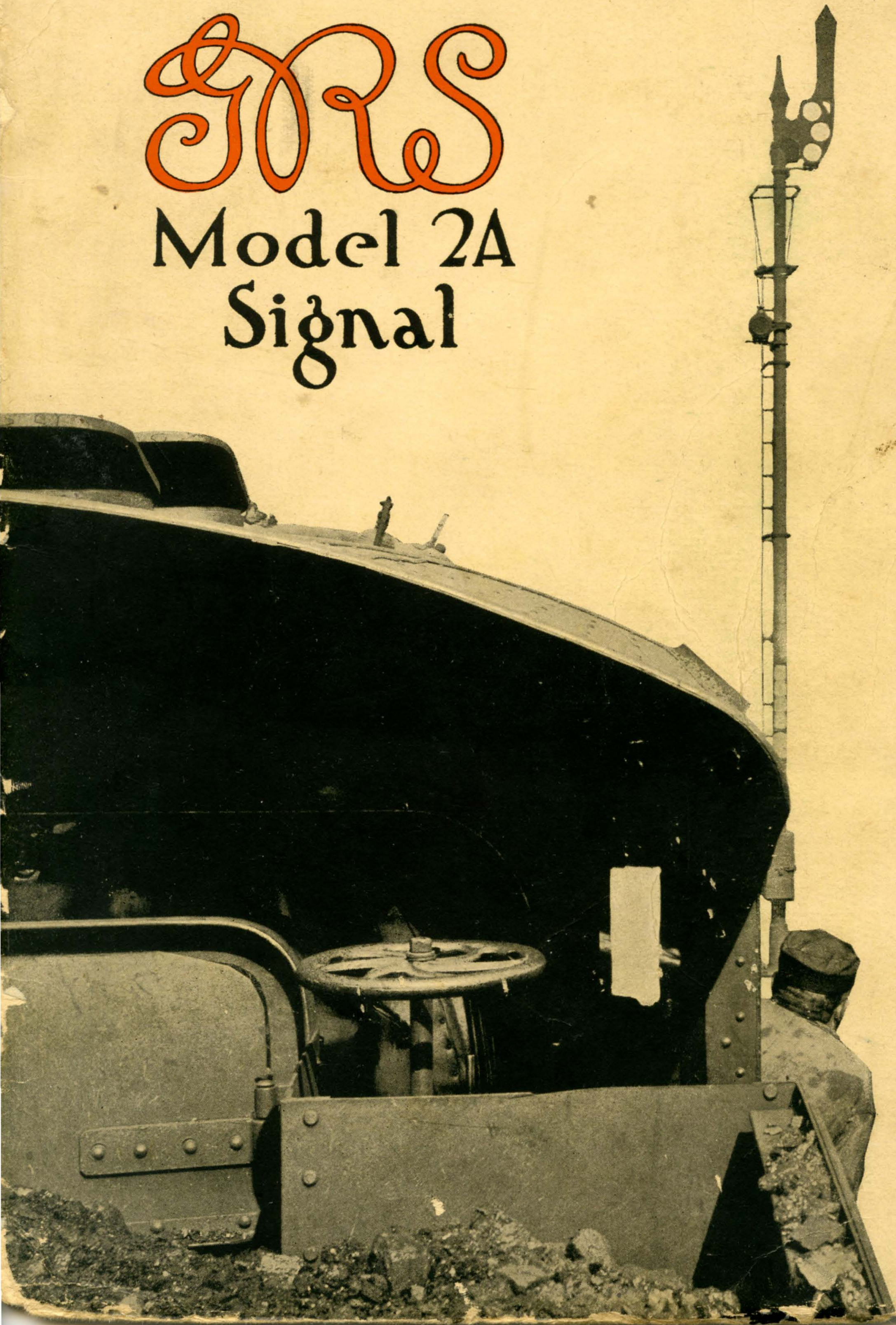
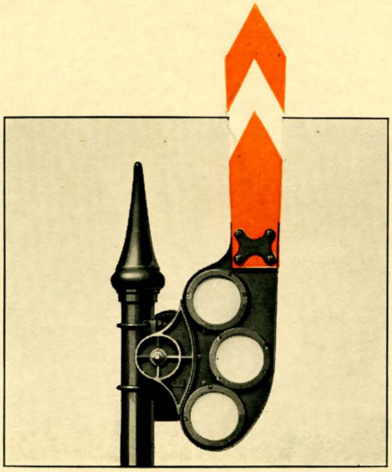
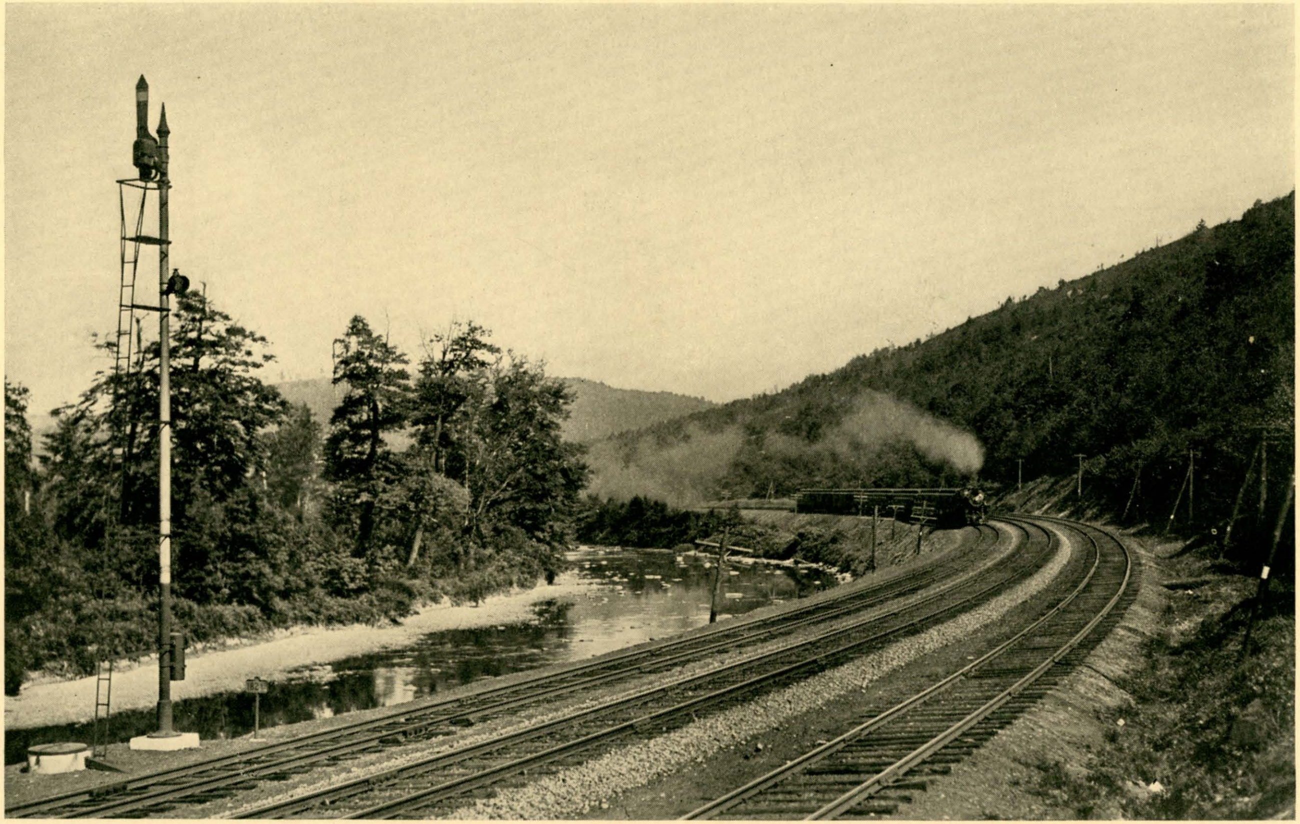
GRS

