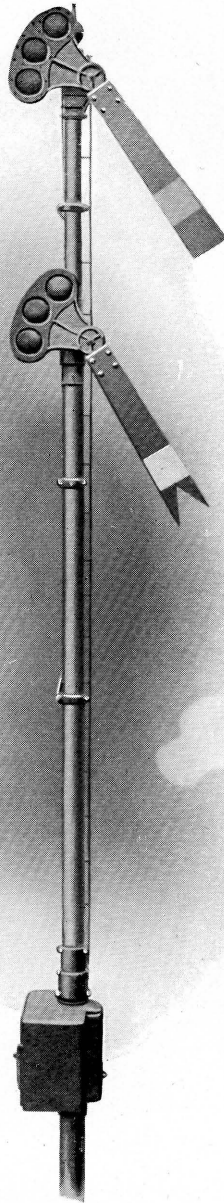
The standard form of Bracket Signal is here illustrated. Any desired form of blade grip can be furnished, and the same general style of signal is used for iron mast.



39AF

Automatic Block Signaling

Automatic Block Signal



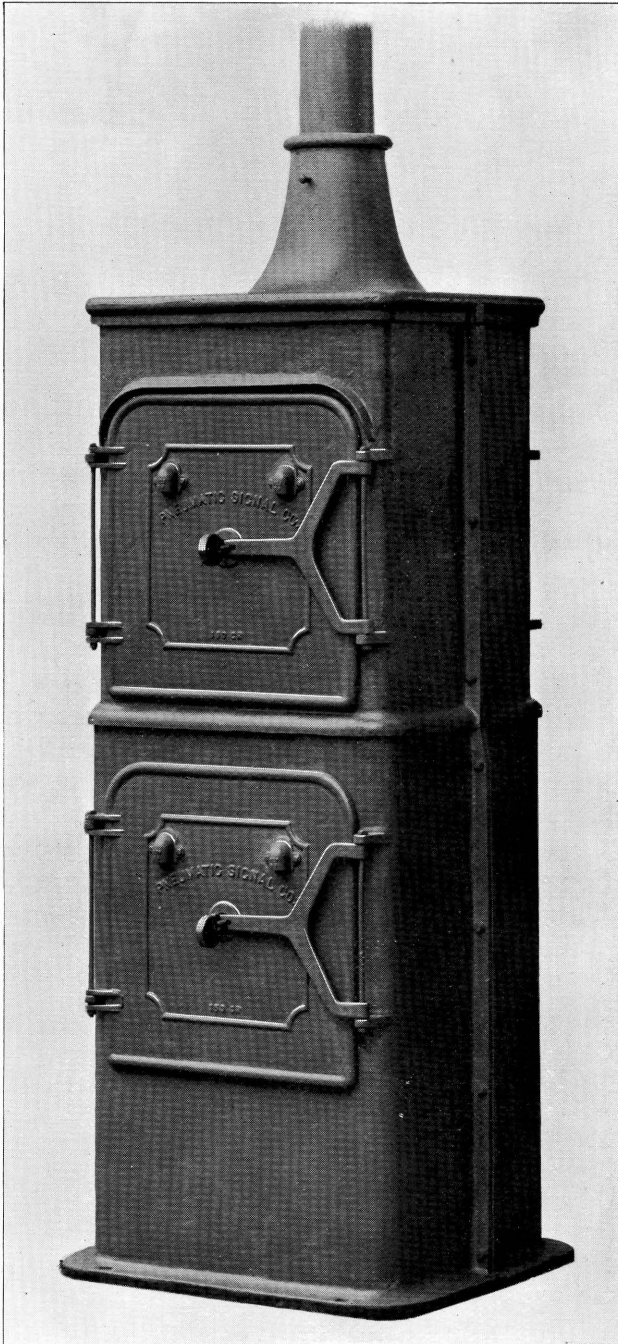
View of Two-Arm Home and Distant Signal Complete

Automatic Block Signal

The 2-arm Semaphore Signal illustrated on the opposite page shows the latest type of automatic block signal with iron mast. The operating mechanism is enclosed in an iron box at the base. The illustration shows the mast passing through the box containing the mechanism and extending thence into the ground.

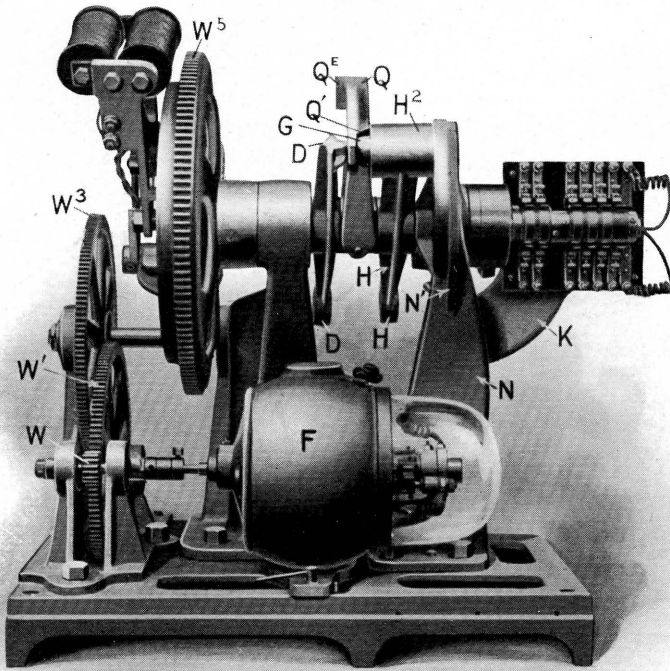
Another form of base is illustrated on the next page. This combines the battery box and the box for containing the signal mechanism in a common base for the support of the mast. It will be observed that the connections between the operating mechanism and the two arms of the signal are carried inside the mast and that all moving parts are enclosed. An important feature of this design is that the operating mechanism is at one side of the mast so that any drip from the interior of the mast cannot fall upon the mechanism. The details and technical description of the apparatus are given in the following pages.

Automatic Block Signal



View of Double Box with Battery Room

Automatic Block Signal



Front View of Mechanism for Two-Arm Signal

Automatic Block Signal

On page 30 is illustrated our two-arm electric motor signal consisting of an iron mast with semaphore blades attached, having internal counter-weighted operating rods between the blades and motor.

The operating mechanism consists of an electric motor with a train of gear wheels, an electric control for making and breaking the connection between the motor and the blades.

The motor shown at "F," page 33, is entirely inclosed, the commutator end having a glass shield. 680 revolutions of the motor are made to one of the main shaft "T," page 35. The power is transmitted through a train of gear wheels, "W," "W-1," "W-2," "W-3," "W-4," "W-5."

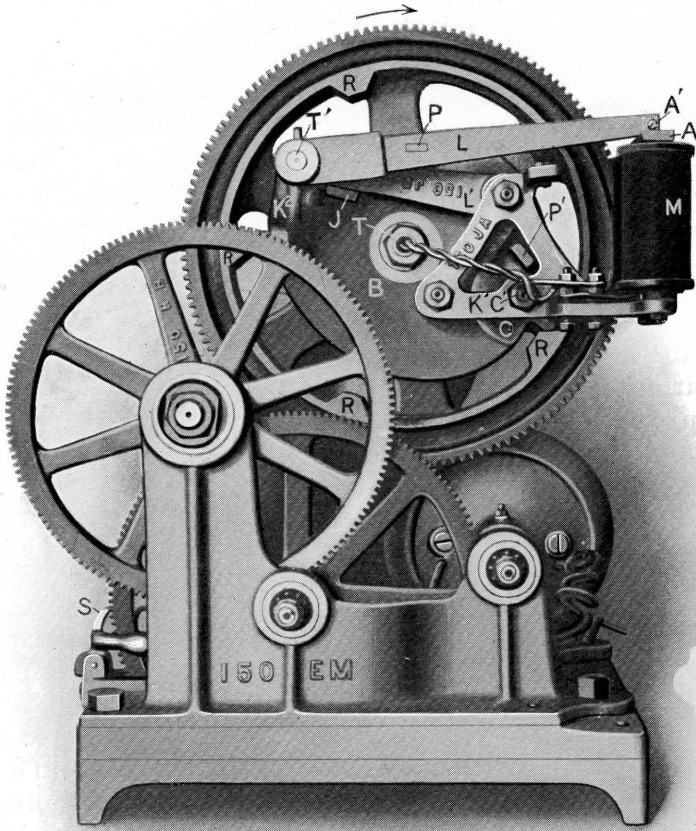
The main shaft "T" is carried on roller bearings, all other shafts being fitted with ball bearings. The operating mechanism is placed in the case in such manner as to make it easily removable as a whole or in part, and is conveniently accessible from the front or rear.

The main shaft "T" carries between the standards the home and distant signal levers "H" and "D," respectively, which are free to revolve on the shaft "T," the driving lever or quadrant "Q" being fixed to the shaft.

The up and down rods are attached to "H" and "D" at "H-1" and "D-1," respectively. The lever "H" carries a sliding dog "G" at "H-2," which is fitted with rollers at each end. The driving quadrant is faced on the side next the lever "H" with hardened tool steel. The front of standard "N" is similar to "H." The main shaft "T" is extended beyond the standard "N," and has attached to it a commutator to make and break the circuit.

The operation is as follows, all references being made to pages 33 and 35: The wheel "W-5" forms part of the controlling apparatus, it being free to revolve on a boss, which forms part of wheel "B." This part "B" carries an electromagnet "M," the armature lever "L," the crank lever "L-1" and cam "C." The part "B" has a square hole on the side

Automatic Block Signal



Side View of Mechanism for Two-Arm Signal

Automatic Block Signal

into which the main shaft "T" fits, the two revolving together. The electro-magnet "M" is carried by the bracket "K-1," which is secured to "B." This bracket also supports the cranked lever "L-1" and the cam "C." Another bracket "K-2," also attached to "B," carries the armature lever "L." On the shaft "T-1," to which the armature lever "L" is fastened, there is also fixed an escapement jaw "J." The armature lever "L" carries the armature "A," pivoted at "A-1." When the electro-magnet "M" is energized, the armature "A" holds the armature lever "L" in position; this through the escapement jaw "J" holds the lever "L-1" in the position shown; and the shorter arm of this lever will in turn hold the cam "C." The cam itself is free to move about the center "C-1" and engage with projections "R-R" on the inner side of the rim of the wheel "W-5."

When the magnet "M" is energized and the motor circuit closed, the motor will rotate the wheel "W-5" in the direction of the arrow, and this wheel being engaged through the cam "C" and the levers "L" and "L-1" with the part "B," the main shaft "T" will also rotate, carrying with it the driving quadrant "Q." The dog "G" not being free to slide to the right, will engage with the recess "Q-1" in the driving quadrant "Q," and in consequence the "home" signal will be moved to the "clear" position. The projection "Q-2" on the driving quadrant "Q" will then engage with the distant signal lever "D." Should the motor circuit remain closed, the dog "G" will be forced to the right into the recess "N-1" in the extension of the standard "N," thereby holding the "home" signal at "clear." The "distant" signal will in turn be operated to the "clear" position. When the magnet circuit is broken with the signal in the "clear" position, the levers "L" and "L-1" are released; the longest arm of the lever "L-1" will move upward until it strikes the stop "P" on "B;" this will allow the cam to be moved from its engagement with "R" until it strikes the stop "P-1," and the motor mechanism being in this way disconnected from the signals, the counterweights will cause them to return to the "danger" position in the reverse order to that in which they are operated to the "clear" position; *i. e.*, the "distant" signal will go first to

Automatic Block Signal

“danger,” followed by the “home” signal, the force of the movements being checked by suitable dash-pots.

To prevent the motor from being reversed by the counterweights, a pawl “S” engages with the teeth of the wheel “W-1.”

To facilitate the cleaning of the motor commutator and the setting of the brushes, a single clutch is provided on the motor shaft, and the motor is so fixed that upon this clutch being released, it can be turned on the base so that the commutator end is to the front.

The power for operating this signal is furnished by the usual form of battery located in the bottom part of box, in case the double box illustrated on page 32 is used, and when the smaller box with mast extending through is used, the battery is placed in battery-well, conveniently located.

Special attention is called to the compact form and simplicity of construction which insures reliability, workability and economy of operation and low cost for maintenance.

In other forms of electric signals on the market the working mechanism is located below and in line with the mast, and any drip from interior of mast is liable to fall upon the machinery. There is also no opportunity to carry the mast through the box to a firm seat in the ground. With the Pneumatic Signal Co.'s form of construction, no drip can fall on the mechanism, and the pole can be carried through box and fixed in a firm foundation.

