

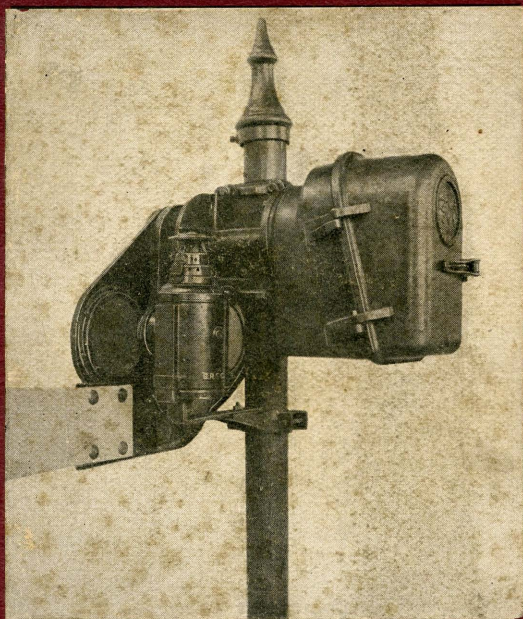
GENERAL RAILWAY SIGNAL COMPANY.

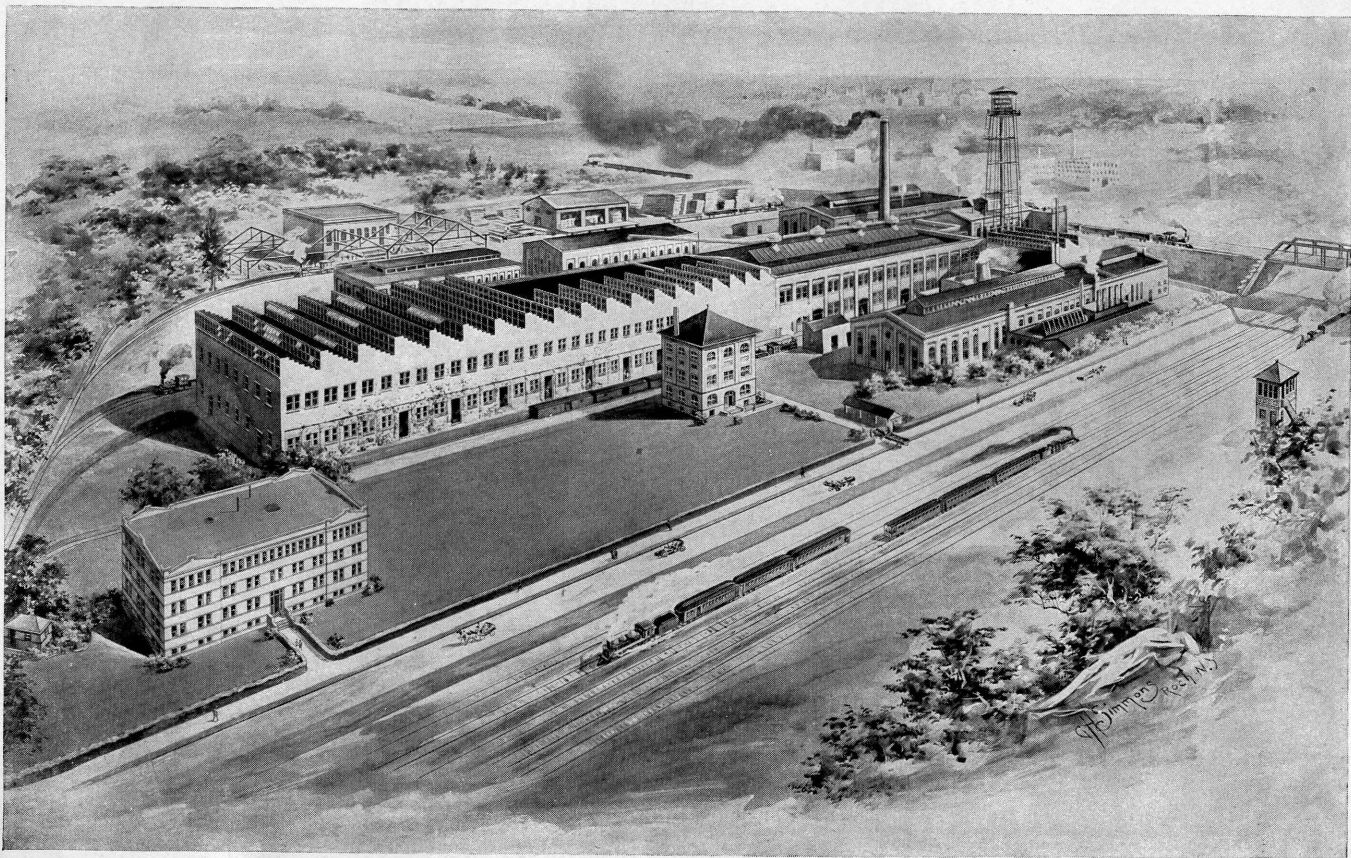
1910

BULLETIN No. 115

SUPPLEMENTING CATALOGUE, SECTIONS 1, 2 AND 5

MODEL 2A SIGNAL





MAIN OFFICE AND FACTORY OF THE GENERAL RAILWAY SIGNAL CO., AT ROCHESTER, N. Y.

GENERAL RAILWAY SIGNAL COMPANY.

ROCHESTER, N.Y.



BLOCK SIGNALS
AUTOMATIC
SEMI-AUTOMATIC
CONTROLLED MANUAL
FOR
STEAM AND ELECTRIC ROADS

INTERLOCKING
ELECTRIC
PNEUMATIC
ELECTRO-PNEUMATIC
MECHANICAL
OR COMBINATIONS OF ABOVE
TO MEET ALL CONDITIONS

TUNNEL SIGNALS
THE MOST EFFICIENT AND COMPACT MADE

CROSSING GATES
MECHANICAL AND ELECTRICAL

SELECTIVE CALLING
APPARATUS FOR TELEPHONE TRAIN
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**PLANS, ESTIMATES, PROPOSALS AND
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GENERAL RAILWAY SIGNAL COMPANY.

THE GENERAL RAILWAY SIGNAL COMPANY takes pleasure in describing herein their MODEL 2, FORM A, SIGNAL MECHANISM.

It is universal in its adaptibility to all the known signaling requirements of to-day. That is to say one mechanism

Will Operate

A HIGH SIGNAL
A DWARF SIGNAL OR
A SUSPENDED SIGNAL

It May be Located on

ANY POLE
ANYWHERE ON A POLE
ANY NUMBER ON A POLE

It May be Operated

AUTOMATICALLY
SEMI-AUTOMATICALLY OR
BY A LEVER ONLY

Will Operate (With a Minimum Change of Parts) on

10 TO 650 VOLTS DIRECT CURRENT
55 TO 220 VOLTS ALTERNATING CURRENT 25 OR 60 CYCLES

The Return Indication May be

DYNAMIC
OR
BATTERY

The Signal Aspect May be

2 OR 3 POSITIONS
UPPER OR LOWER QUADRANT
RIGHT OR LEFT HAND
60—75—90—(OR ANY OTHER) DEGREE

And It Has

NO SLOT
NO DASH-POT

which is to say that it can be used anywhere that a power operated signal is required.