Model 2A Signal







Model 2A Signal. Buffalo, Rochester & Pittsburgh Ry.

GRS

Model 2A Signal

Bulletin 115 C
March
1914

GENERAL RAILWAY SIGNAL COMPANY
ROCHESTER, N.Y.
QUALITY

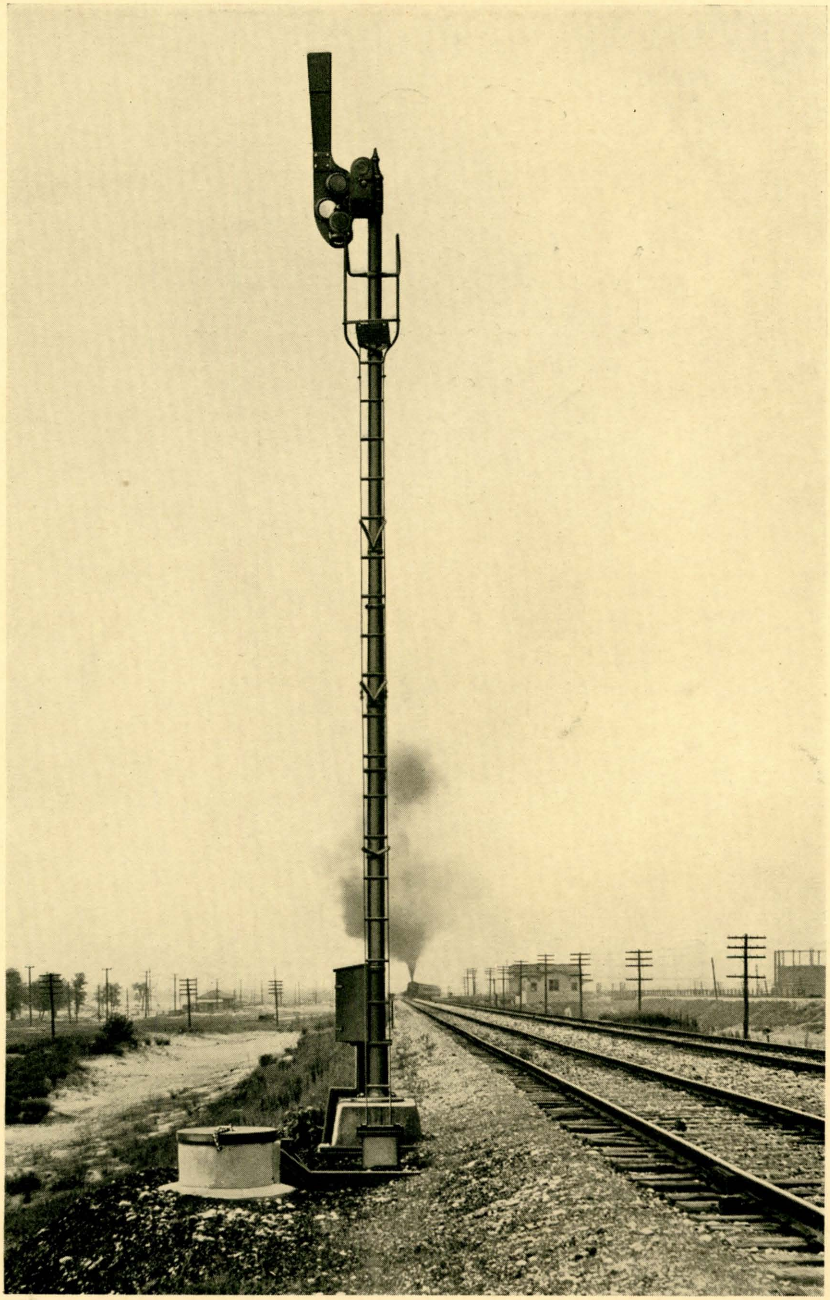
New York
Liberty Tower Building
55 Liberty St.

Chicago
Peoples Gas Building
122 So. Michigan Ave.

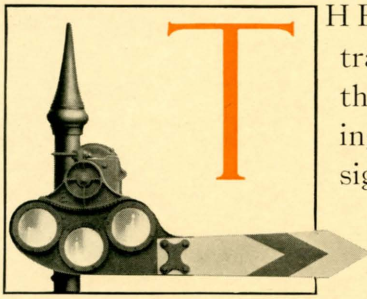
San Francisco
Monadnock Building
681 Market St.

Canadian Agency
General Railway Signal Company
of Canada, Limited
Lachine, P. Q. Winnipeg, Man.

Australasian Agency
R. W. Cameron & Company
Sydney, N. S. W. Australia
16 Spring Street



Model 2A Signal. Baltimore & Ohio R. R.