Block Signals for Electric Railways

Automatic block signaling has made more progress in the United States than in any other country. There are some thousands of miles in successful operation and the experience of more than fifteen years has demonstrated the efficiency and desirability of the automatic system as compared with the controlled manual.

The installation and maintenance of the rail or track circuit on steam railways is a comparatively simple matter since Signal Engineers are thoroughly familiar with the principles and requirements involved. The application of automatic signals to electric railways has, however, baffled the electricians and engineers for many years, and it is only recently that this Company has fully demonstrated the practicability of operating automatic signals on electric lines.

There is, of course, no difficulty in dividing the steam railway into blocks by using insulated joints at any point desired, but in case of the electric railway it is necessary to provide a free path for the return of the operating current to the power station. Therefore, any track circuit system must require that, while the railway may be divided into sections or blocks for the separation of traffic, such division must in nowise interfere with the return of the current.

Some installations of automatic signals on electric lines have been made, but in all cases it has been necessary to give up one of the traffic rails for the purpose of signaling, and when this is done we must necessarily supply some other form of conductor, equal to the carrying capacity of the rail, which, of course, adds greatly to the expense.

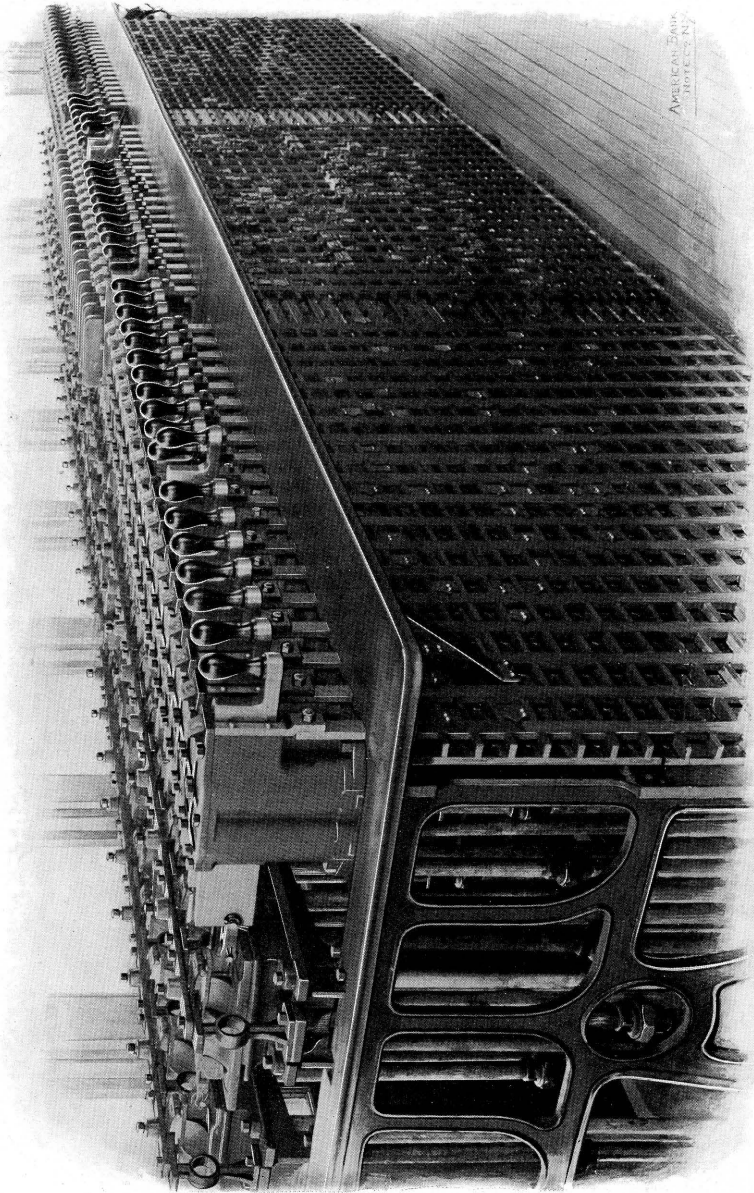
The "Young System" which this Company has developed, furnishes the same measure of safety in operation as does the ordinary track circuit on steam railways and it does not in any way interfere with the return of the operating current through the traffic rails. This system is fully illustrated in our Bulletin No. 6, which will be furnished on application.

**Low-Pressure
Pneumatic Interlocking**

Low-Pressure Pneumatic Interlocking

This company is the sole owner of all patents covering the Low-Pressure Pneumatic Interlocking Apparatus, which is partly illustrated and described in the following pages, with plans of a few of the more important installations in the United States. The foreign patents are owned by the British Pneumatic Railway Signal Co., Ltd., with offices at Palace Chambers, Westminster, London, England, and a number of important installations of this system have been completed in England, Austria, and France, and several installations are now in hand in those countries, Germany, and India.

Low-Pressure System



Low-Pressure Pneumatic Interlocking Machine

The Low-Pressure System

For operating railroad switches and signals pneumatically has five characteristic features :

(1) It requires no force but air.

(2) The air-pressure is always low; normally 15 pounds per square inch (1 kg. per sq. cm.)

(3) Every movement is accomplished by air-pressure; nothing depends on gravity, or springs, or withdrawal or reduction of pressure.

(4) Except when a switch or a signal is being moved, or an indication is being given, all operating and indicating pipes are subject to atmospheric pressure and no more.

(5) The final portion of the stroke of the "lever" is automatic, requiring no effort or care on the part of the operator. These points are more fully explained in the following pages.

The foregoing are mechanical or scientific advantages. There is also marked economy. The machine costs to install no more than other power systems. Wear of movable parts is reduced to the lowest limit; and, consequently, the cost of maintenance and renewal is far below that of any other interlocking apparatus. The cost of inspection is less than

Character-
istics

Economy

Low-Pressure System



Machine at Jamaica, N. Y., Long Island Railroad

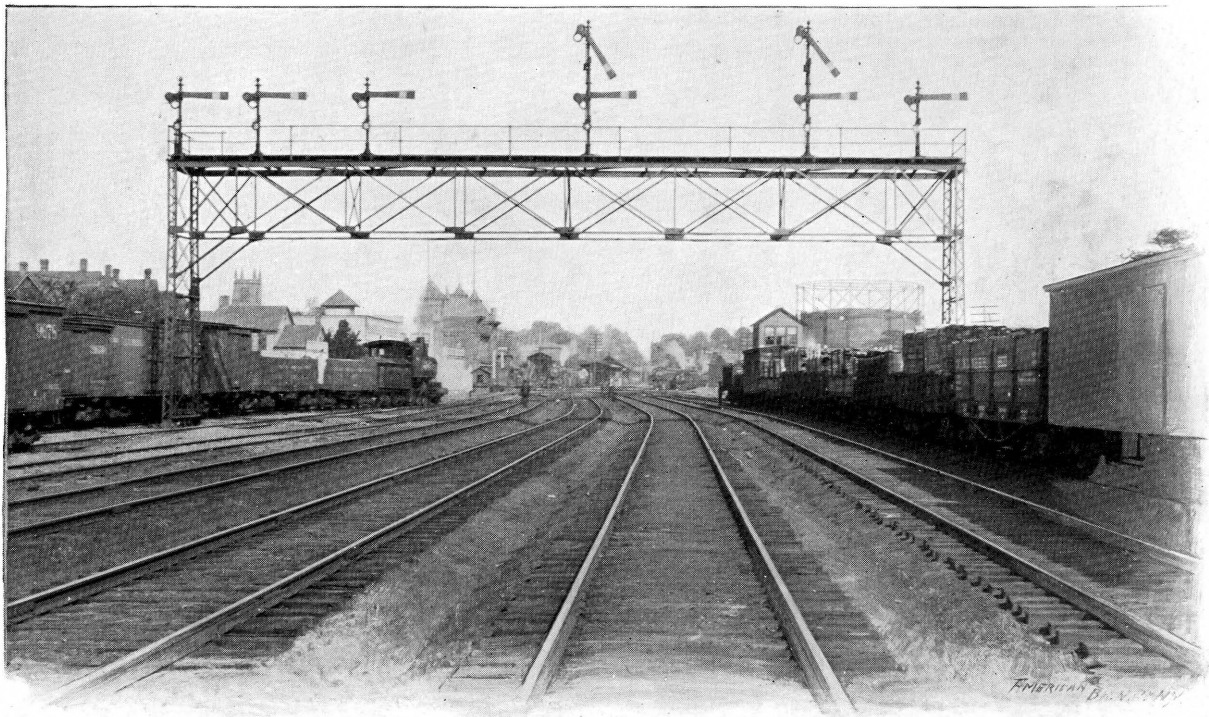
Low-Pressure System

with any other system, and one signalman in the cabin can care for as many trains as three or four men can attend to with mechanical levers.

Advantages

The machine and devices used in connection with this system; which is now in use on a large number of the prominent railroads in America, fulfill, completely and economically, the three chief functions of a railroad switch and signal device. These are: (1) To furnish *power* to move the switches or points and the signals; (2) *concentration* in one cabin of the control of all the switches and signals within a given field; and (3) *interlocking* of the controlling parts of different switches and signals, so that it shall always be impossible to give conflicting signals. The power is compressed air at a pressure of 15 pounds per square inch above the atmosphere. The concentration is accomplished under ideal conditions, all connections from the cabin to the switches and signals being buried in the ground, and the action being so quick that any necessary or desirable distance can be covered. The interlocking is based on the well-established mechanical types, but with all parts much smaller, though still of ample size to afford all necessary strength

Compre-
hensive



Low-Pressure System

AMERICAN BROS. CO. N.Y.

Part of Jamaica Yard of Long Island Railroad
Low-Pressure System in Use

Low-Pressure System

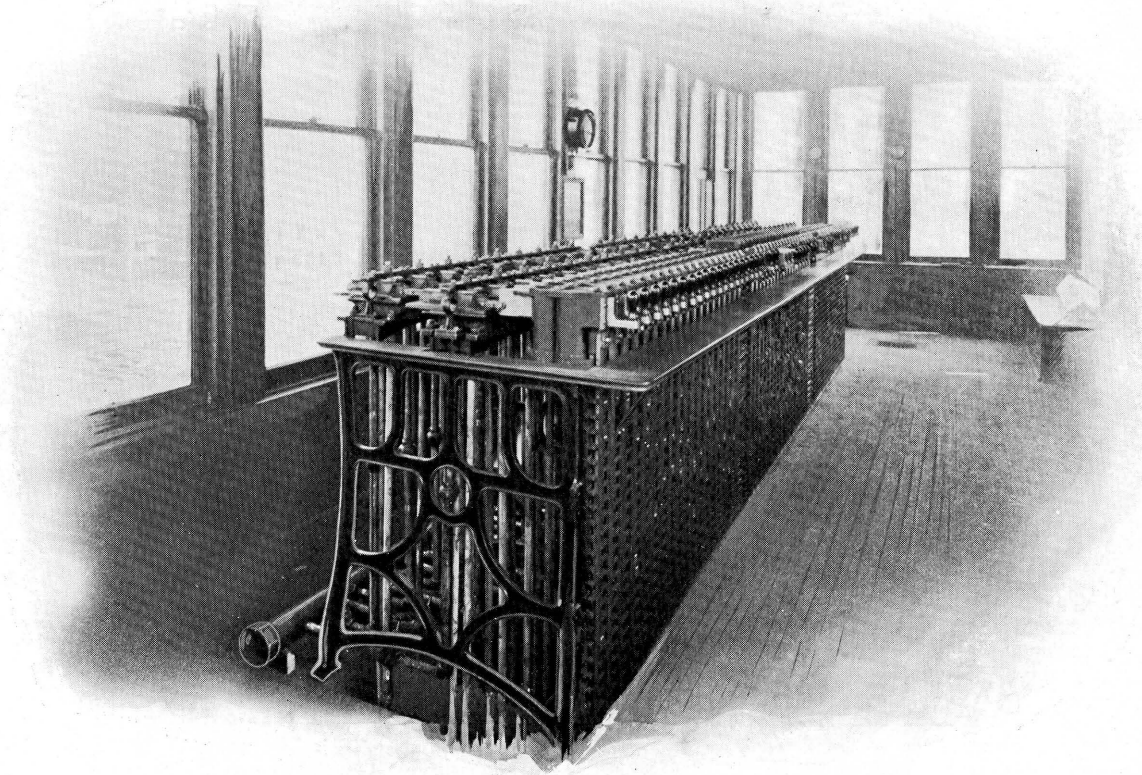
The minor as well as the main functions of interlocking signals are also fully provided for; and the advantages previously enumerated may be more fully stated as follows:

(1) A complete system of power movements and interlocking which requires no electrical apparatus. This point will perhaps be best appreciated by those whose experience with electrical apparatus has been extensive, and who realize how the increasing use of electric currents for other purposes in and near railroad yards tends to interfere with the satisfactory use of this force in signaling. The non-use of electricity conduces to simplicity and lessened cost, both of construction and maintenance, and insures greater certainty of action.