It has great advantages where it is desired to carry block signaling through existing interlocking plants in that it is entirely self-contained and may be applied to any existing pole by clamping the mechanism in the desired location. Its universality will be appreciated by any road that may desire to equip all power operated signals (high—dwarf—suspended automatic—or semi-automatic) with the same mechanism.

The mechanism is bolted to a bearing which may be clamped to any suitable support (new or existing signal masts, trolley poles, etc.) in any desired location (as to spacing of arms or angle with track) by means of two U bolts; or it may be bolted to the mast base castings shown in Figs. 10, 12, and 13, using the adapter crank Fig. 14, or (the preferred method for base of mast mechanisms) it may be clamped near the bottom as shown in Fig. 9.

The clamp bearing (see Figs. 1 and 11), which may be used for attaching fixed or mechanically operated arms that are intended for power operation at a future date, carries the semaphore shaft and stop plate, both of which are variable to suit the particular style of spectacle used. The shaft bearing is packed with oil soaked felt thereby insuring ample and constant lubrication.

The signal arm is locked in the normal position by the bolt **A**, which is arranged so that a preliminary movement of the mechanism end of the clutch (provided with slanting edged groove) will lift the bolt out of the notch (square edged) in the blade end of the clutch.

The use of the mechanism is not limited to signaling proper—as its small size (12" wide, 18½" high, 15½" deep) and efficiency will permit its successful and economical application to many other uses, such as, crossing gates, highway crossing signals, etc.

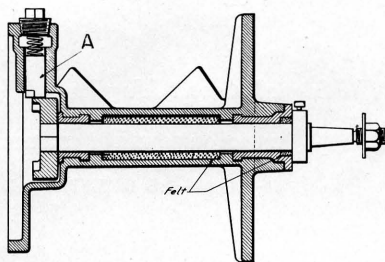


FIG. 1. Cross Section of Clamp Bearing.

GENERAL RAILWAY SIGNAL COMPANY.

Especial attention is called to the extreme simplicity of this mechanism; there being but three main parts thereto, namely, the train of gears, the circuit breaker and the motor.

The parts are extraordinarily strong and the efficiency is unequalled.

GENERAL RAILWAY SIGNAL COMPANY.

Rochester, N. Y.
January, 1910.

DESCRIPTION

Mechanism

The mechanism is of extraordinarily rugged construction and is connected to the semaphore shaft by means of the coupling illustrated in Fig. 2.

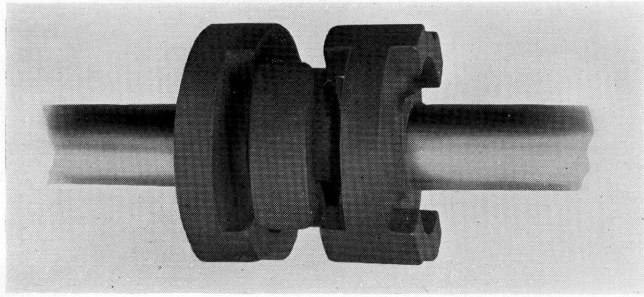


Fig. 2. Coupling.

The motor is connected to the coupling through a train of low reduction gears having heavy teeth and large clearances, and all parts are securely held in position by cap screws, keys, or cotter pins, thereby securing continuity of correct alignment and adjustment, and making it the easiest and quietest running mechanism now on the market; all of which qualities add in a most marked degree to both the efficiency and life of the signal.

The simplicity is self evident upon examination of Fig. 3, showing the parts and the successive steps of assembly.

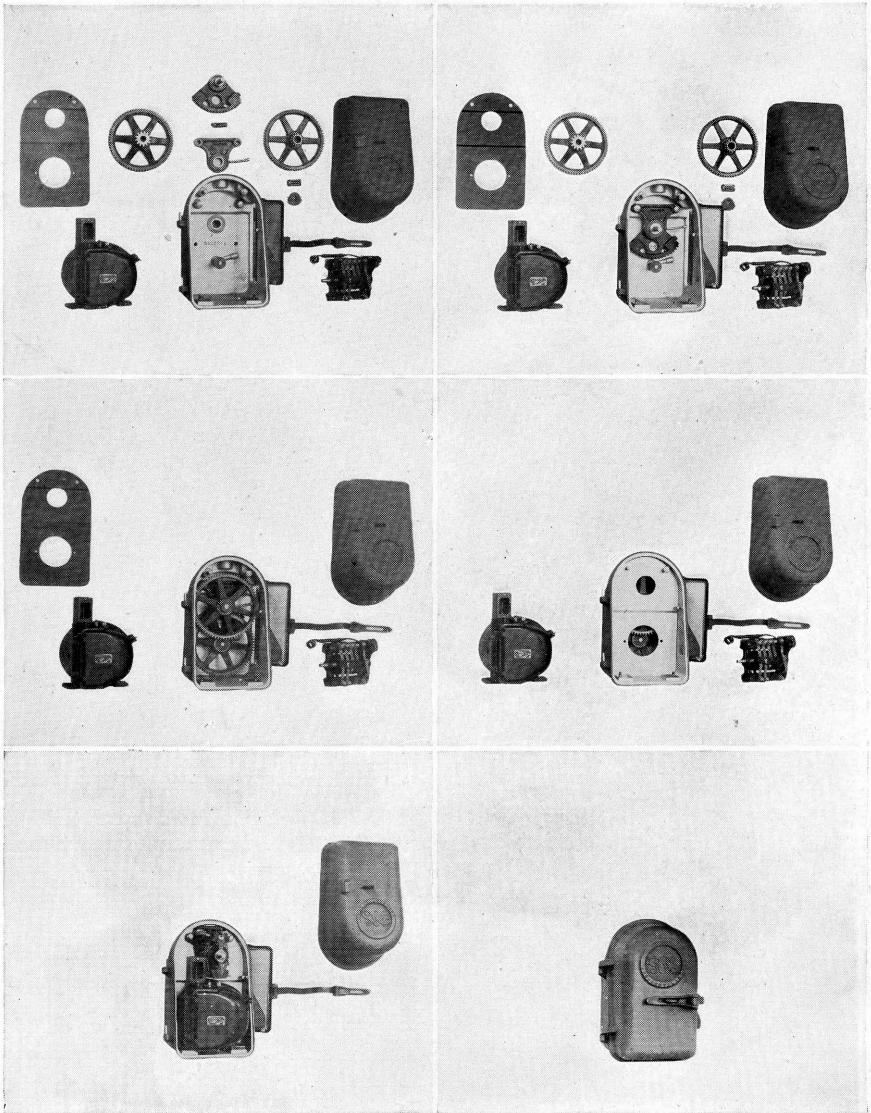


Fig. 3.
Details and Assembly.

Gearing

As previously stated, the gears have unusually heavy teeth and large clearances, as shown, in Fig. 4 which is drawn to full size. The ratio of reduction is such that the signal clears to 90 degrees in 30 revolutions of the motor armature.

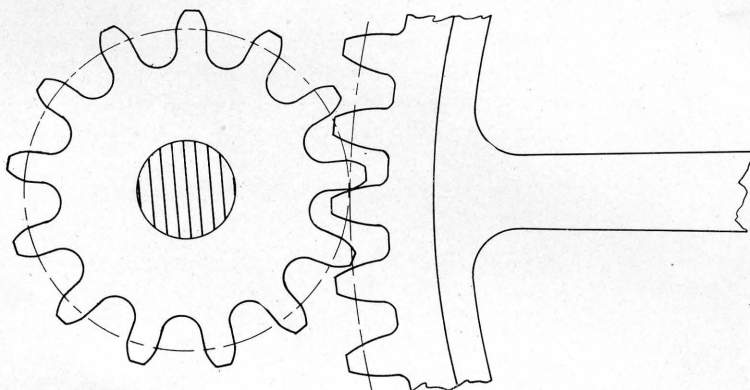


Fig. 4.