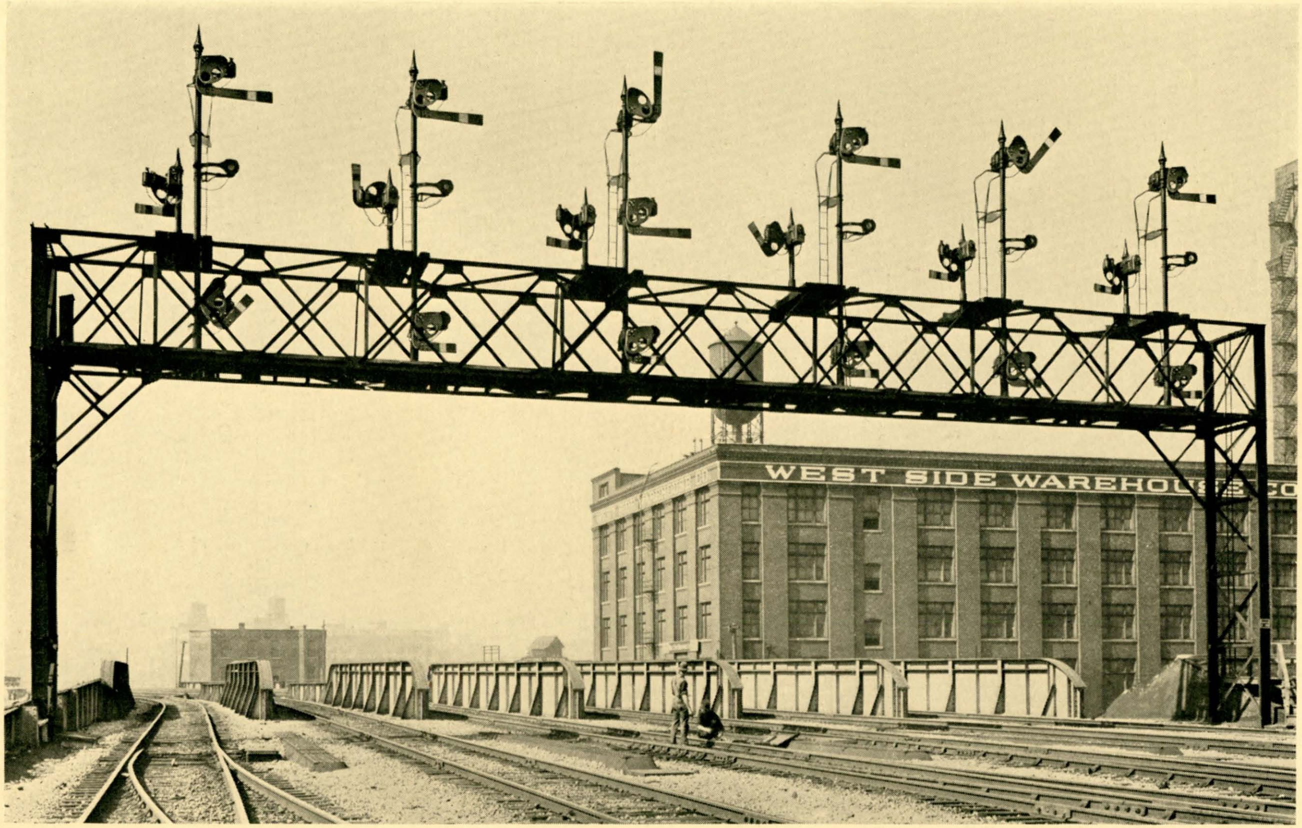
INTRODUCTION

THE rapid development of railway traffic has created a demand for the power signal in block signaling and interlocking. The power signal has also been developed to meet the increasing requirements and today is an important factor in the safe and economical operation of railway trains.

In blocking or spacing trains, the power signal in connection with a track circuit, automatically indicates the presence of a train in the block, a misplaced switch or a broken rail; in routing or switching trains, in connection with electric interlocking, the power signal under control of a leverman, and track circuit also when desired, may be located at any distance from the interlocking tower so that the limits of the interlocking plant are unrestricted; and as a distant signal, in connection with a mechanical interlocking plant, the power signal may be located at a sufficient distance from the home signal to afford proper braking distance for high speed trains.

Since the invention of the closed track circuit in 1872 the power signal has passed through successive stages of development: from the clockwork disc to the electro-pneumatic semaphore; from the electro-pneumatic semaphore to the enclosed disc; from the enclosed disc to the electro-gas semaphore; and finally to the highly perfected electric motor semaphore.

The principal objections to former types of power signals were: first, the operation of the mechanisms was unreliable; second, the high cost of maintenance and



Model 2A Signals. Chicago Terminal, Chicago & Northwestern Ry.

operation; third, in the case of electro-pneumatic and electro-gas signals, the inconvenience and additional expense of supplying two kinds of energy, electricity and compressed air or gas.

The superior advantages of a semaphore signal operated by an electric motor were so apparent that, for the past twenty years or more, signal engineers have confined their efforts to the perfection of this type of power signal.

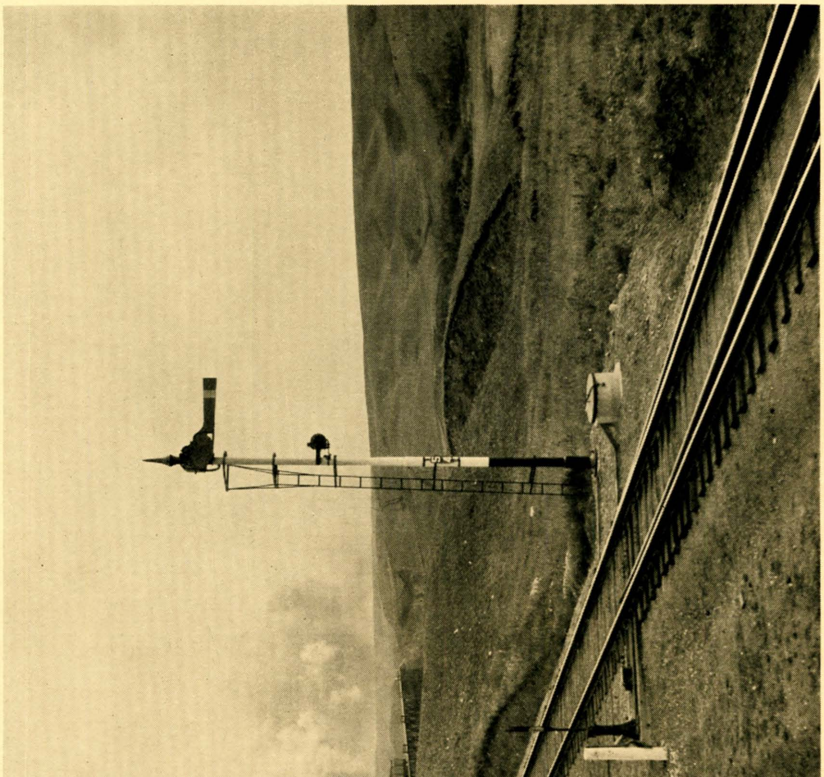
The General Railway Signal Company was one of the first manufacturers of signal appliances to design electric, motor operated, semaphore signals, many of which are still in service.

As the use of the power signal became more extensive there was urgent need of a mechanism adaptable to the various requirements, a mechanism that could be used as a high signal or dwarf signal, as an automatic, semi-automatic or non-automatic signal, a mechanism that would give the desired indications in the upper or lower right or left hand quadrant and could be arranged to operate on practically any voltage A. C. or D. C.

The Model 2A Signal was designed, in 1908, to provide a uniform signal mechanism for all requirements and embodied many new features in design and construction which were the result of the experience of many years in the manufacture of electric signals and from the record made by prior types of signals, under service conditions.