(2) Low pressure. The pressure used to move switches and signals is 15 pounds per square inch (1 kilogramme per square centimetre), and that for conveying indications is only half this amount. Low pressure being made practicable, there is, with this system, no possibility of trouble from condensation of moisture in pipes; and the annoyances from leaks, which are common with high pressure apparatus, are practically abolished. A smaller quantity of air is used, and the service required of the compressor is, therefore, less than with high pressures. Numerous tests of this system, confirmed by long experience in actual service, have proved that with 7 pounds pressure to the inch, the time elapsing between

Non-
Electric

Low
Pressure



Low-Pressure System

Interior of Tower at Grove Street, Jersey City
Erie Railroad

Low-Pressure System

the introduction of air into a pipe at a switch and the resulting valve movement at the other end of the pipe (in the cabin) is less than with high pressures. A switch 500 feet (152 metres) from the cabin is moved, and the return indication is received back at the cabin, all within three seconds from the moment that the lever is pulled. The movement of a signal arm, at the same distance, is practically simultaneous with the movement of the lever. Indeed, at the average distance, in any yard, the difference in the time required as between a switch or signal movement controlled by the electric current and one controlled by low-pressure air is so very small that it is practically impossible to measure it. A fifth advantage of this low-pressure system is the added flexibility of the power. With all the pistons designed to be moved by 15 pounds pressure, an abnormal requirement demanding, for example, 50 per cent. additional pressure, can be met by the desired increased compression, while still keeping within the very moderate limit of $22\frac{1}{2}$ pounds per square inch ($1\frac{1}{2}$ kg. per sq. cm) A substantial advantage is the facility with which changes in piping can be made; joints can be separated and wooden plugs inserted in ends while work is being done, and all without shutting off the compressor or main source of supply.

(3) Positive application of power is in every case required to accomplish any result. To move a switch either to or from its normal position, or to return to the cabin an "indication"

Quick
Action

Safety
Features



*AMERICAN
BANK NOTE
Co.*

Low-Pressure System

Part of Jersey City Yard of Erie Railroad, in which
Low-Pressure System is in Use.

Low-Pressure System

that a switch has completed a movement ; to move a signal to or from the all-clear or go-ahead position, or to indicate in the cabin that a signal has returned to the danger or stop position, air-pressure must be applied. A signal is held in the all-clear position by continued pressure of air in the pipe leading from the cabin to the signal. Absence or failure of power will always leave the signal in the stop or danger position, and thus be on the side of safety.

No
Leakage

(4) All of the operating and indicating pipes are normally subject to atmospheric pressure only. Compressed air is introduced into these pipes only when a switch or a signal is to be moved ; so that there is practically no loss of air by leakage.

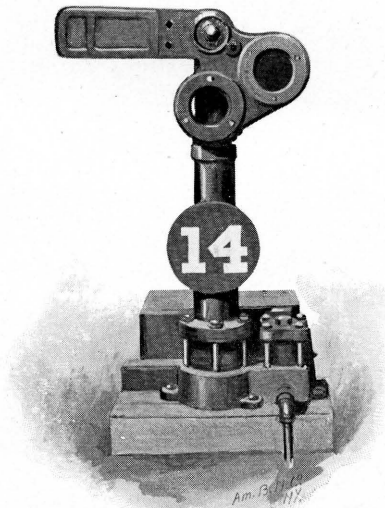
Automatic
"Return"

(5) The automatic indicating stroke of the lever, seemingly of minor importance, is found in practice to greatly facilitate the work of the operator or signalman. The original theory of pneumatic switch and signal movements was to divide the stroke of the "lever" (the valve handle, called "lever" on account of its function being the same as that of the lever in the older mechanical interlocking machines) into two parts, so as to provide for preliminary locking. The signalman moves the lever through the first part of its stroke ; this sends air to the switch, and the switch must complete its stroke and thereby send air-pressure back to a valve attached to the lever in the cabin, before the final part of the lever-stroke can be effected. The lever must not finish its stroke until the switch stroke is surely finished. Now, the time

Low-Pressure System

which the operator must wait, after making the first half stroke before he can make the second half, is short, measured in seconds, but yet it is an appreciable addition to his necessary mental processes; for until he has fully performed his duty with one lever, he does not effectually turn his thought to the lever which is next to be moved. In this machine this waiting is rendered unnecessary; the air-pressure completes the lever-stroke without the man's intervention. The practical result of this is that the operator is relieved of the necessity of hurrying. Having moved lever No. 1, for changing a switch, his next act is to move lever No. 2, to give a signal for that switch; and with this device he is relieved of all thought of the switch as soon as he has made the half stroke with the lever; and he may then grasp lever No. 2 preparatory to moving it as soon as No. 1 shall have automatically completed its stroke. If, because of failure of any part, the completion of the stroke of lever No. 1 should not be effected, the operator would be warned of the fact by his inability to move No. 2, this being suitably interlocked with and controlled by lever No. 1.

Economy
of Time



Dwarf Signal

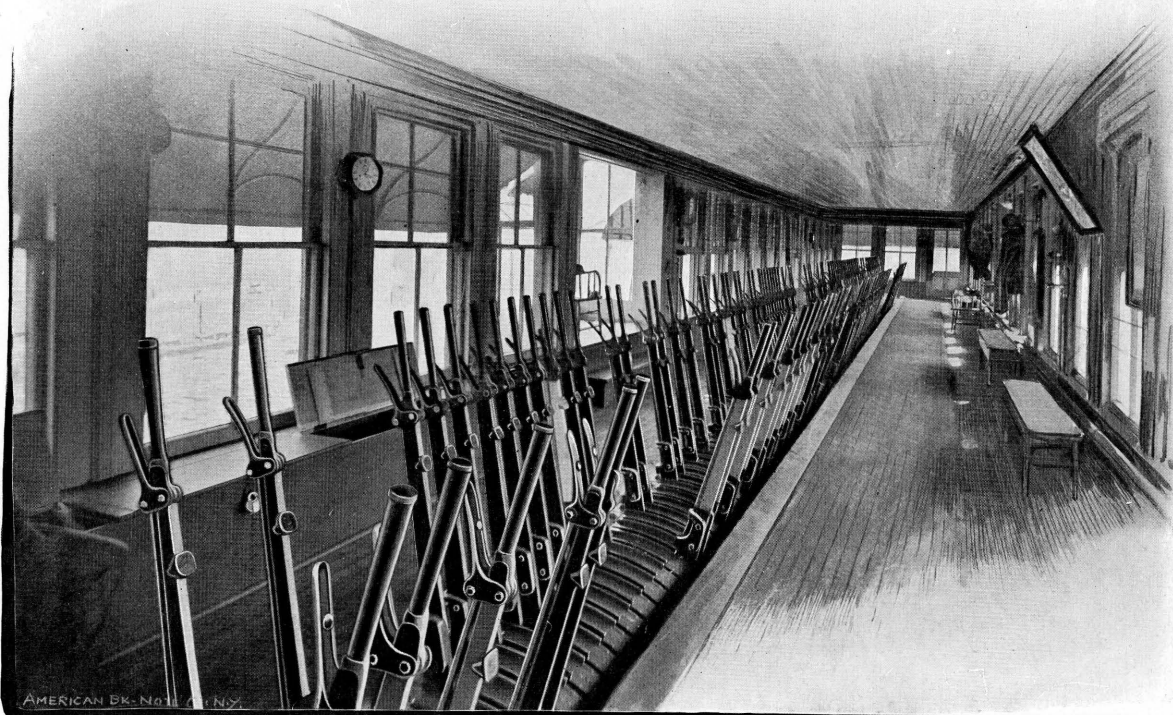
Low-Pressure System

Safety—Durability—Economy

Safety is a prime requisite in all interlocking. The advantage, in the Low-Pressure System, of freedom from the annoyance and dangers of outside or uncontrollable electric currents has already been referred to. A second important element of safety is the automatic "return indication" for each switch and signal movement, which was referred to on the preceding page. This is entirely lacking in manual-power mechanical interlocking; the integrity of the rods, connections and cranks being the sole dependence in such machines for this assurance. In large yards there is a third element which tends to increased safety—the smaller force of men required in the tower or cabin. Where from fifty to one hundred and fifty manual-power levers are worked in a single cabin it is found necessary to employ from four to eight men. This is necessary on account of the number of movements, the long distance from one end of the machine to the other, and the considerable physical energy required to move the levers. With the pneumatic machine the levers are nearer together, and the physical effort required to move them is too small to notice. With this saving in labor and in steps, it is found practicable to work a 150-lever tower with two men. And not only do we need fewer men; the men have much easier work. They may be more deliberate in each movement, while, at the

Economy
of Labor

Low-Pressure System



175-Lever Manual Machine at Grand Central Station, New York City
Replaced by Low-Pressure Pneumatic Machine

Low-Pressure System

same time, they accomplish the desired result at the switch or at the signal post with greater promptness. This moderation of the mental burden keeps a signalman's efficiency at a higher level.

Durability

Durability of the Low-Pressure Pneumatic, as compared with the ordinary mechanical interlocking machine, is a point which scarcely needs proof. The wearing parts of the machine in the cabin have extremely light service. They are made interchangeable, are inexpensive and of simple design, and new parts can be quickly substituted. In the pneumatic plant all the connections from the cabin to the switches and signals are immovable, and are buried in the ground. In a mechanical plant, on the other hand, the carriers for supporting rods, the bell-cranks and temperature compensators are among the most expensive parts of the machinery to maintain.

Easy
Inspection

Economy of maintenance is the natural result of the smaller force of lever-men required and of the features of mechanical superiority just mentioned. Besides this, the wages of repair men is an item in which there is a large saving. At interlocking plants where electricity is employed, an inspector, at liberal wages, is usually kept on duty night and day; and as men who are available for electrical inspectorships are seldom expert at mechanical signal work, it is necessary to have a separate mechanical inspection force. The economy effected by the substitution of Low-Pressure Pneumatic for mechanical machines at the Grand Central Station, New York City, which is set forth on a subsequent page, affords a striking illustration of this point.

Low-Pressure System

Description of Machine

The general exterior appearance of the interlocking machine of this company, as well as of the signals, signal bridges, and switch movements, is shown in the photographic views on preceding pages. We will now describe the principal devices somewhat more in detail.

The Diaphragm Valve

A chief characteristic of this system is the diaphragm valve. This valve is called the relay (and in the diagrams hereinafter shown is indicated by the letter R), because it performs a function analogous to that of the electro-magnetic relay in electrical apparatus. It is actuated by a comparatively weak force (air at 7 pounds pressure per square inch), but by its action opens a valve which liberates air at 15 pounds per square inch (1 kg. per square centimetre), to perform any desired work. The construction of the valve is well shown in the illustration. The work to be done is to lift the stem of the vertically placed cylindrical valve in the upper part of the case; and this is accomplished by introducing pneumatic pressure on the under side of the horizontal rubber diaphragm

Relay
Valve

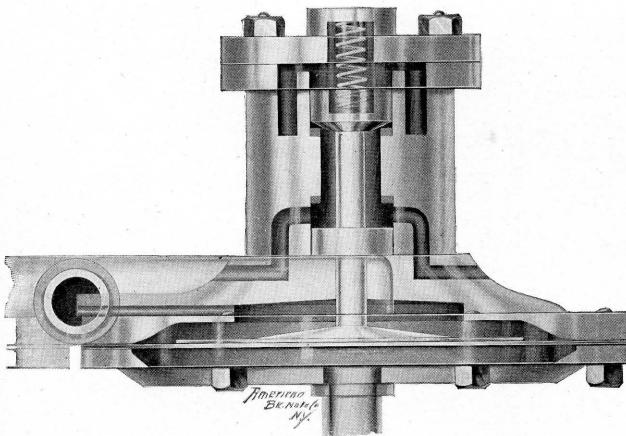
Low-Pressure System

in the lower part. This diaphragm is circular, 8 inches (2 decimetres) in diameter, and is quickly responsive to low pressure. The pistons and openings are so proportioned that a movement of the diaphragm of only one quarter of an inch (6.35 millimetres) is found sufficient for all purposes. Two relay valves, one at each end, control the switch cylinder, the piston of which moves the switch. Two at the foot of the semaphore signal post control the signal arm in a similar manner.