Clearance of Gears—full size.

The low gear reduction permits the driving of the gears and motor in the reverse direction when the signal returns to normal, without danger of sticking; only five (5) foot pounds at the semaphore shaft being required for this purpose.

**Automatic
Operation
No Slot**

The signal has no slot, notwithstanding which it may be operated either automatically or semi-automatically.

To permit this, the low voltage, D. C. and all A. C. motors are built with a retaining mechanism, and the 110-650 volt D. C. motors are equipped with special fields.

**Retaining
Mechanism**

The retaining mechanism reduces the power consumption to a minimum, as explained below, and is entirely independent of the torque of the blade-grip.

The motor will start the blade in any portion of its stroke; that is to say, it is not necessary for the blade to return to the stop or 45 degree positions before again clearing, when, for any reason, the circuit is momentarily interrupted. This eliminates the necessity of introducing slow acting relays or similar devices where it is desired to use this signal with polarized circuits.

The retaining mechanism (Fig. 5) is composed of :

A rotating member **A** on the armature shaft.

A fixed member **B** on the motor frame.

An oscillating member **C** (working between **A** and **B**) and a contact **D**, both of which are operated by a solenoid **E**.

All of which are an integral part of, and enclosed in, the motor case.

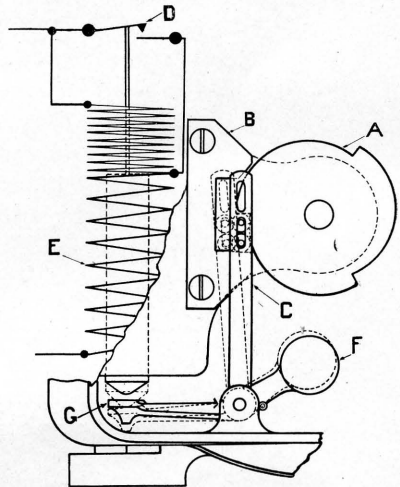


Fig. 5. Retaining Mechanism.

It will be noted that with this construction, the large amount of electro-magnetic energy required in slot mechanisms, which must not only be capable of holding the signal clear but of starting and clearing it as well, is reduced to the amount required to lift the solenoid core from the arm **G** of the member **C**.

The great amount of electro-magnetic energy required in slot mechanisms necessitates, for economical energy consumption, the use of very small air gaps, which not infrequently cause "clear" failures due to the hammering down of short residual pins.

The greatly reduced work to be performed by the retaining mechanism not only eliminates the necessity of providing power to withstand the shock of starting and clearing the signal, but also allows the use of a much larger air gap—large enough in fact to permit the use of thick residual washers instead of short residual pins.

Especial attention is called to member **C**. The essential part of this consists of two hardened steel rollers held in a slotted cage. When **E** is energized, the counterweight **F** moves the cage and rollers into engagement with **A**. At the same time **D** opens, thereby connecting the high resistance holding coil in series with the low resistance working coil and reducing the energy consumption to a minimum. It will also be noted that the rollers, resting on each other and between the parallel faces of **A** and **B**, transmitting the weight of the signal arm directly to the motor frame, require but a very slight force to move them out of engagement because rolling friction only is present, and that the required force is independent of the weight of the signal arm. In releasing, a strong "hammer blow" is provided as a factor of safety, for the starting of **C**, by dropping the solenoid core on the arm **G**.

A is connected to the armature shaft through a friction clutch to prevent damage to any part when operating under abnormal conditions.

As above pointed out, the retaining mechanism eliminates all of the complications of the slot, in that the mechanical connection between the motor and the signal arm is never broken; being a part of the motor and enclosed in the motor case it is not subject to frost troubles; and it has no small air gaps, short residual pins, flexible connections, etc., which cause most of the slot troubles.

**Checking
No Dash Pot**

The necessary checking or retardation of the moving parts when returning to the normal position is accomplished without the use of a dash-pot by providing an arrangement of contacts on the circuit breaker, which "short circuit" the motor (driven as a generator by the weight of the signal arm) just before the arm reaches the caution or stop position. This arrangement is automatic and requires no adjustment for any weight of spectacle, as the retardation is in proportion to the speed of rotation of the armature, which, in turn, is proportionate to the weight of the spectacle.

Aspects

The signal arm may be displayed at any angle 2 or 3 positions in any quadrant of the circle.

The upper or lower quadrant, and right or left hand indications, are dependent only on the armature connections, circuit breaker adjustments, and the arrangement of the parts of the retaining mechanism when used.

The angle at which the signal is displayed, is dependent only on the location of the movable contact plates and adjustment of contact brushes on the circuit breaker.

To change from 2 to 3 position indication, it is only necessary to readjust the circuit breaker and replace the old stop, shaft and spectacle with the new, and in the case of the high voltage D. C. operation, substitute the two tooth latch **A** for the one tooth **B**, (Fig. 6).

All of the changes required for a change in aspect are readily and quickly made on the ground and require a minimum number of new parts.

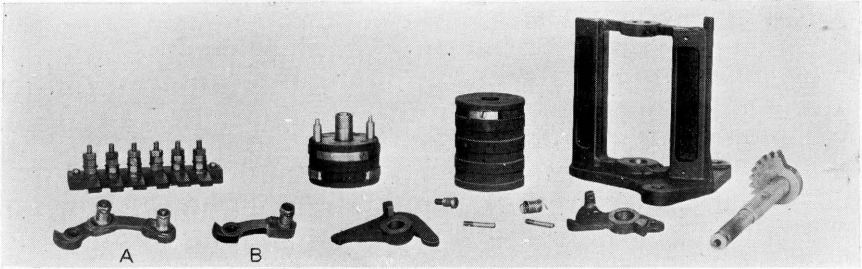


Fig. 6.
Detail of Circuit Breaker.

**Circuit
Breaker**

The circuit breaker, shown in detail in Fig. 6, is a complete unit and is connected directly to the signal operating shaft by means of segmental gears so keyed and secured that accidental disconnection cannot possibly occur.

It is built with broad brushes, and slightly narrower contact plates which are set in shallow grooves. This construction provides different bearing surfaces on the brushes for the contacts and for the insulation, thereby overcoming the trouble experienced in previous designs, caused by the dragging of metallic particles on to the insulation, which soon causes an arc, and carbonization and breakdown of the insulation.

All brushes are adjustable and are securely locked in position.

All contact plates are attached to the commutator with wood screws and may therefore be placed in any desired location with a minimum of time and effort.

The drum is made of treated hard wood, the best known insulator for such purposes, and is impervious to moisture.

For ordinary low voltage operation, the commutator is arranged to "drag;" that is, move in conjunction with the signal arm. A section may be furnished, and where

operating voltage is 110 volts or over, is always furnished arranged to "snap over," thereby giving the quick action necessary for breaking high voltage circuits.

It may be equipped for the control of 12 circuits (including those required for the local control of the signal) and a wide variation of combinations of drag and snap contacts.