The main points of the Model 2A Signal, in addition to being adaptable to the various requirements, are:

First — The construction and arrangement of the several parts of the mechanism, providing for quick inspection and adjustments. The circuit controller is placed at the top of the mechanism where all contacts are visible and may be easily arranged or re-arranged to control the various circuits.



MODEL 2A SIGNALS. GREAT NORTHERN RY.

SECOND — The direct connected mechanism, which insures the proper movement of the signal arm and reduces losses in mechanical energy, between motor and signal arm, to a minimum.

THIRD — The elimination of slot and dash pot, which materially increases the efficiency of the power signal and reduces the cost of maintenance, as the mechanism requires less attention.

FOURTH — The electrical means for holding the signal arm in any desired position.

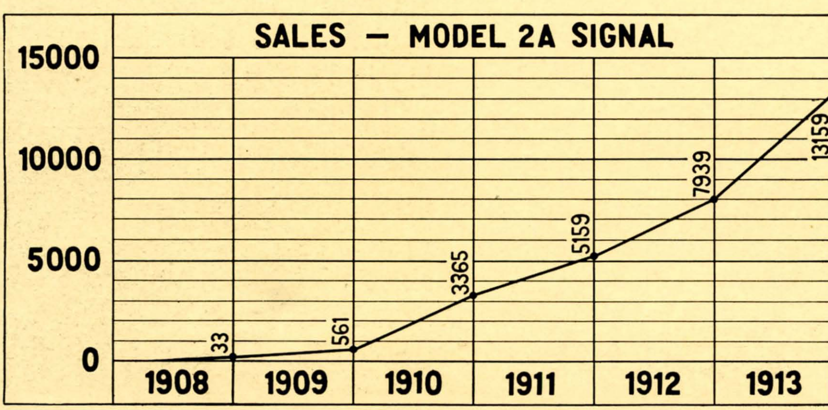
FIFTH — The electrical means for retarding the signal arm when going to the caution or stop position.

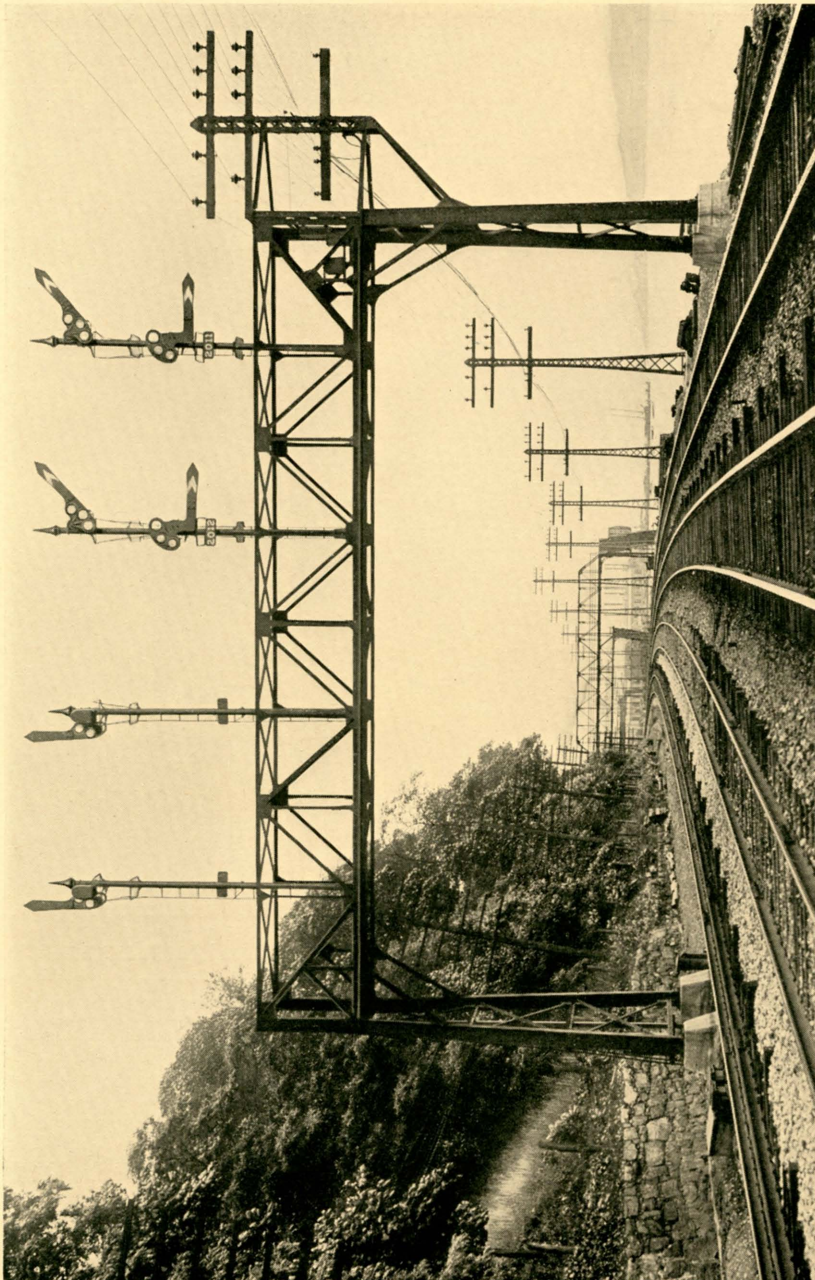
SIXTH — The low operating and holding current required, resulting in long life of battery.

SEVENTH — The short time it takes for the motor to clear the signal.

EIGHTH—The facility of applying a Model 2A mechanism to a mechanical signal, thereby converting the mechanical signal into a power signal.

There is no better basis for judging the merits of a power signal than the extent to which it is used. The following diagram shows the total number of Model 2A Signals that have been ordered previous to January 1, 1914, by eighty-eight railroads.





Model 2A Signals. New York Central R. R.

ADAPTABILITY OF THE MODEL 2A SIGNAL MECHANISM

APPLICATION:

Ground . .
Bridge. . .
Bracket . . } Signal.
Suspended .
Dwarf . . .

CONTROL:

Automatic.
Semi-Automatic.
Non-Automatic.

OPERATION:

10 to 650 volts D. C.
55 to 220 volts A. C. 25 or 60 cycles.
Low Operating Current—2.2 amperes for 10 volt D. C. Mechanism.
Low Holding Current—0.018 amperes for 10 volt D. C. Mechanism.
Clearing Time—10 seconds for 10 volt D. C. Mechanism.

INDICATION:

Dynamic.
Battery.

ASPECT:

Upper Right or Left-hand Quadrant.
Lower Right or Left-hand Quadrant.
Two or Three Positions.
Any Angular Movement.

There is no slot.
There is no dash-pot.