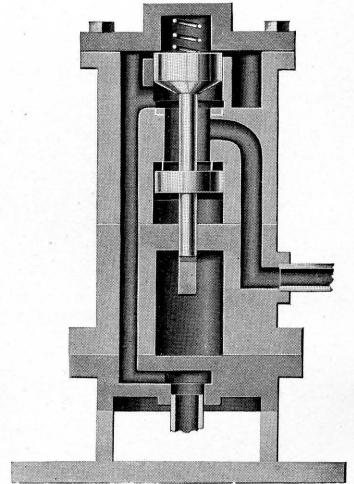
Other important parts are the *main valve* attached to the operating bar or "lever" of the interlocking machine, and the *indicating valve* placed at a switch or a signal, and actuated by the movement of the switch or the signal. This latter valve automatically notifies the signalman of the completion of the movement of the switch or signal.

Air
Supply

Other parts which are essential, but which need no description are: An air compressor, an air reservoir, air-supply pipes to each switch and signal, cylinders 10 inches (2.54 decimetres) in diameter for switches, and 5 inches (1.27 decimetres) in diameter for signals, and operating pipes $\frac{1}{2}$ inch (13 millimetres) in diameter from the machine in the cabin to each switch or signal.

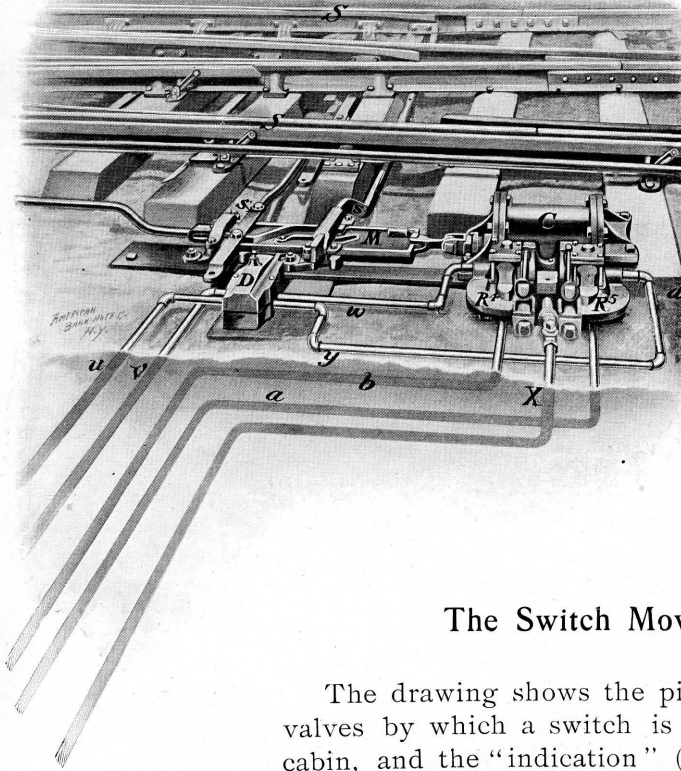


Diaphragm Valve



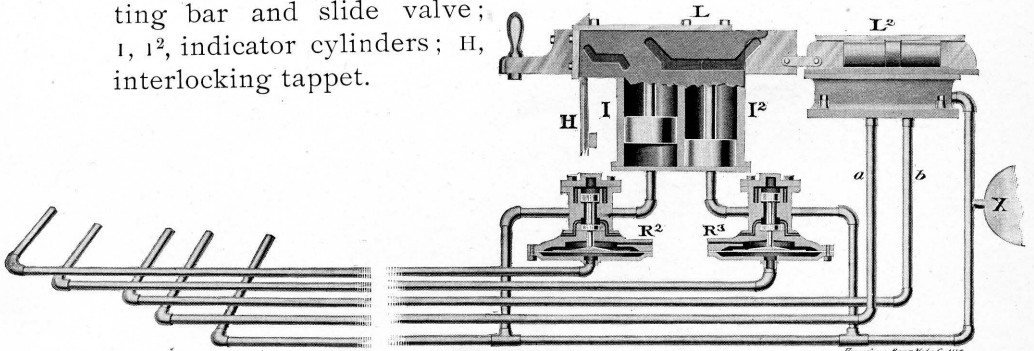
Indicator Valve on Signal Post

Low-Pressure System



The Switch Movement

The drawing shows the pipes, cylinders and valves by which a switch is worked from the cabin, and the "indication" (showing that the switch has been moved) is returned to the cabin. The principal parts are: S, switchrails; s¹, lock bar; s, switch rod; M, motion plate; C, switch cylinder; D, indicating valve; R², R³, R⁴, R⁵, controlling valves; L, L², operating bar and slide valve; I, I², indicator cylinders; H, interlocking tappet.



American Brass Works Co. N.Y.

Low-Pressure System

To change the position of the switch the signalman grasps L by the handle, and pulls it out. In doing this he admits air (from the main supply X, through the valve L²) through pipe *a* to valve R⁵, which opens communication from the supply pipe X, to the right-hand end of cylinder c, pushing the piston to the left. Observing now the slots in L and M, it will be noted that after about one-half of the stroke of L has been completed, it is stopped by the piston rod of I²; but the operation of valve R⁵, already accomplished, causes M to move through the whole of its stroke. This stroke of M is uninterrupted, but we must consider it in three parts. The first part, say one-third, does not move the switch, but valve D is moved far enough to close pipes *w* and *y*, while *u* and *v* are open to the atmosphere. At the same time lock bar s¹ has been liberated. As M moves through the next or middle portion of its stroke, it moves the switch; but it now produces no effect on valve D, because the rod of D is now engaged by the straight portion of the slot in plate M. The switch being set, the third and final part of the stroke of M locks the switch by pushing a pin through a hole in s¹; and also (but not until after the pin has entered its hole), the plate changes valve D so as to connect together pipes *v* and *y*. This conveys pressure from the supply through R⁵, *d*, D, and *v* to valve R³, which valve then admits

Switch
Movement

Low-Pressure System

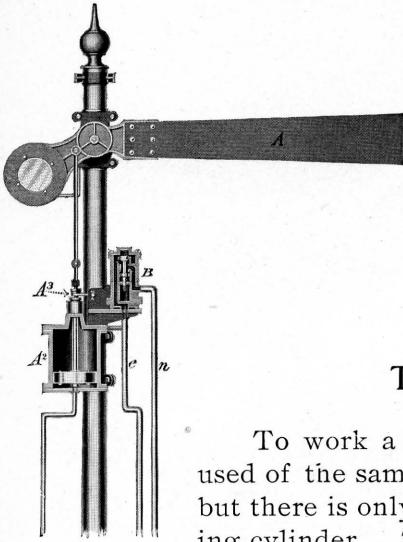
air from the supply to R^2 , forcing the piston rod upward, and, by means of the diagonal portion of the slot in bar L, forcing this bar to complete its stroke, and this without any action on the part of the attendant.

By the action of L^2 , pipe a is now opened to the atmosphere. Valve R^5 is now relieved from pressure, and R^4 is closed; so that the right-hand pipe to cylinder C and its connection to and through D are open to the atmosphere. All four operating pipes are now at atmospheric pressure.

By the movement of L, tappet H has been moved so as to produce the proper mechanical locking of conflicting levers as in ordinary interlocking machines.

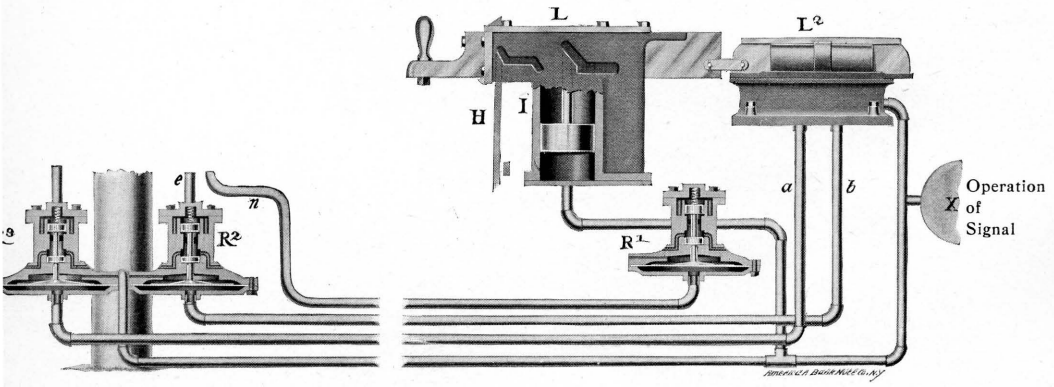
To move the switch back to its original position, the opposite set of pipes is used. The bar L is pushed to the right, air through b actuates R^4 , and the return indication to the cabin through u actuates R^2 , and lifts the piston in I.

Low-Pressure System



The Signal Movement

To work a signal, valves and operating pipes are used of the same general style as those for a switch, but there is only one indicating valve and one indicating cylinder. To assure a switchman that a signal is in the stop position, the same process is used as with a switch; but to assure him that a signal is in the go-ahead position is deemed unnecessary, and the parts are omitted. The signal connections are shown on this page. The principal parts are: A, signal arm; A², signal cylinder; A³, lever to work indicating valve; B, indicating valve; R² and R³, diaphragm valves, controlling the admission of air to the top and bottom, respectively, of the signal cylinder; R¹, diaphragm valve controlling admission of air to cylinder I; L, L², operating bar and slide valve, controlling R² and R³; H, interlocking tappet. The signal is in the normal or danger position. The indicating valve B is now in a position to maintain a connection between the two pipes



Low-Pressure System

attached to it, but the instant the signal arm leaves the horizontal position, the valve shuts off this connection. To change the signal the signalman pulls L to the left, the whole length of its stroke. By this movement L^2 , admitting air from the supply X to pipe a , actuates valve R^3 , which supplies air to the lower end of cylinder A^2 , and pushes up the piston, putting the signal in the inclined or all-clear position. In this position it remains as long as L is pulled to the left. To restore it to the normal or stop position, L is pushed to the right until it is stopped by the piston rod of I (at the end of the horizontal part of the slot in 1). With L in this position pipe b is charged and R^2 is opened. The passage between pipes e and n (through B) is now closed, so that the opening of R^2 admits air from the supply to the upper end of A^2 . This restores the signal to the horizontal position, and, by means of A^3 , opens valve B. Air now passes from e through B and n to R^1 , and the latter causes air to enter I and complete the return stroke of L by the action of the piston rod on the diagonal part of the slot. Pipes b , e and n are now at atmospheric pressure, and the parts are in the same position as at the beginning.