Motors

Motors are provided for operation on

Low Voltage (5-20) Direct Current
High Voltage (110-650 Direct) Current
Alternating Current, (25 or 60 cycles, 55-
220 volts).

All of these are of very high efficiency, having low speed and high torque; only 30 revolutions of the armature are required to clear the signal to 90 degrees.

The armature is mounted on ball bearings, and is connected to the gearing through a combined pinion and friction clutch; the clutch being provided to protect the mechanism from undue shock when operating under emergency conditions.

THE LOW VOLTAGE MOTORS are provided with the retaining mechanism already described. Their efficiency is indicated by the operating data given below.

THE 110 VOLT MOTORS are ordinary four pole series motors, in which two poles are wound for operating and the other two for holding purposes; the latter being provided with specially constructed pole pieces and high resistance windings (connected in series with the operating windings at the proper time) for providing a magnetic lock for holding the signal in the caution and clear positions.

THE ALTERNATING CURRENT MOTOR is a new design of commutating induction motor of extraordinary efficiency, operating on either 25 or 60 cycles 55 to 220 volts.

Its very low current consumption permits the control of signals over a line without the use of line relays; and also very largely reduces the size of power transmission lines and over load capacity of station equipments as compared with the requirements for ordinary induction motors.

It is a radical departure from previous types and has no high resistance starting coils controlled by delicate centrifugal cut outs.

Operation

The voltage, current and time of clearing (depending on the torque and degrees of travel of the blade grip) of the various signals is as follows:—

Low Voltage—10 volts, D. C.

$1\frac{1}{2}$ to $2\frac{1}{2}$ amperes

6 to 12 seconds

High Voltage—110 volts, D. C.

$\frac{3}{4}$ to 1 ampere

3 to 5 seconds

(dependent also on the line
resistance)

Alternating Current

$\frac{3}{4}$ to 4 amperes

4 to 6 seconds

(dependent also on the voltage
and frequency of the current)

Of the photographs and drawings following, your especial attention is called to Fig. 22, showing the circuit for power distant signals, in which the operating battery for all signals in any plant is located in the tower, and the lock is released by dynamic current from the motor (driven as a generator) when returning to the normal position; and to the circuits for alternating current operation, of which the following brief description is given:

A series motor is used for the operation of these signals on account of the very low current consumption and the possibility of operating over a line wire without the use of local relays. In order to overcome the characteristic speed variations of series motors under varying conditions of line resistance, load and voltage, a simple speed governor **A** is used to secure uniform action under all conditions.

B is a shunt contact around the governor contacts and limits the governor action to the latter portion of the movement; giving an exceedingly quick action.

C, also a shunt contact, travels but 5 degrees in either direction, and is arranged so that in event of a momentary interruption of the control circuit, the signal will start up at once when power is reapplied.

D (in the 3 position circuit only) is a contact also limited to 5 degrees travel and is in series with the retaining mechanism. It serves to hold the retaining circuit open until the mechanism has been brought to rest at the 45 degree position when returning from 90 degrees and prevents the shock of sudden stoppage of heavy parts which would otherwise occur when the regular 45 degree holding contact closes.

Any further information that may be required will be very gladly furnished.