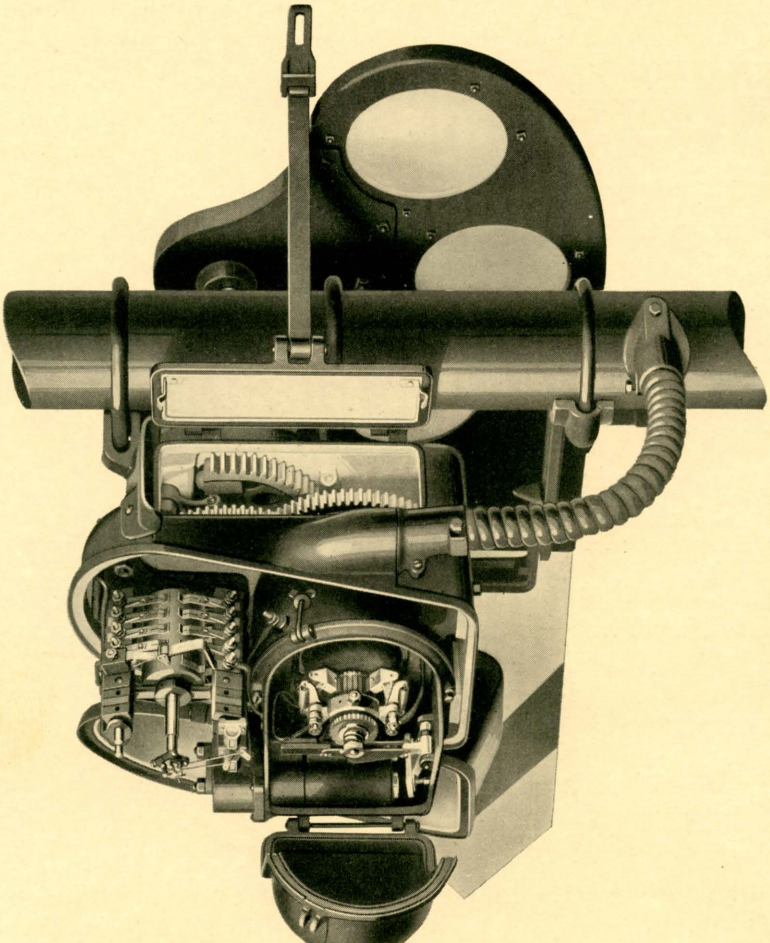


Fig. 1
Model 2A Signal

MODEL 2A SIGNAL

THE Model 2A Signal is primarily a top of mast mechanism but is also constructed as a base of mast mechanism.

Mechanical efficiency and the consensus of opinion among signal engineers favor the top of mast mechanism as in this mechanism the motor shaft is directly connected to the semaphore shaft. Another point in favor of the Model 2A top of mast mechanism is that it can be used wherever a power signal is required — as a ground, bridge, bracket,

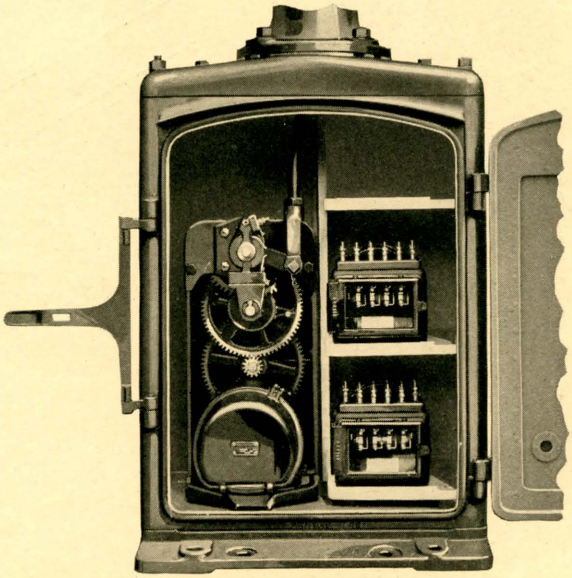


FIG. 2
MODEL 2A. BASE OF MAST MECHANISM

suspended or dwarf signal. The base of mast mechanism is restricted to the use of a one or two-arm ground, bridge or bracket power signal.

Fig. 1 shows a Model 2A top of mast mechanism and Fig. 2 a Model 2A base of mast mechanism. The mechanisms are practically the same but the arrangement of the parts is different.

The Model 2A Signal Mechanism comprises the following main parts: high torque, low speed motor with retaining mechanism, train of gears, driving shaft and coupling, clamp bearing and spectacle shaft, circuit controller and a cast-iron case or housing. There is no slot nor dash-pot.

The motor operates in a dust-proof case in the lower part of the mechanism case and is directly connected to the spectacle shaft by means of the train of gears and the

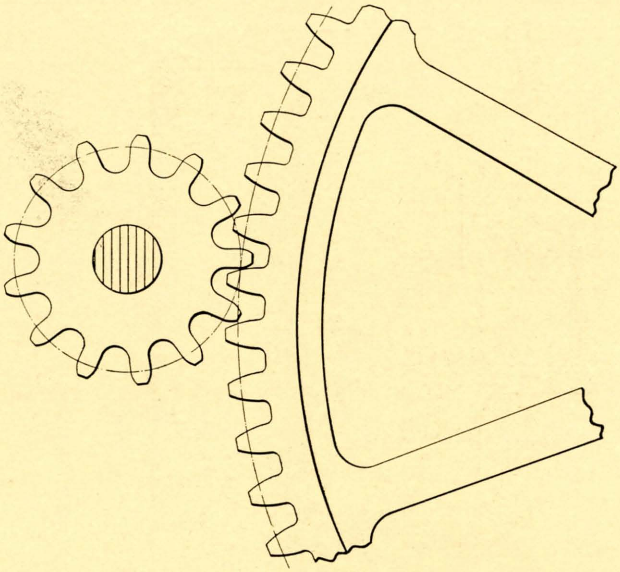


FIG. 3
CLEARANCE OF GEARS

coupling. The front part of the motor case opens so that the motor can be examined when an inspection is made. There are several types of motors for the various conditions of high and low voltage, A. C. and D. C. automatic, semi-automatic and non-automatic signals, which are described in detail in the Model 2A Pamphlet 2019. There is one feature that is common to all D. C. motors: the signal arm in going from the proceed to the stop position causes the motor to rotate in a reverse direction, generating a current, which effectively checks the motion of the signal arm when the motor is shunted through a snubbing resistance, just before the blade comes to the caution or stop position. This method of retarding the motion of the signal arm is far superior to the old dash-pot and eliminates the chance of imperfect operations from defective dash-pots. A friction clutch between the motor and its driving pinion protects the motor and gearing from sudden strains.