Operation
of Signal

Low-Pressure Pneumatic Plants

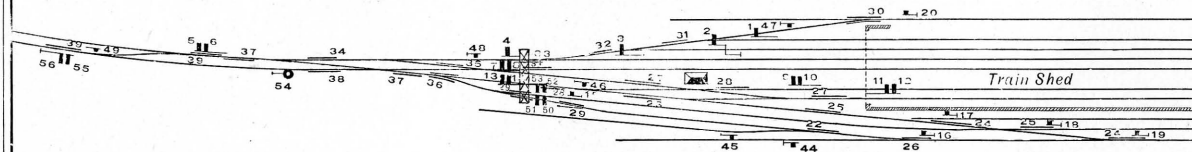
In Use or Being Installed

| NAME OF PLANT | Number of Levers | LOCATION | NAME OF RAILROAD | DATE PUT IN SERVICE |
|---------------------------------|------------------------|-------------------|------------------------|------------------------|
| West Exchange Street, | 56 | Buffalo, N. Y. | N. Y. C. | January, 1898 |
| Jamaica, | 48 | Long Island | Long Island | August, 1899 |
| Grove Street, | 64 | Jersey City | Erie | June, 1899 |
| Hoffmans, | 48 | Hoffmans | N. Y. C. | April, 1900 |
| 15th Street, | 40 | Chicago | C. & W. I. | July, 1900 |
| 16th Street, | 48 | Chicago | C. & W. I. | July, 1900 |
| Grand Central, | 176 | New York City | N. Y. C. | November, 1900 |
| Wayne Junction, | 64 | Philadelphia | P. & R. | February, 1901 |
| Suspension Bridge, | 88 | Suspension Bridge | N. Y. C. | May, 1901 |
| Pan-American Yard, | 32 | Buffalo | N. Y. C. | May, 1901 |
| Ohio Street, | 32 | Buffalo | N. Y. C. | June, 1901 |
| Seneca Street, | 40 | Buffalo | N. Y. C. | June, 1901 |

62

| | | | | |
|--------------------------------------|-------|---------------|------------|----------------------|
| Alabama Street, | 32 | Buffalo | N. Y. C. | June, 1901 |
| Buffalo Terminal, | 24 | Buffalo | Erie | June, 1901 |
| Nicetown, | 40 | Philadelphia | P. & R. | July, 1901 |
| Williams Street, | 40 | Buffalo | N. Y. C. | November, 1901 |
| East Exchange Street, | 64 | Buffalo | N. Y. C. | December, 1901 |
| 12th and Rockwell Streets, | 64 | Chicago | C. T. & T. | December, 1901 |
| Harrison Street, | 80 | Chicago | C. T. & T. | June, 1902 |
| Livingston Avenue, | 32 | Albany | D. & H. | January, 1903 |
| Carman, | 40 | Carman | N. Y. C. | October, 1903 |
| Tower 25, | 56 | Rochester | N. Y. C. | } Under Construction |
| Tower 25-A, | 40 | Rochester | N. Y. C. | |
| Tower 47, | 96 | Buffalo | N. Y. C. | |
| Tower 47 A, | 48 | Buffalo | N. Y. C. | |
| 49th Street, | 32 | New York City | N. Y. C. | |
| 56th Street, | 48 | New York City | N. Y. C. | |
| Total, | 1,472 | | | |

NEW YORK CENTRAL & HUDSON RIVER RAILROAD
BUFFALO, NEW YORK
WEST EXCHANGE STREET



56 lever machine having 51 operating levers
and 5 spare levers for future use

West Exchange Street, Buffalo, N. Y.

Diagram on opposite page.

This plant is at the western end of the main passenger station at Buffalo, N. Y. It was installed February 1, 1898. This was the first large machine of this kind that was built, and it is here that the unparalleled advantages of the low-pressure machine have been demonstrated. This machine has space for 56 levers, and the number of levers in actual use is 45. This station, owned by the New York Central & Hudson River Railroad Co., is used also by the Michigan Central; the Lake Shore & Michigan Southern; the West Shore; the Pennsylvania; the Buffalo, Rochester & Pittsburg; the Allegheny Valley, and the Toronto, Hamilton & Buffalo. Besides the through trains of the several roads, there are numerous suburban and belt passenger trains throughout the day. At this tower the number of train movements amounts to 1200 in 24 hours. This number of train movements requires 8500 lever movements. All this signaling is done by one man; that is to say, only one signalman is on duty in the cabin at a time.

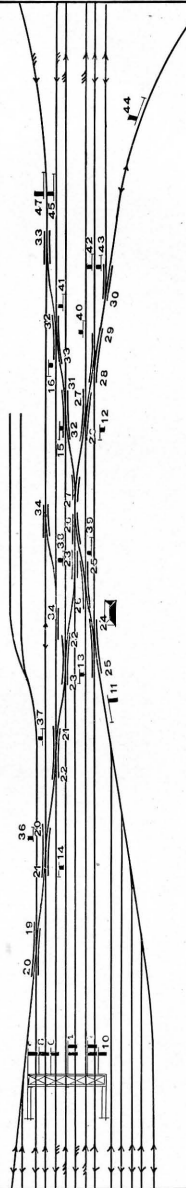
In addition to this machine, there have been installed six other pneumatic plants in Buffalo, on the lines of the New York Central & Hudson River Railroad Co., at the eastern end of the main passenger station, at William Street, Ohio Street, Seneca Street, Alabama Street, and at the main entrance to the Pan-American Exposition. Two others are now being installed at East Buffalo, one at Tower 47, and the other at Tower 47-A.

Jamaica, N. Y.

Diagram on opposite page.

This plant, with 48 levers, is at the busy suburban terminal yard of the Long Island Railroad Company, at Jamaica, N. Y., ten miles (16 kilometres) from the New York City terminus of the road. This plant has been in use about five years, with highly satisfactory results. In the summer season Jamaica is the junction or terminal point for the trains making up the very heavy passenger service between New York City and the popular seaside resorts of Long Island. During the busiest parts of the day the number of trains entering this yard averages one each minute. (See view on page 43; also page 45).

LONG ISLAND RAILROAD
 JAMAICA, LONG ISLAND



48 lever machine

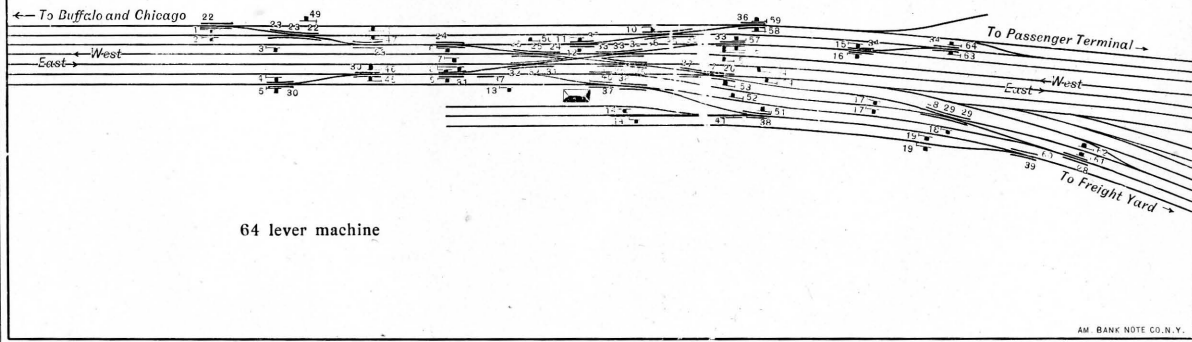
AM. BANK NOTE CO. N.Y.

Grove Street, Jersey City, N. J.

Diagram on opposite page

This machine, with 64 levers, is about one-half mile out from the station at Jersey City, N. J., which is the New York City terminus of the main line of the Erie Railroad. The trains using this station daily comprise not only the through trains to and from Buffalo, Chicago and Cincinnati, but also a large number of suburban passenger trains. There is a large freight yard on the north side of the line as well as on the south, and at the switches controlled by this tower there is a large freight movement across the passenger tracks. (See pages 47 and 49.)

ERIE RAILROAD JERSEY CITY YARD

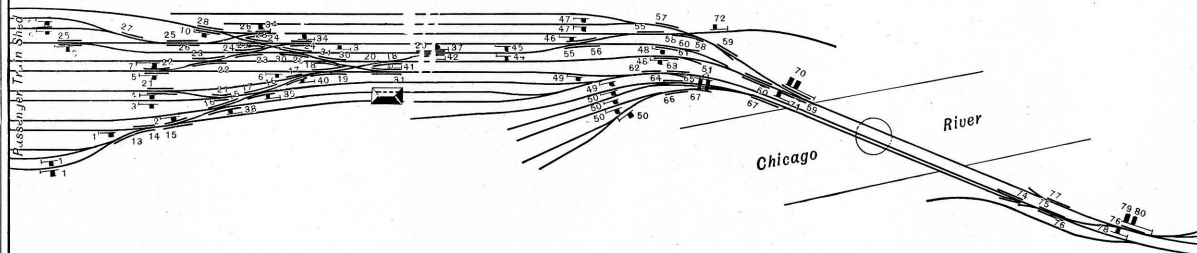


Grand Central Station, Chicago, Ill.

Diagram on opposite page

This yard is at the entrance of the terminal passenger station of the Chicago Terminal Transfer Railroad Co., at Harrison Street, Chicago. This station is used by the Chicago Great Western and the Baltimore & Ohio Railroads. This is an 80-lever machine, which controls and operates not only the signals and switches in the yard proper, but also a number of switches and signals at the farther end of the draw-bridge, as shown. The Low-Pressure Pneumatic machine at this yard takes the place of *two* power machines heretofore in use, one electro-pneumatic and the other hydro-pneumatic, there having been formerly a second cabin across the river. The substitution of an all-air machine for the others, and the use of a single machine to control the whole of the plant, were decided upon after a most thorough and careful investigation on the part of the railroad company into the merits and records of all kinds of interlocking.

CHICAGO TERMINAL TRANSFER RAILROAD COMPANY
POLK ST. YARD and DRAW-BRIDGE at TAYLOR ST.



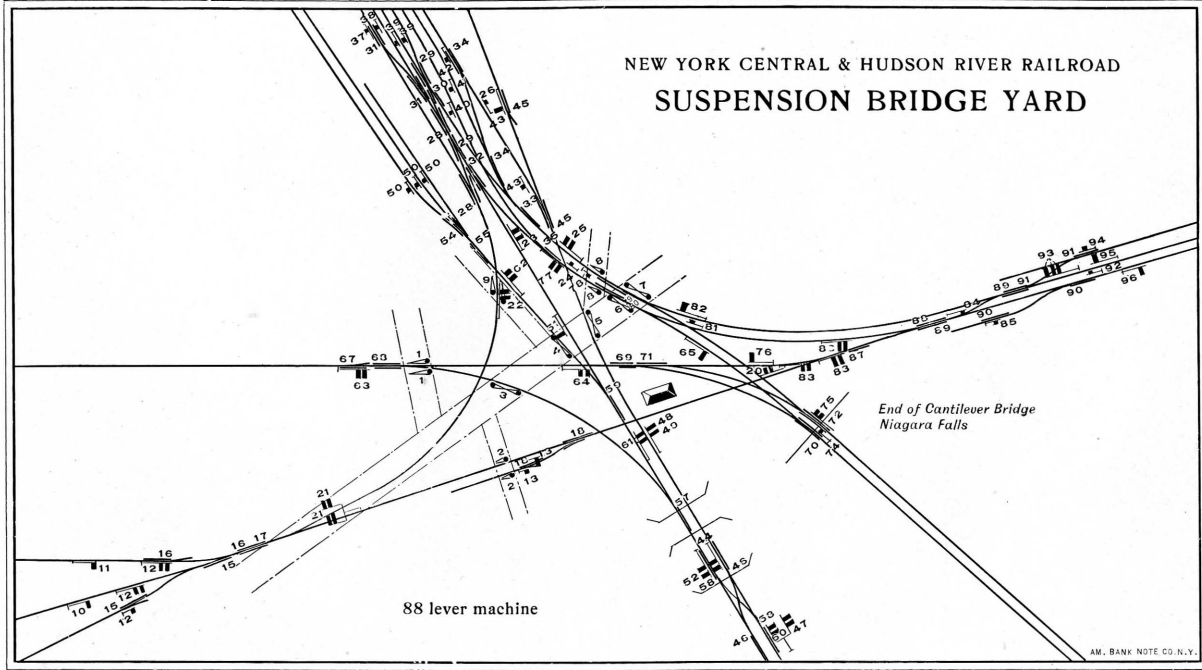
80 lever machine

71

Suspension Bridge, N. Y.

Diagram on opposite page

This yard, with its complicated crossings and junctions, is at the eastern or New York end of the two railroad bridges crossing the Niagara River below Niagara Falls. The machine has 88 levers. Suspension Bridge is the junction of three lines of the New York Central & Hudson River Railroad (from Buffalo, from Rochester, and from Lewiston); the main line of the Michigan Central, the Erie and the Lehigh Valley roads. The trains of the Canadian Pacific and the Wabash also run over these tracks.



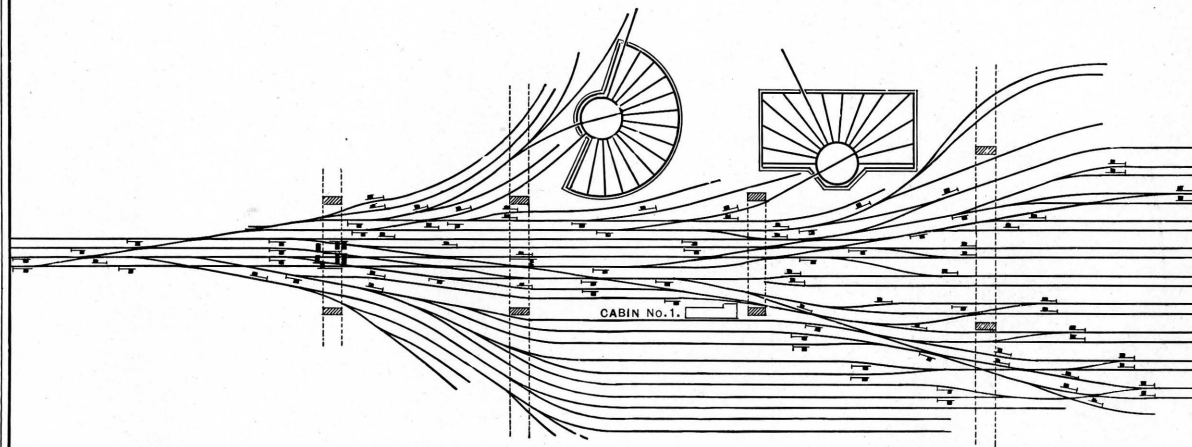
AM. BANK NOTE CO. N.Y.