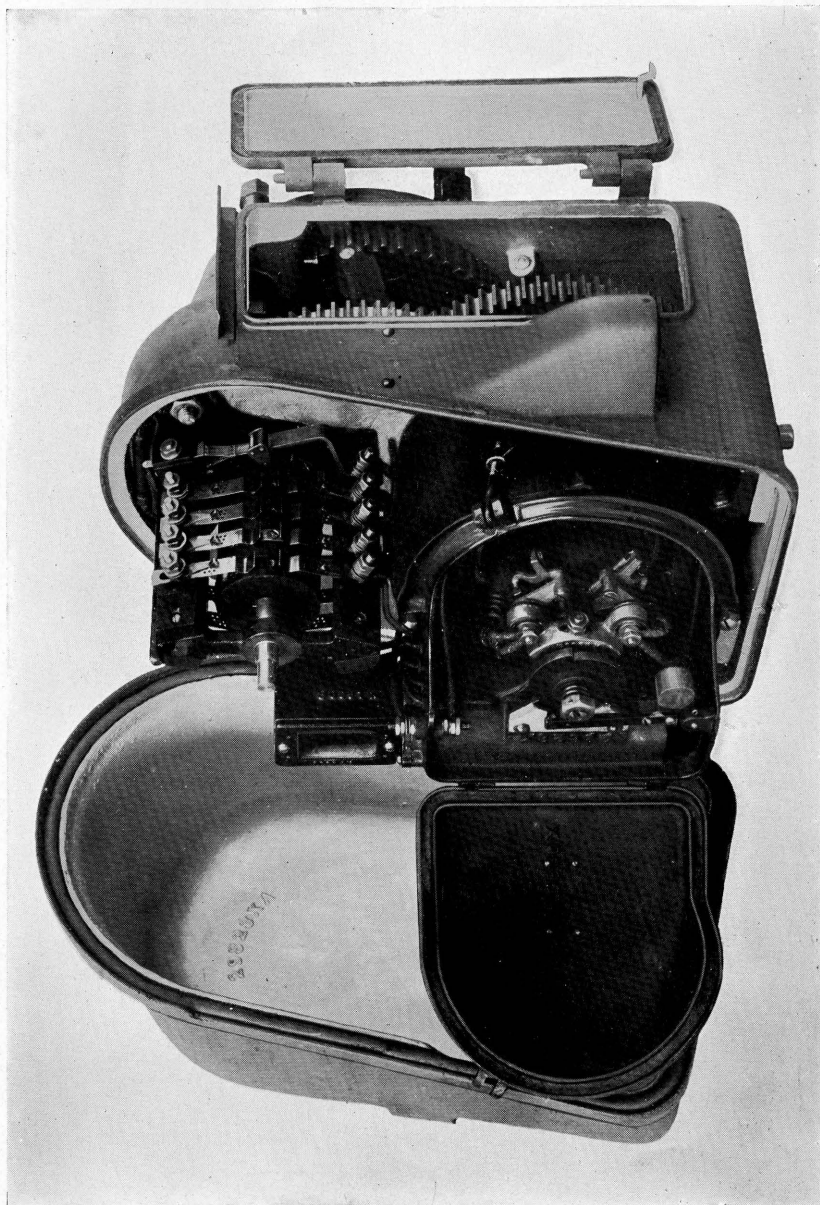


Fig. 7.
10 Volt Mechanism Complete

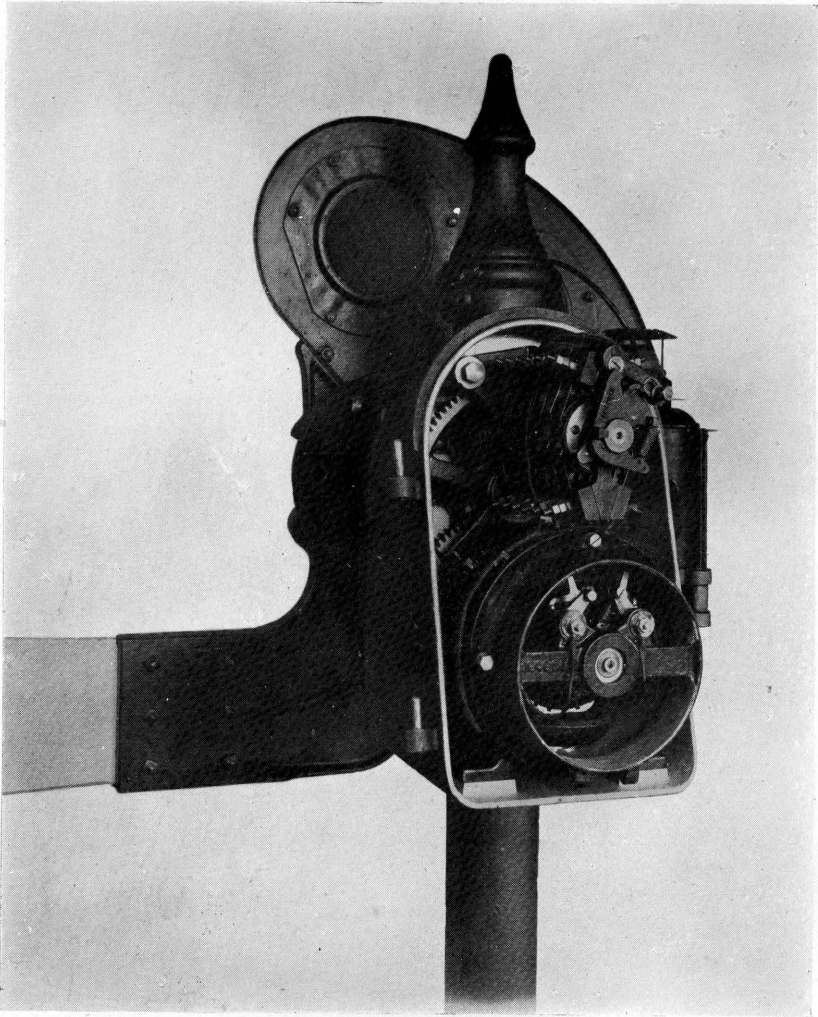


Fig. 8.
110 Volt Mechanism, diaphragm removed.



Fig. 9.
Signal Clamped at base of pole.

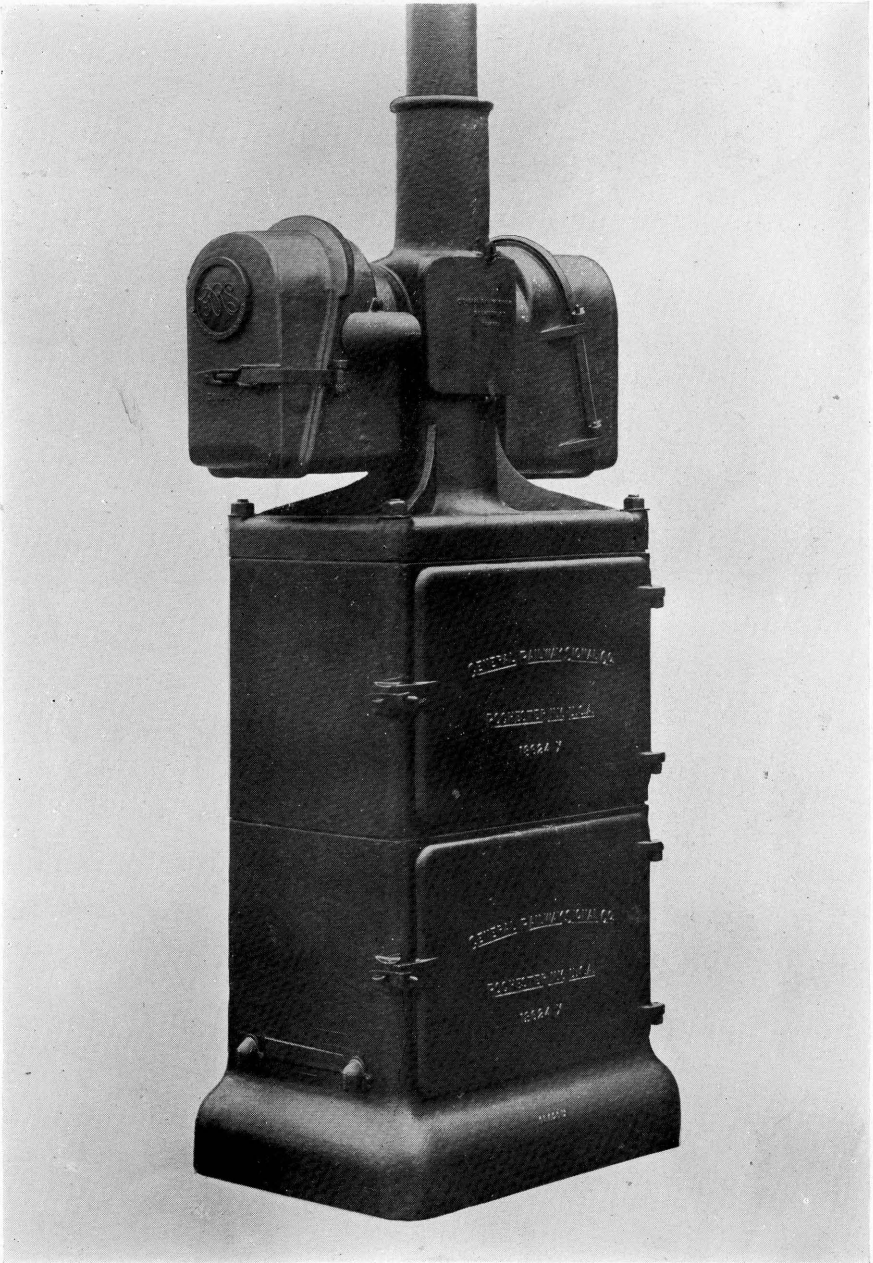


Fig. 10
Battery case and base for 2 arm pole.
(base of pole mechanism)