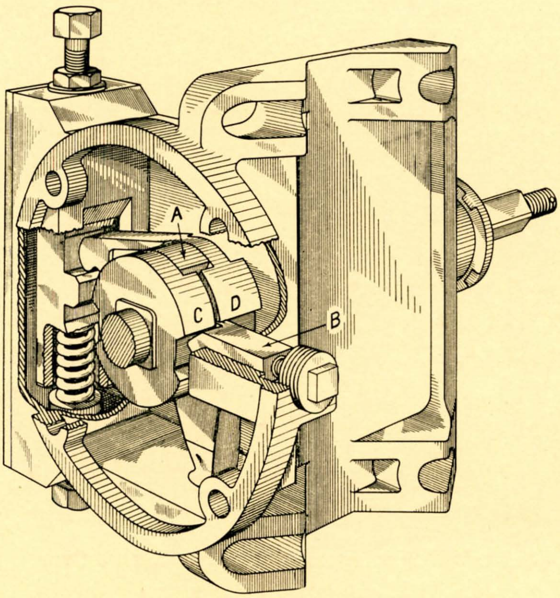


FIG. 4
COUPLING

The train of gears is placed in a compartment in the back part of the case. The ratio of the gearing is such that thirty revolutions of the armature move the signal arm from the stop to the proceed position. The gear teeth are heavy and there is ample clearance between the teeth, as shown in Fig. 3, to insure free movement of the gears, under all conditions.

The driving shaft and the spectacle shaft are connected by means of the coupling, shown in Fig. 4, to provide for any variation in the alignment of the two shafts, and to insure free movement of the shafts. The coupling also provides a means for locking the signal in the stop position, preventing the operation of the signal, except in the proper manner. This is accomplished by means of a dog B, Fig. 4, which normally engages the notches in the two discs of the coupling. The part of dog B that engages the notch in disc D is square and the notch is also square,

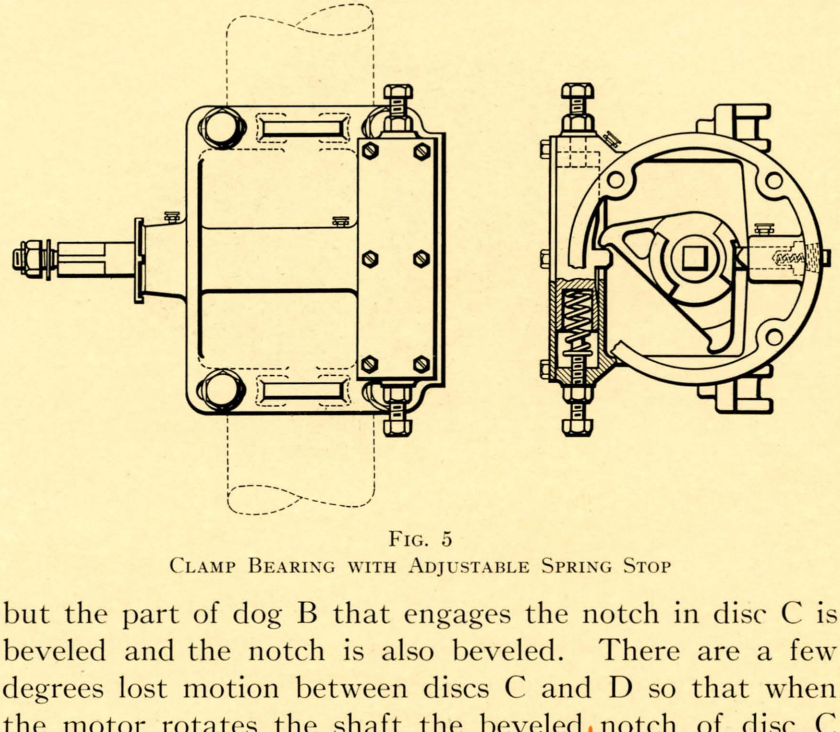


FIG. 5
CLAMP BEARING WITH ADJUSTABLE SPRING STOP

but the part of dog B that engages the notch in disc C is beveled and the notch is also beveled. There are a few degrees lost motion between discs C and D so that when the motor rotates the shaft the beveled notch of disc C engages the beveled part of dog B, forcing the dog outward so that the square part of dog B clears the square notch in disc D. The spectacle shaft cannot be turned from outside the mechanism as the square part of dog B obstructs any movement of disc D.

The mechanism case is bolted to a clamp bearing, Fig.

5, which is clamped to the signal pole by means of two "U" bolts. With this arrangement it is a simple matter to convert a mechanical signal into a power signal. The spectacle shaft extends through the clamp bearing and an adjustable spring stop, shown in Fig. 5, limits the travel of the signal arm, serves as a buffer and affords a means for adjusting the position of the signal arm so that the full movement is from horizontal to vertical and vice versa.