Grand Central Station, New York City.

Diagram on opposite page

This station, in the heart of New York City, is the passenger terminus of the New York Central & Hudson River Railroad (main line), the Harlem Division of the same road (which was formerly the New York & Harlem Railroad, the first railroad built into the city), and the New York, New Haven & Hartford Railroad. Over the last named road travel all of the trains from New York to Boston. The total number of train movements to and from this yard is about 1030 daily, in addition to which are the usual switching and engine movements. This is a very busy yard, the available area being insufficient for the demands of the business. The 1030 regular trains necessitate about 4000 engine movements in the yard, and each movement involves an average of seven lever movements. On October 9, 1903, a day when the volume of business was normal, the total number of lever movements in Tower No. 1 was 30,330, or an average of 1,264 each hour. The largest hour-record was between 8 and 9 o'clock in the morning, 1,980; and the smallest was between midnight and 1 a. m., 320. On October 11, the number of engine or train

GRAND CENTRAL STATION, NEW YORK



TOWER No. 1
176 lever machine

AM. BANK NOTE CO. N. Y.

movements was 4,080 or 178 per hour. The largest number in one hour was 260, from 5 p. m. to 6 p. m.: and the smallest was 58, between 3 a. m. and 4 a. m.

The total number of passengers (exclusive of free passengers) carried to and from this station in the twelve months ending with September, 1899, was 12,974,867; total number of pieces of baggage 1,354,334; total number of bicycles 71,524.

The LOW-PRESSURE PNEUMATIC machine in this yard, built by this Company, takes the place of two mechanical machines which were previously used. These two machines were in two separate towers about 800 feet (305 metres) from one another. The control of these two plants is now concentrated in a single cabin, this concentration being made possible by the superior facilities of the pneumatic system. The pneumatic machine is not yet fully completed. When finished it will have 176 levers, taking the place of over 200 mechanical levers. By the reduction in the number of lever men required to handle the switches and signals, and the smaller force of repair men required, the expenses of operation have been reduced at least \$12,000 (£2,464) yearly. The number of men required to man the two mechanical towers for one day of twenty-four hours (three shifts of eight hours each), was twenty-three, while the number required with the single pneumatic machine is only eight. (See page 53.)

All of the additional tracks which are being put in on account of the new terminals now building are being controlled by the Low-Pressure Pneumatic system.

Electrical Appliances

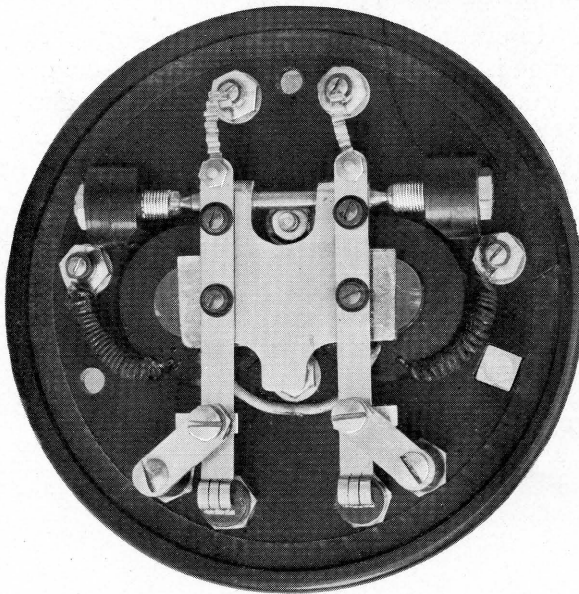
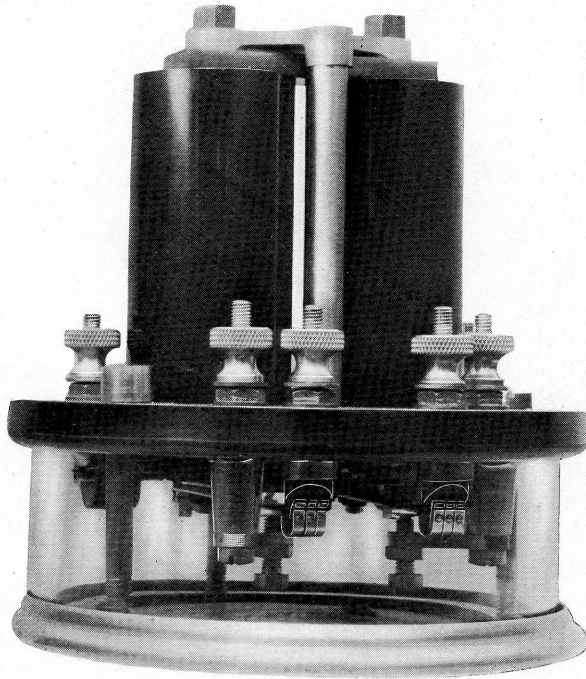
Electrical Appliances

Relays

The relay shown on the following page is our Style "H" double point with front and back contacts. This style of relay has been generally adopted for track circuit work. It is made with any desired combination of front and back contacts up to three of each and with either platinum or carbon front contacts and platinum back contacts. The insulation in this as in other forms of electrical appliances manufactured by this Company is subjected to a test of alternating current of high voltage before being passed by the inspectors. The armature is fitted with steel trunnions turning in glass bearings. The coils are wound to any resistance desired. The enclosing glass case is dust and weather proof. The relay may be arranged to pick up and drop at any point specified. In other forms of relays of this general character, the guarantee is that the magnets will release with a current of 50% of that required to lift the armature and close the contacts. *This new form with improved insulation is guaranteed to release at 60%.*

We are now manufacturing these relays with "Special Compound" tops which makes the separate insulation of each binding post unnecessary. This compound has all the insulating properties of hard rubber and the strength and durability of brass and does not warp. It allows at least $\frac{1}{8}$ in. of air insulation between the binding posts.

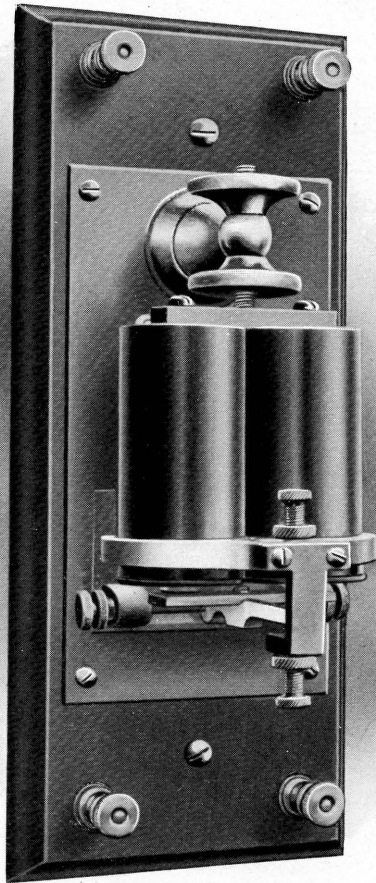
When desired we can furnish the Style "H" Relay arranged as a polarized relay, and in this form it is never made up with less than two neutral and two polar contacts.



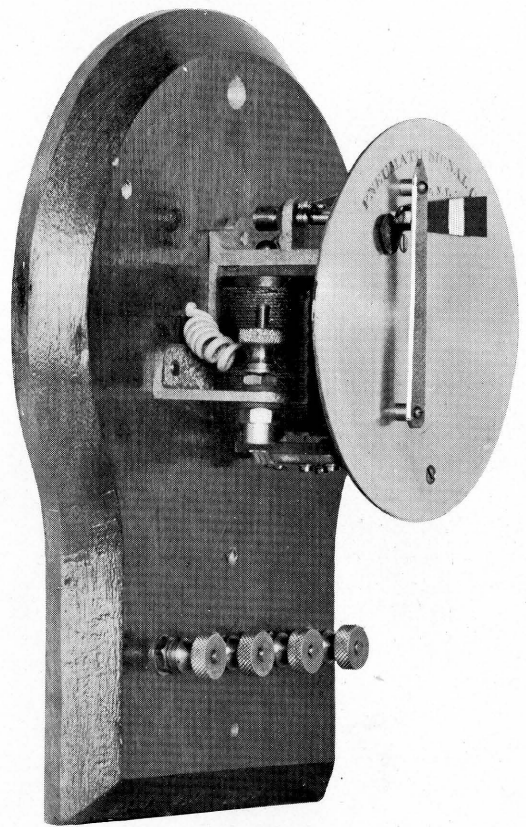
Style "H" Relay
Double Point, Front and Back Contacts

Style "A" Relay

This relay has found a very large sale. Coils adjustable. Contact points platinum or carbon. Highly finished and is recommended where a relay of small cost is desired. Made with all the various combinations of front and back contacts. Rubber coil covers.



Style "A" Relay



Home Signal Indicator—Case removed

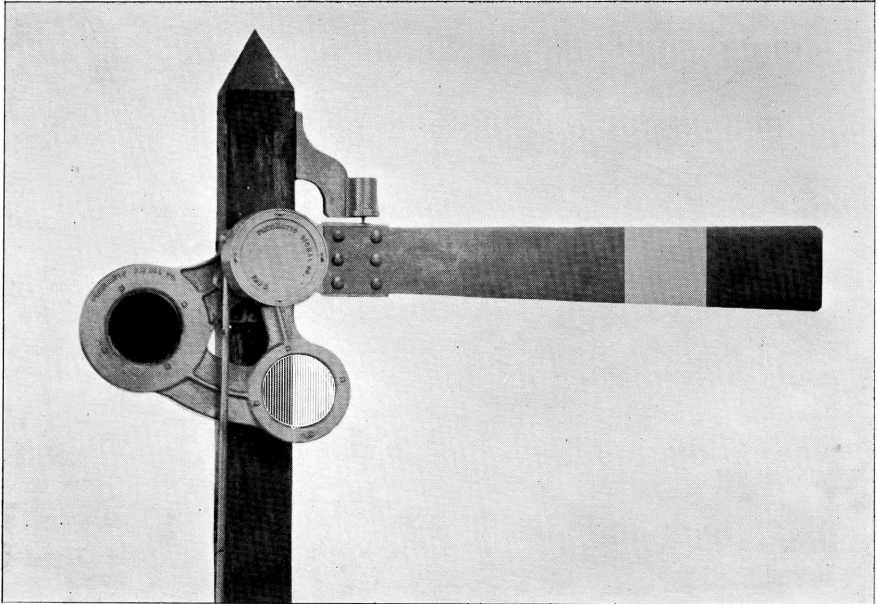


Home Signal Indicator—complete. (83 AB)

Signal Indicators

The illustration on the opposite page shows our Home Signal Indicator (83AB) with one front contact. This repeater can be furnished with any desired combination of front and back contacts up to three of each. It is mounted on a mahogany base, the wires being led on the back of the board direct from the binding post to the contact springs. It has steel shafts with brass bearings. The contacts are of carbon or platinum. The inspection and adjustment of the interior of the repeater is very easily accomplished, it being only necessary to take out three screws in order to remove the glass front and surrounding case.