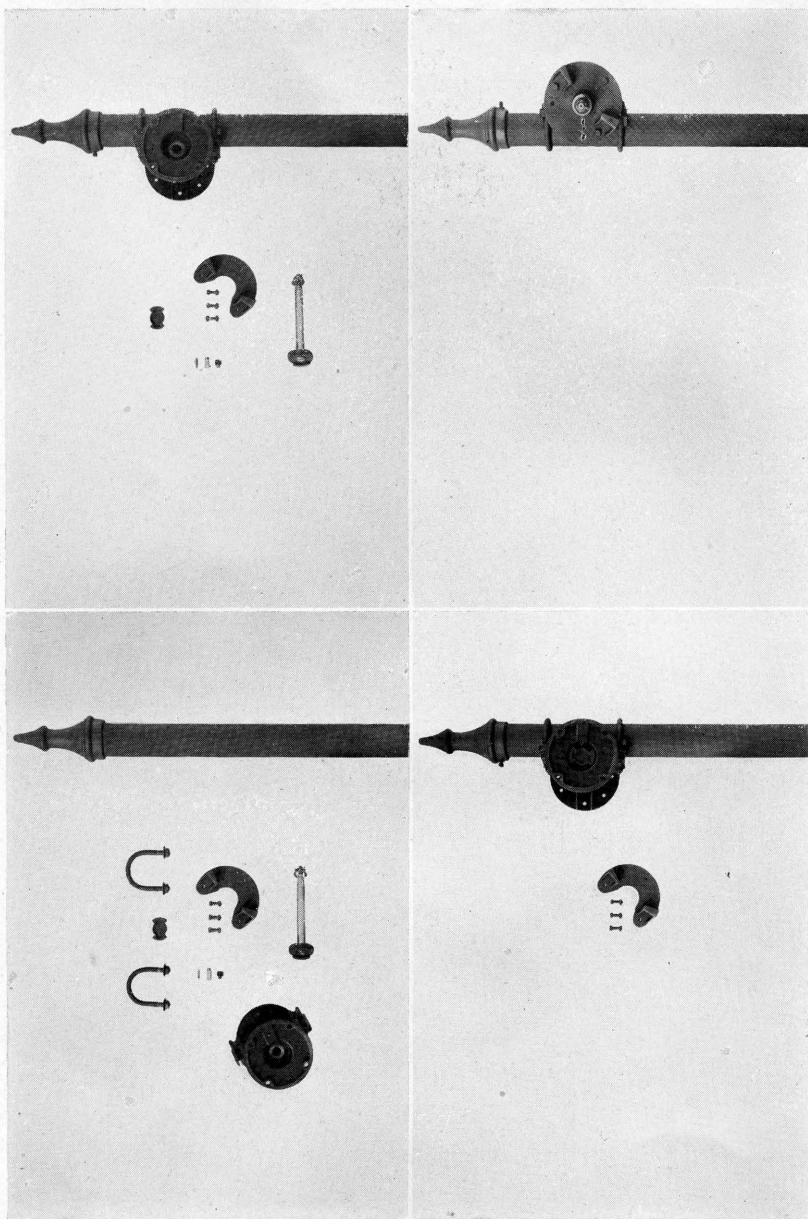


Fig. 11.
Clamp bearing, Detail and Assembly.

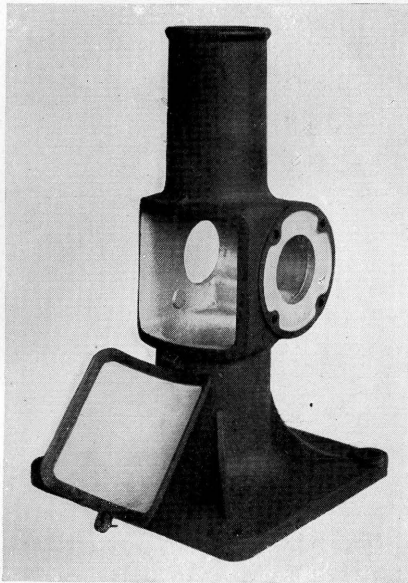


Fig. 12.
Mechanism base for ground pole.

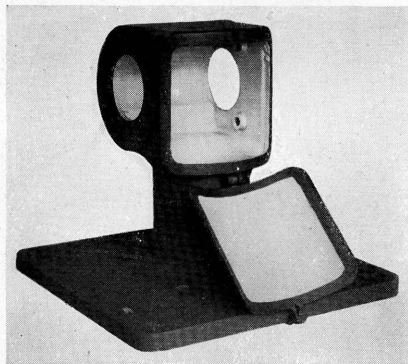


Fig. 13.
Mechanism base for suspended pole.

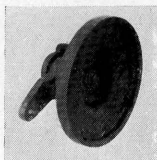


Fig. 14.
Crank complete—for use with mechanism bases.

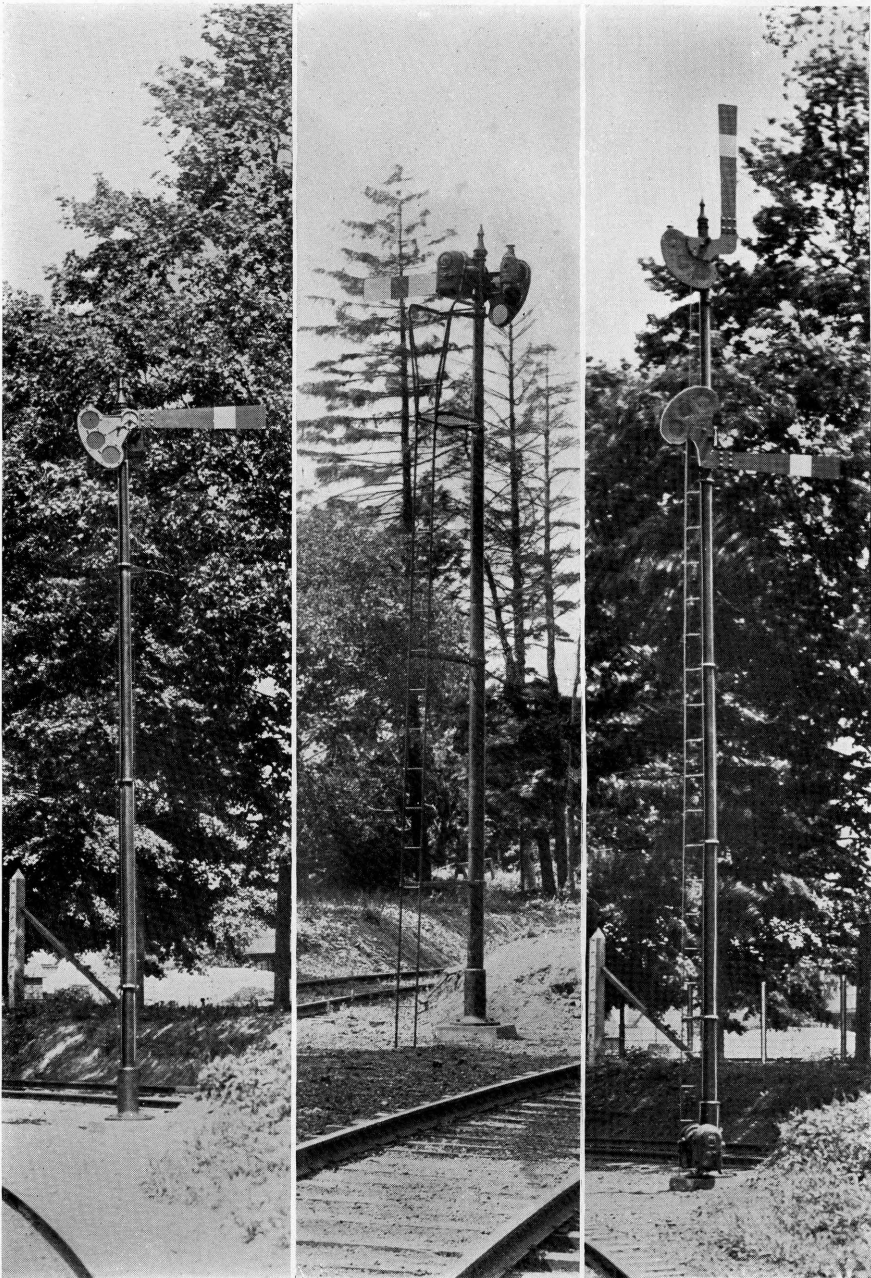


Fig. 15.
Ground Poles.

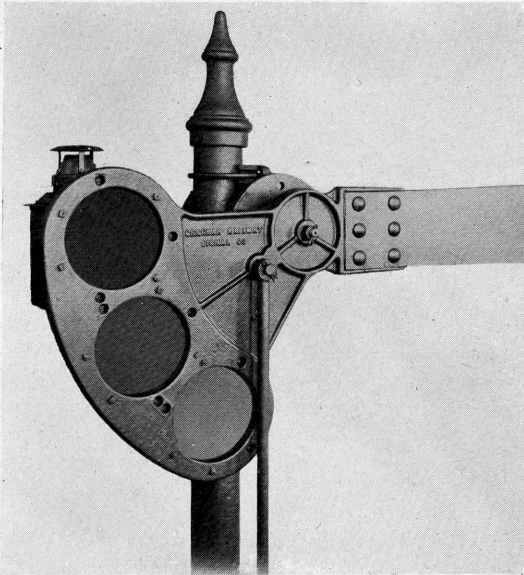


Fig. 17.