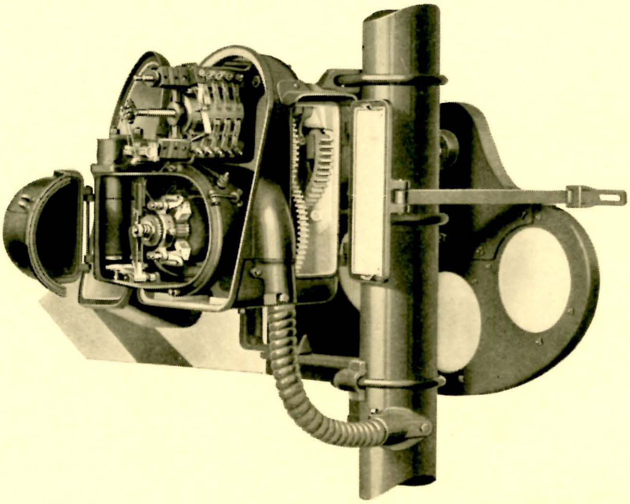
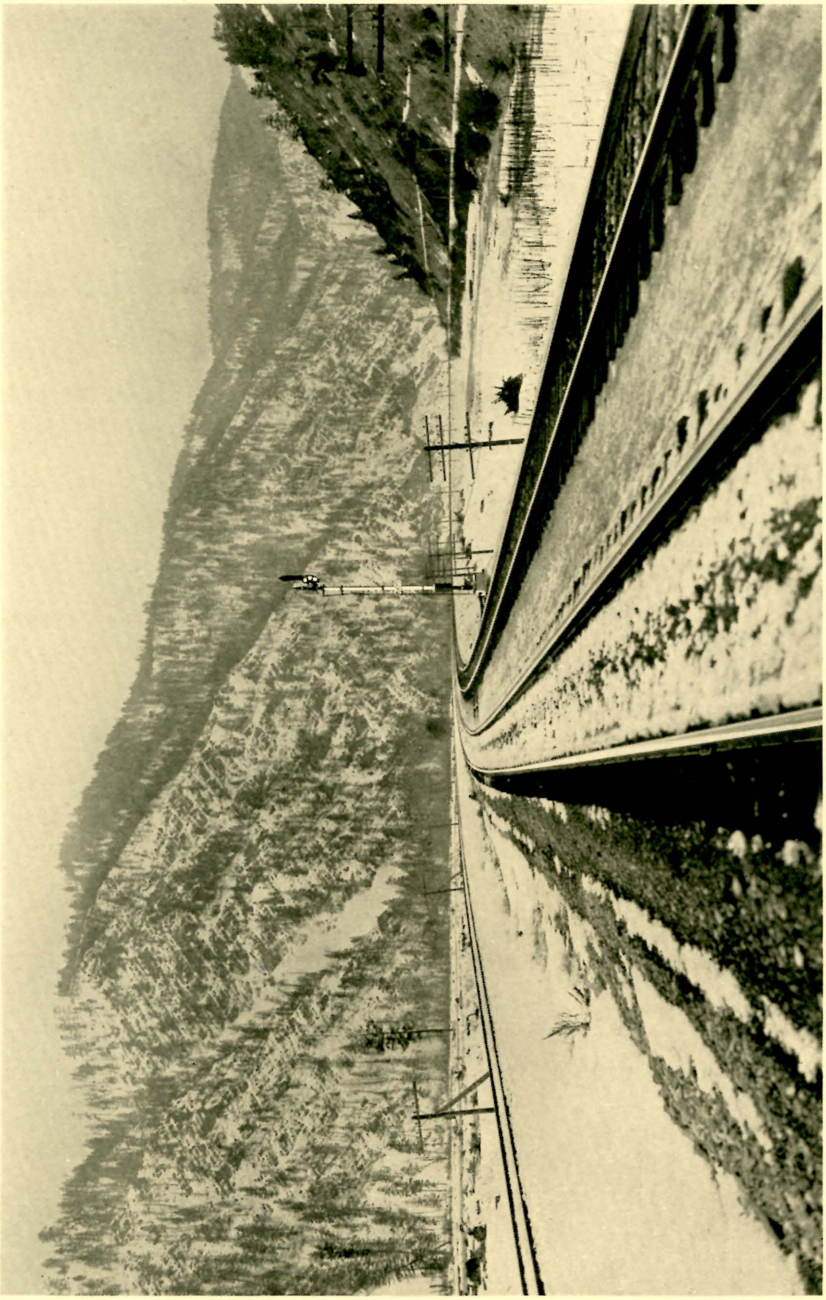


FIG. 6
MODEL 2A SIGNAL

The circuit controller, shown in Fig. 6, is the brain of the Model 2A mechanism, as the operation of the motor and signal is controlled through this unit. The design of this circuit controller appeals strongly to signalmen as all parts are visible and accessible and there are no parts of the mechanism in the way to interfere with the free use of pliers and wrenches when there are connections or adjustments to be made.

The circuit controller consists of a frame which carries a hardwood cylindrical drum on which the contact plates are mounted; adjustable contact fingers, with an arrange-



Model 2A Signal. Northern Pacific Ry.

ment for locking them in proper position; an attachment for producing snap contacts, when required; and segmental gears, by means of which the movement of the main shaft is transmitted to the circuit controller. There is space for a maximum of fourteen contacts, each of which can be adjusted to make or break at any position of the signal arm. There is provision for a maximum of four snap contacts which are used to control the operating and indicating circuits of dynamic indication mechanisms and where a contact performs the function of a pole changer. The other circuits have drag contacts.

The mechanism case is conveniently arranged for inspection of all parts of the mechanism. The front part of the case forms a door, which when opened, exposes the circuit controller and the motor case, as shown in Fig. 6. The train of gears are accessible through a door in the side of the mechanism case. Both doors, when closed, are held firmly in place by means of a wrought iron strap and a special attachment. A hasp is provided for a padlock, which when in place locks both doors. The operating and control wires are lead into the mechanism through a flexible conduit or in some cases the several wires are taped together forming a cable which is securely taped to a bushing, where it protrudes from the signal mast, and to a coupling, where it enters the mechanism. The taped cable is then painted with electric lacquer or P. & B. paint and any openings are filled with waste. In either case the mechanism is practically air-tight and free from any action of the elements, dust, cinders and smoke.

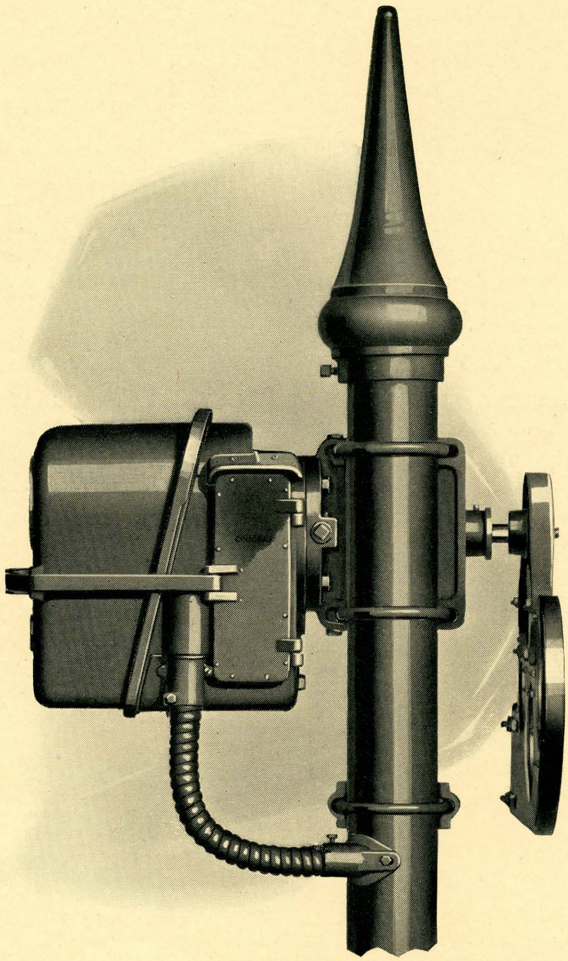
A. C. Model 2A Signals. Southern Ry.

The Model 2A Signal provides a uniform signal for the various requirements of block signaling and interlocking — Adaptability.

All parts of the mechanism are designed to withstand the natural wear and tear and are protected from the elements, smoke and dust — Efficiency.

The mechanism operates on a small current and requires little attention other than an occasional oiling — Economy.