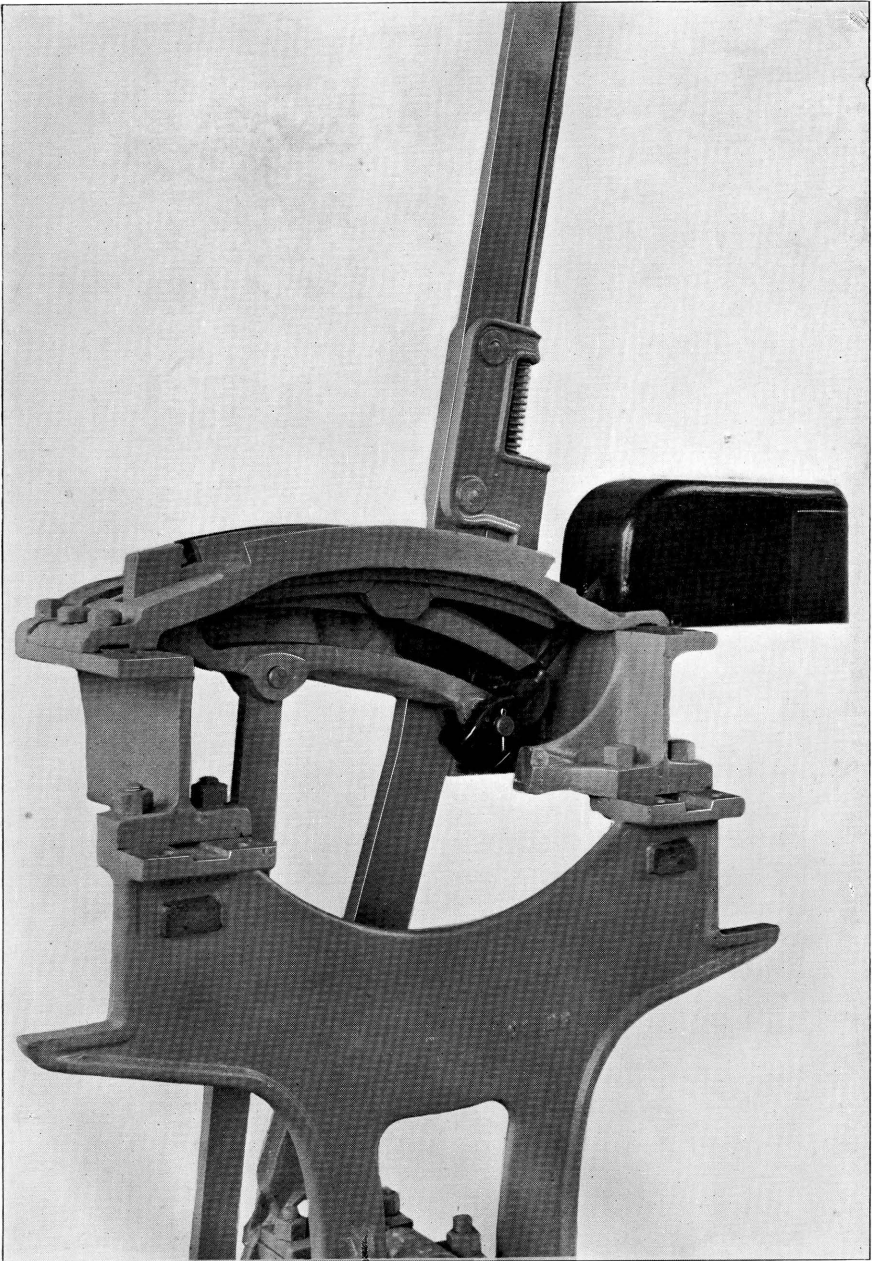
We also manufacture two styles of 2-position Distant Signal Repeaters, one presenting the same external appearance as the Home Repeater; the other is of a different and cheaper form.



Electric Slot (84AA)

Electric Slot

The Electric Slot, illustrated on the opposite page, is attached directly to the spindle to which the blade grip is fixed. In other forms of electric slots it is necessary to remove a section of the up and down rod in order to put the slot in position to form a part of the operating mechanism. This slot can be attached directly to any form of spindle, but in order to avoid moving wires, we furnish a hollow spindle and run the wires through it. This method avoids the movement of wires and consequently there is no liability of their becoming chafed or injured. The slot has a much neater appearance on the signal than any other form, it being but slightly larger than the central boss of the blade grip and at a short distance from the signal it cannot be detected. It can be attached to the pole in much less time and at much less expense than any other form. The slot operates satisfactorily on two cells of Gravity Battery. It is advisable, however, in order to avoid frequent attention on account of depreciation of battery, to install the slot with four cells. THE DESIGN OF THE SLOT IS SUCH THAT THE ADJUSTMENT IS PERMANENT, thus avoiding the possibility of disarrangement.



Style "B" Lock attached to Style "A" Machine

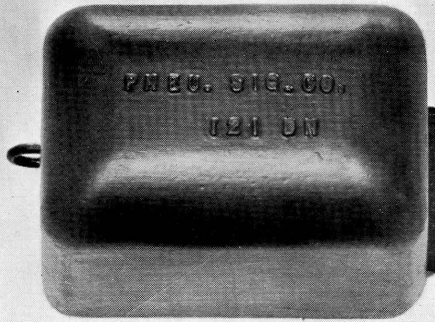
Electric Locks

The illustration shows the method of connecting our style "A" or style "B" Lock to the style "A" machine. The body of the lock is bolted on the back girder of the machine, and by a special rod (81 AH) the locking dog of the lock is connected with the rocker. Until the magnet of the lock is energized, no movement of the lever can be made.

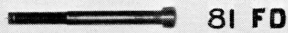
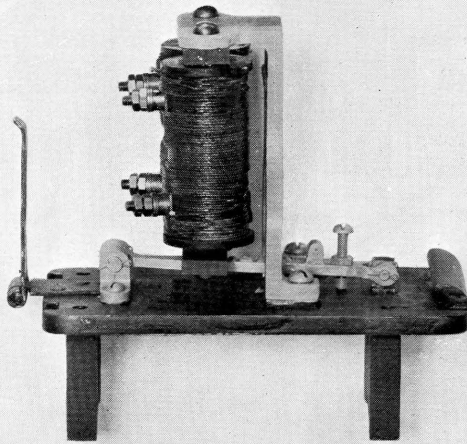
Our style "B" Lock is shown on the next page. The only difference between styles "B" and "A" is in a commutator which is included in the "B" Lock, but not in the "A." This commutator is operated by a connection to the shaft of the locking dog and can be fitted with from one to four contacts. The magnet coils are wound with any desired resistance. The lock shown in illustration is provided with a normal locking dog, which is sent with the lock unless a reverse dog is specified.

The same general design of locks is furnished for the Saxby & Farmer machine. These are designated as styles "E" and "F". The style "F" is provided with a commutator.

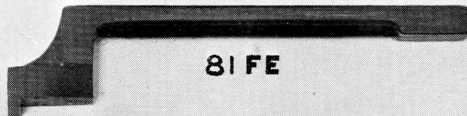
The style "D" Lock, shown on page 87, is arranged for use on the Dwarf Interlocking Machines, and is especially valuable for controlling the switch at the far end of a siding, the distance of which is too great for it to be conveniently operated from the signal cabin.



81 FA



81 FD

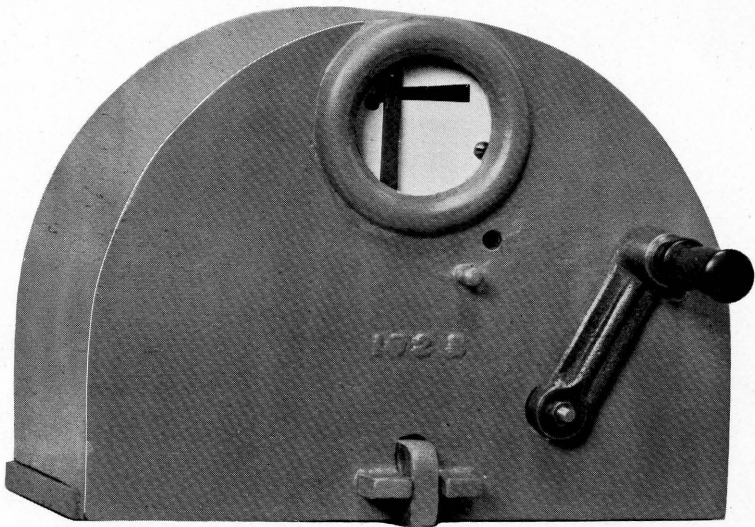


81 FE

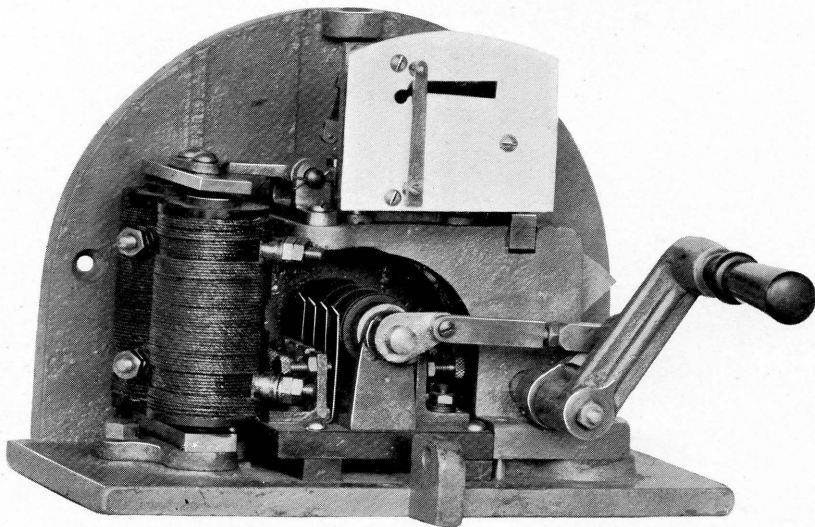


81 FF

Style "D" Lock. (81FA)



Outlying-Switch Controller. (81PA)

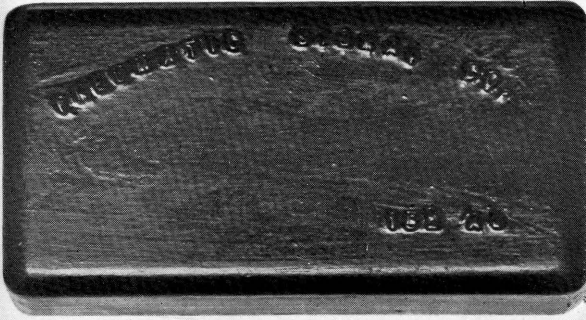


Outlying-Switch Controller—Cover removed

Outlying-Switch Controller

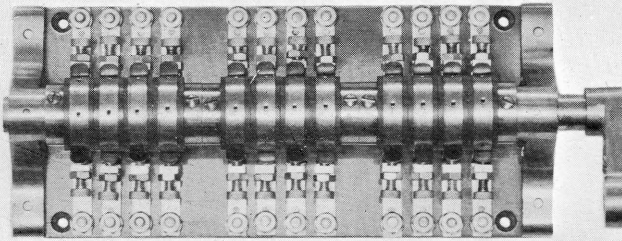
The Outlying-Switch Controller, as its name implies, is used for the control of a switch located between Signal Cabins of a Controlled Manual Block System. The one shown herewith is known as our style "A" (81-PA). The interior of the Controller is practically the same as our style "B" Lock.

The commutator is supplied with one, two, three, or four contacts either normally open or closed as desired. The Controller has a visual indicator which is operated by the armature lever. The coils are wound to any desired resistance.



82 DE

82 DA



82 DB



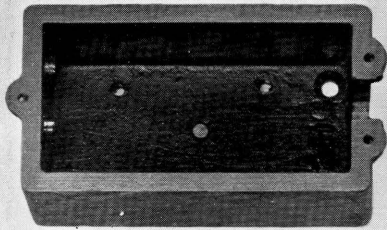
Tappet Multi-Circuit Controller. (82AF)

Circuit Controllers

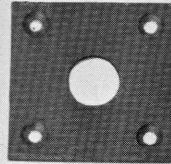
There are several different kinds of Circuit Controllers manufactured by this Company. The one illustrated is known as the Tappet Multi-Circuit Controller. It is operated from the tappet by the connecting rod (82-DA) which is attached to the tappet by a special stud (82-DB), and to the controller handle by the screw jaw and its pin, which is included with the rod. The screw jaw is provided for necessary adjustment. This form of controller is made in two sizes; the smaller having four, six, or eight contacts, and the larger, ten or twelve contacts.

Another style is the One-Way Tappet Circuit Controller, the lever of which is designed to be attached directly to the tappet, the box containing the contacts being supported by a piece which takes the place of the bearing cap on the bottom girder of the style "A" machine.

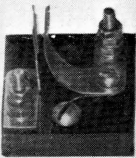
In addition to these we make a Rotary Signal Commutator arranged to be placed on a signal pole, having from one to four contacts as desired.