Clamp bearing with mechanically operated arm.

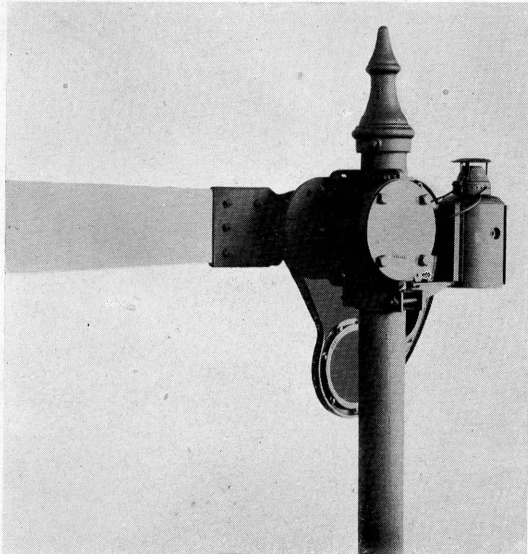


Fig. 18.

Clamp bearing with fixed arm.

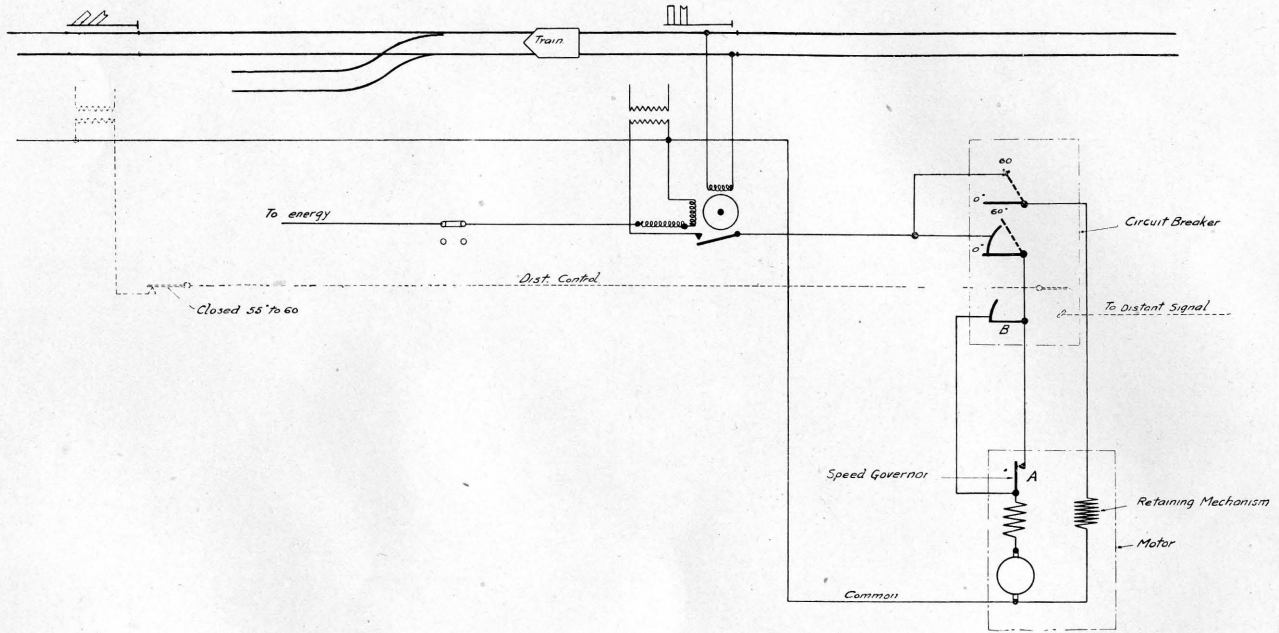


FIG. 19
 MODEL 2-A SIGNAL CIRCUIT
 Two Position Automatic Block Signal
 Alternating Current Operation

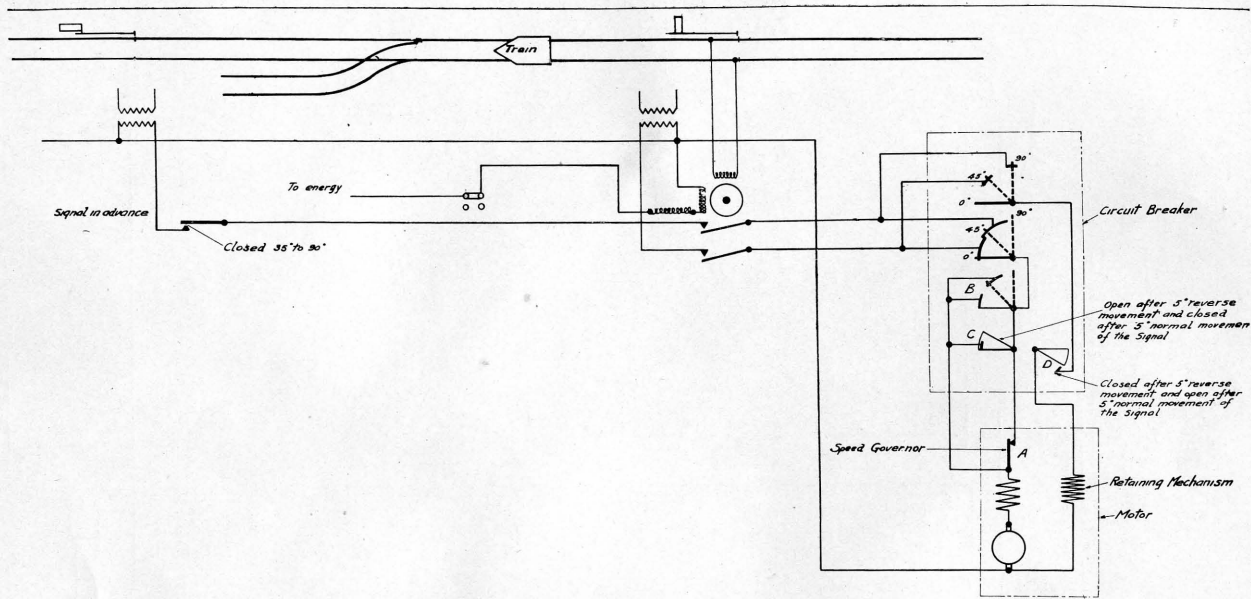


FIG. 20
 MODEL 2-A SIGNAL CIRCUIT
 Three Position Automatic Block Signal
 Alternating Current Operation

[32]