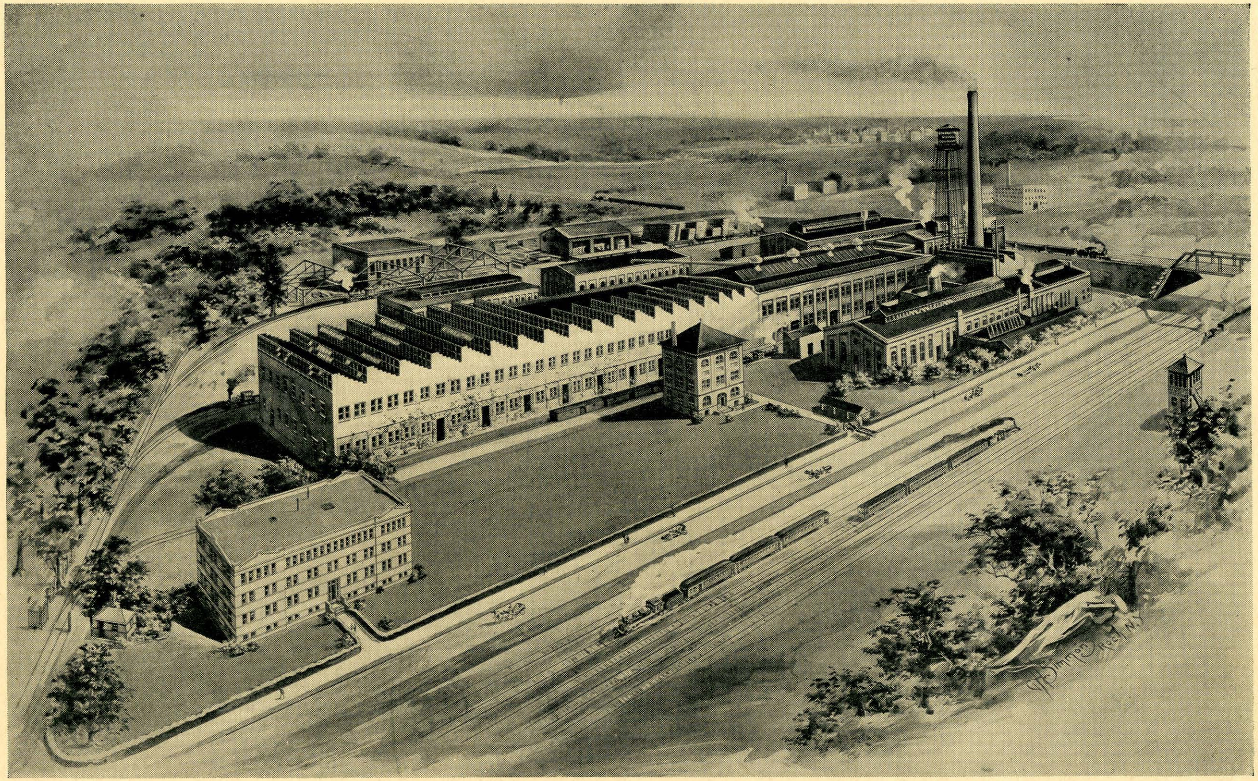
There are thirteen thousand Model 2A Signals in service on eighty-eight railways in the United States and Canada, purchased during the past five years — There is a Reason.



Side View Model 2A Signal

RAILWAYS USING G. R. S. MODEL 2A SIGNALS

Arizona & New Mexico Ry.
Atchison, Topeka & Santa Fe Ry.
Aurora, Elgin & Chicago, R. R.
Baltimore & Ohio R. R.
Baltimore & Sparrows Point R. R.
Boston & Albany R. R.
Buffalo, Rochester & Pittsburgh Ry.
Canadian Pacific Ry.
Chesapeake & Ohio Ry.
Chattanooga Station Co.
Chicago & Alton R. R.
Chicago, Burlington & Quincy R. R.
Chicago & Eastern Illinois R. R.
Chicago Great Western Ry.
Chicago, Indianapolis & Louisville Ry.
Chicago & Northwestern Ry.
Chicago, Milwaukee & St. Paul Ry.
Chicago, Rock Island & Pacific Ry.
Chicago, St. Paul, Minneapolis & Omaha Ry.
Chicago & Western Indiana R. R.
Cleveland, Cincinnati, Chicago & St. Louis Ry.
Cincinnati, Hamilton & Dayton Ry.
Cincinnati, New Orleans & Texas Pacific Ry.
Cumberland Valley R. R.
Delaware & Hudson Co.
Delaware, Lackawanna & Western R. R.
Detroit River Tunnel Co.
Duluth & Iron Range R. R.
Duluth, Winnipeg & Pacific Ry.
Elgin, Joliet & Eastern Ry.
Erie R. R.
Essex Terminal Ry.
Galveston, Harrisburg & San Antonio Ry.
Grand Trunk Railway System
Great Northern Ry.
Houston Belt & Terminal Ry.
Houston & Texas Central R. R.
Illinois Central R. R.
Illinois Northern Ry.
Kansas City Terminal Ry.
Kentucky & Indiana Terminal R. R.
Lake Erie & Western R. R.
Lake Shore & Michigan Southern Ry.
Lake Superior, Terminal & Transfer Ry.
Lehigh & Hudson River Ry.
Lehigh Valley R. R.
Lehigh Valley Transit Co.
Long Island R. R.
Louisville & Nashville R. R.
Louisiana Railway & Navigation Co.
Michigan Central R. R.
Milwaukee, Sparta & Northwestern Ry.
Minneapolis, St. Paul & S. St. M. Ry.
Missouri, Kansas & Texas Ry.
Missouri Pacific Ry.
Mobile & Ohio R. R.
Morgan's, Louisiana & Texas R. R. & S. S. Co.
New York Central & Hudson River R. R.
New York, New Haven & Hartford R. R.
New York State Railways
New York, Susquehanna & Western R. R.
Norfolk & Western Ry.
Northern Central Ry.
Northern Electric Ry.
Northern Pacific Ry.
Oregon Electric Ry.
Pacific Electric Ry.
Pennsylvania Lines, West of Pittsburgh
Peoria & Pekin Union Ry.
Pere Marquette R. R.
Pennsylvania R. R.
Philadelphia, Baltimore & Washington R. R.
Philadelphia & Western Ry.
Pittsburgh, Cincinnati, Chicago & St. Louis Ry.
Pittsburgh Coal Company of Wisconsin
Pittsburgh & Lake Erie R. R.
Puget Sound Electric Ry.
San Francisco, Oakland & San Jose Ry.
Southern Pacific Co.
Southern Ry.
Spokane & Inland Empire R. R.
St. Louis, Peoria & Northwestern Ry.
Toledo & Ohio Central Ry.
Toronto, Hamilton & Buffalo Ry.
United Railways Co.
Washington, Baltimore & Annapolis Electric R. R.
Washington, Baltimore & Annapolis Elec. R. R.
Washington Water Power Co.
Wichita Valley Ry.



MAIN OFFICE AND PLANT, GENERAL RAILWAY SIGNAL COMPANY, ROCHESTER, N. Y., U. S. A.

The Caxton Company
Cleveland—Rochester