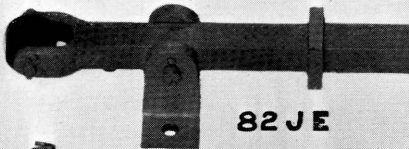
82 JB



82 JH



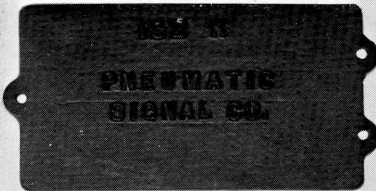
82 JD



82 JE

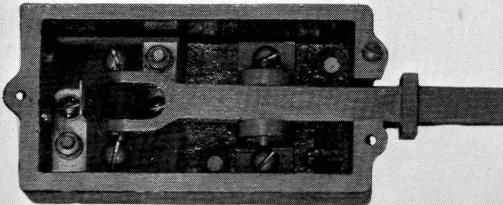


82 JF



82 JG

82 JJ

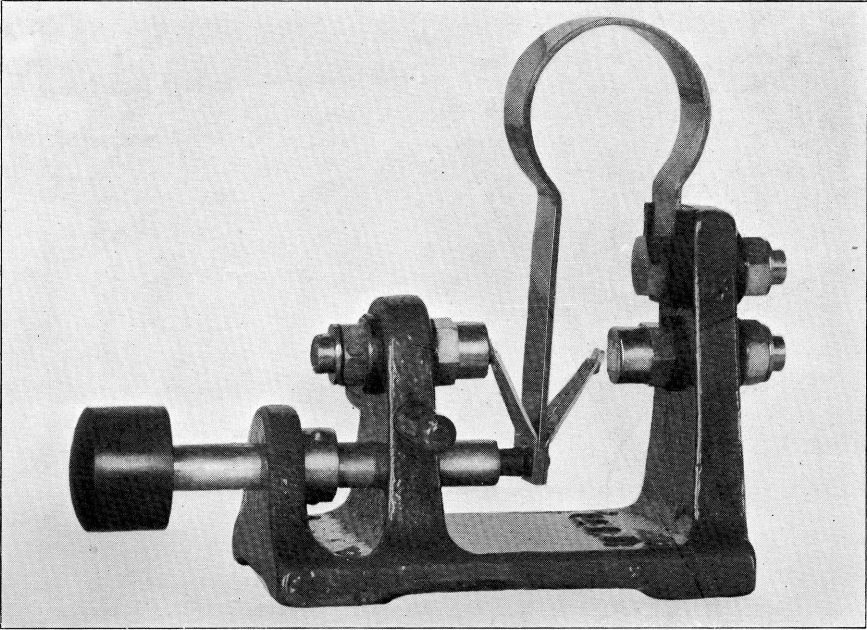


82 JK

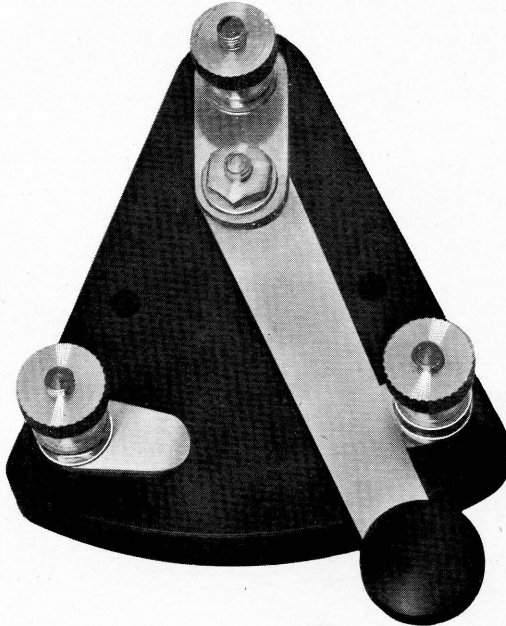
Floor Push. (82JA)

Floor Push

The Floor Push (82-JA), shown in detail on the opposite page, is used in interlocking cabins for the purpose of making a circuit which is kept normally open. The box containing the contacts and actuating lever is fixed under the machine-floor of the cabin, and the rod (82-JJ) is passed through the floor plate (82-JH) and through the floor so as to rest in a notch on the upper side of the lever (82-JE). This lever has on its other end a rubber roller. The downward pressure of the rod (82-JJ) brings together the two contacts (82-JD) completing the circuit. One of the uses of this floor push is to automatically cut off the current from an electric lock.



Bell Key. (82HA)



Hand Switch. (82KA)

Bell Key

On the upper part of the opposite page is shown the Bell Key (82-HA) which is the standard of this Company. It has front and back contacts and may therefore be used on open or closed circuit or as a two-way circuit controller. The contacts are all of platinum. To change the circuit, considerable pressure must be applied to the push-button. The binding posts are carefully insulated from the frame.

Hand Switch

On the lower part of the same page is represented one form of hand switch (82-KA) made by this Company. As made in this form it is suitable for a number of different purposes. This same style of switch will be furnished with as many poles as desired.

Railway Crossing Gates

Railway Crossing Gates

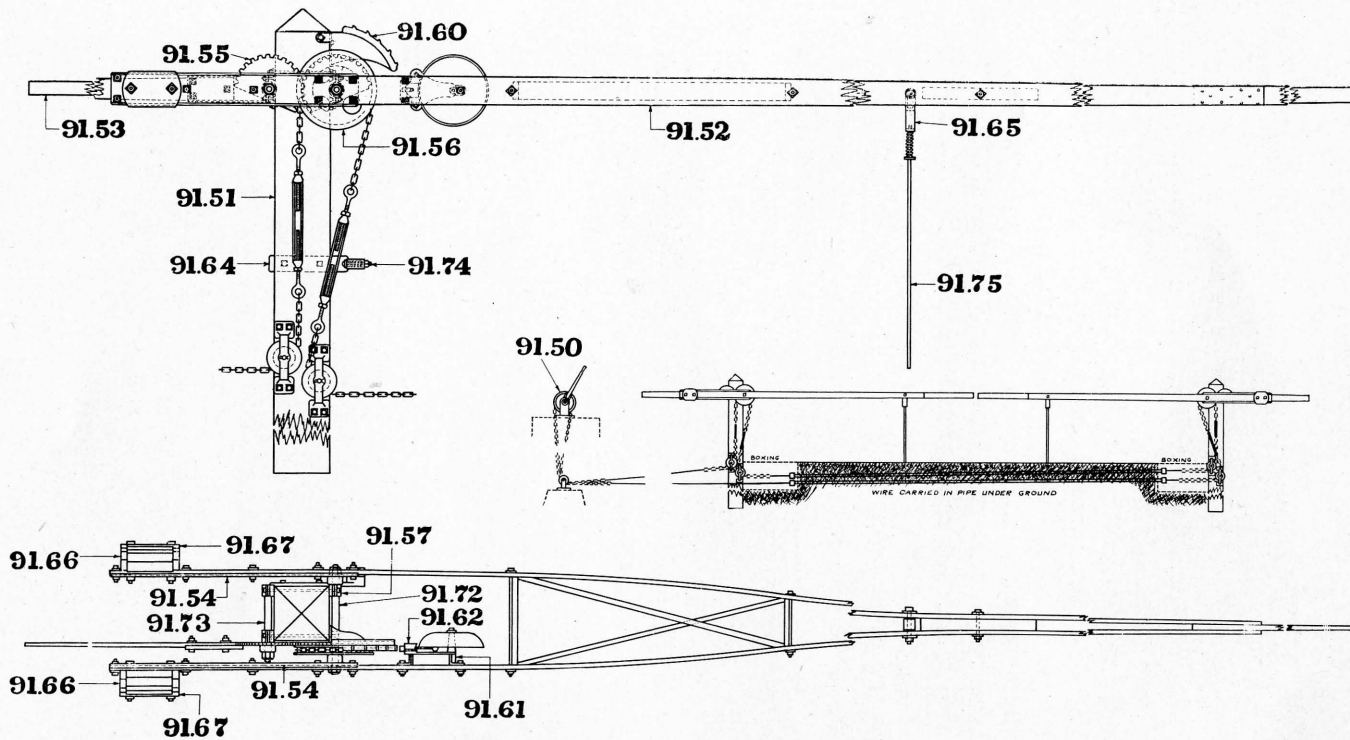
The protection of grade crossings of Steam or Electric Railways with highways, is perhaps as necessary as the equipment of a Railway with air brakes or block signals, and indeed there are more people killed on highway crossings of Railways than by collision or derailment of trains. The traveling public anticipate, to a more or less degree, the possibility of accident in travel, and assume a certain responsibility when they board a train, and yet the liability of accident is considered less on any common carrier than in the ordinary pursuits of life.

The highway is a public avenue for travel, and the railroad crossing of a public highway at grade should be guarded by some means which will give protection to the people using that highway.

If the track and right of way was completely guarded so as to prevent man or beast from getting upon the tracks when there was danger, and if distant signals were displayed upon the railway and highway, we would more nearly approach perfect conditions. The practice in England is to provide regular gates interlocked and working with Semaphore signals. A substantial house for gate tender is built at the crossing, and night and day the crossing is guarded.

If no physical protection is provided, as is done in England, THERE IS NO NECESSITY OF USING THE EXPENSIVE FORM OF GATE, generally in the form of an arm, moving through a vertical arc, and stretching across the highway. The arm is merely a sign and is no bar to man or beast seeking to cross the tracks. It is similar to the Semaphore signal giving notice to approaching traffic on the highway that the crossing is dangerous.

Railway Crossing Gates
Style A-1



Pneumatic Signal Co.'s A-1 Railway Gate.

Railway Crossing Gates

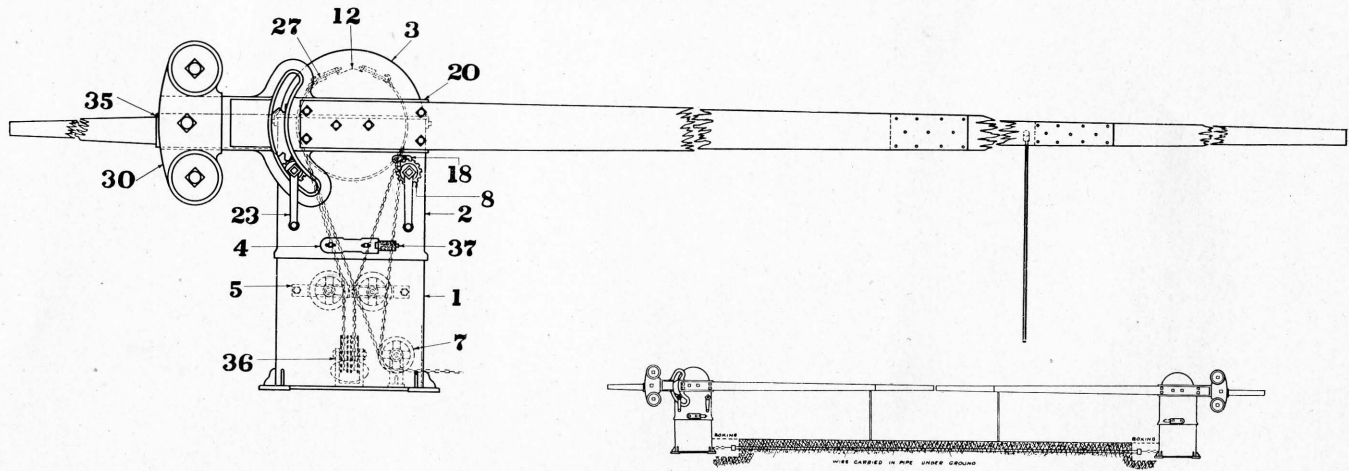
Style A-1

The Railway Crossing Gate, illustrated on opposite page, is, we believe, the simplest form of gate which fulfills all the requirements of a gate having one arm extending over the street and one arm protecting the sidewalk. It is intended that all connections are to be made of wire with chain where connections pass over wheels.

Where the connections pass across streets it is intended to carry the wire in a one-half inch iron pipe, fitted with stuffing boxes and filled with crude oil. This method of working the gates gives the best results. If the wires are carried in boxing considerable trouble is experienced in cold climates by freezing.

This form of gate is easily operated, and where two or three crossings occur close together, and there is no obstruction to the vision, a simple tower may be erected, and one crossing tender can manipulate all the gates.

Jonson Railway Gate



THE JONSON GATE—Front Elevation, with Sidewalk Arms.

Jonson Railway Gate

The Railway Gate, illustrated on the opposite page, is the well-known type, standard on many railways. The post is of cast iron, made in two sections, 1 and 2. The connections are carried inside the post and all parts are made massive. These gates are good for fifteen years' service under exacting conditions, and are recommended for cities at points where traffic is very heavy.

This gate was designed for pipe connections, but can be worked with either pipe or wire. In many cases where these gates were installed with pipe connections carried in boxing, they have been changed to wire connections carried in pipe.



PRESS OF A. J. WEGMAN
ROCHESTER, N. Y.