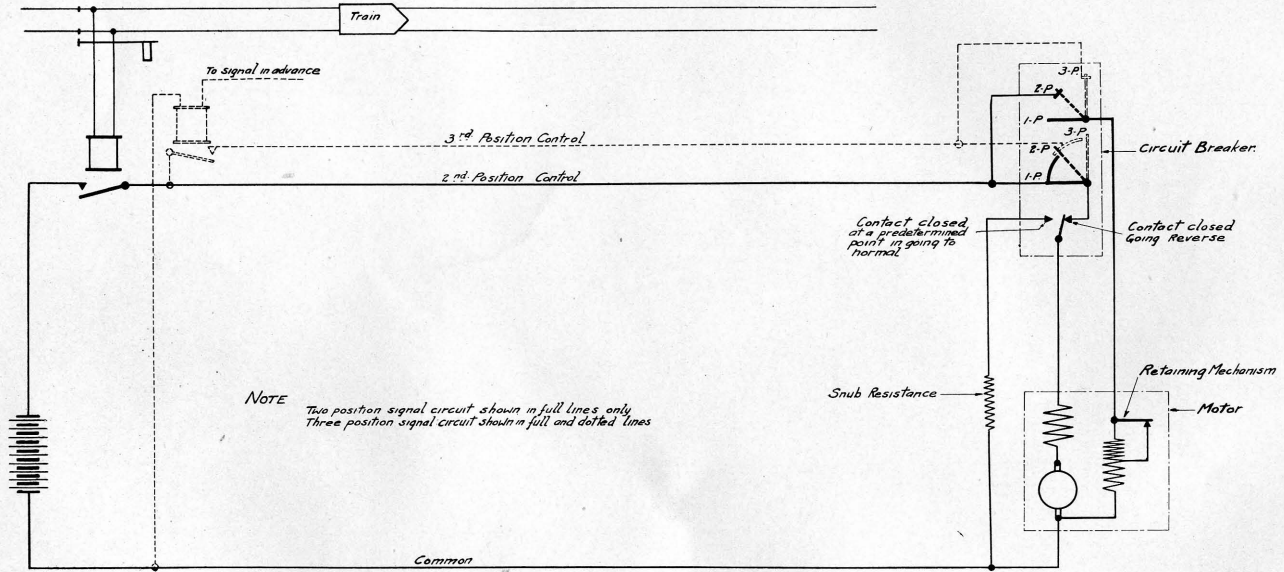


FIG. 21
MODEL 2-A SIGNAL CIRCUIT
10-Volt 2 and 3 Position Signal

[33]

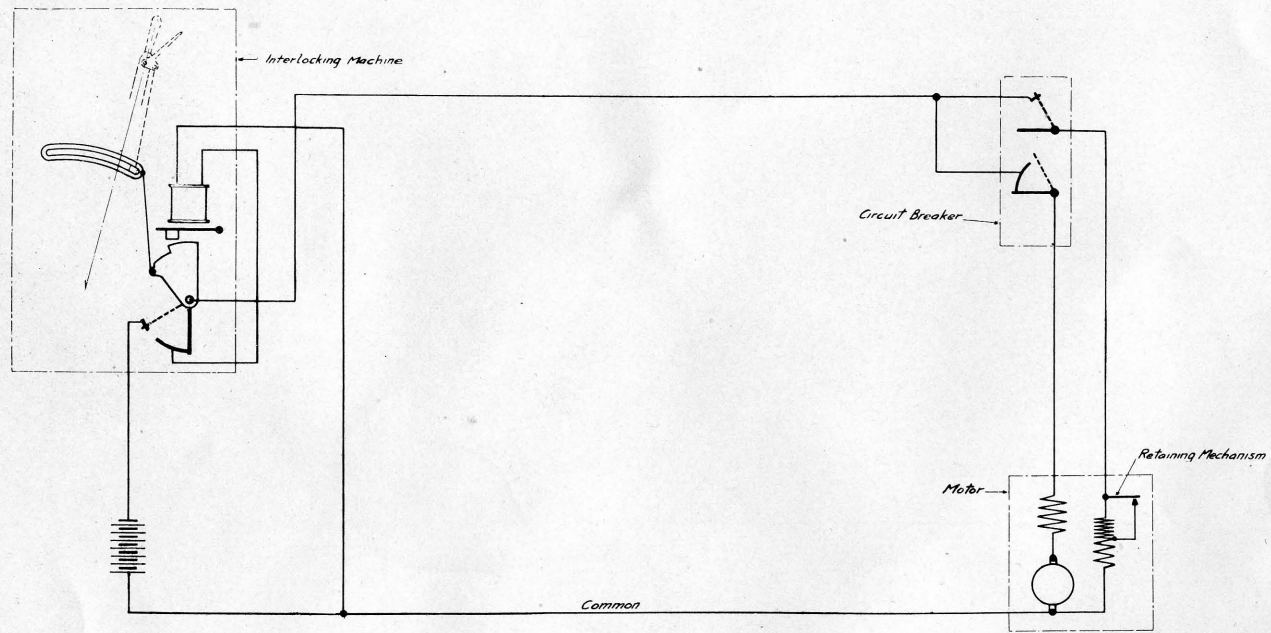


FIG. 22
MODEL 2-A SIGNAL CIRCUIT
Power Operated Distant Signal for Mechanical
Interlocking, with Dynamic Lock Release.

[34]

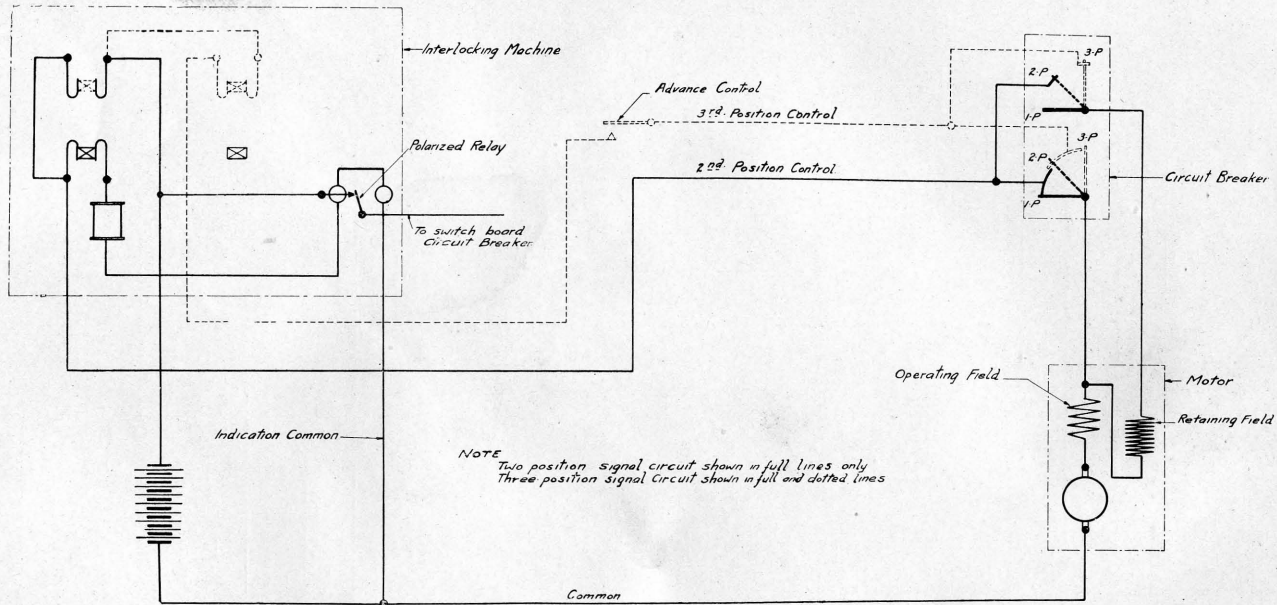
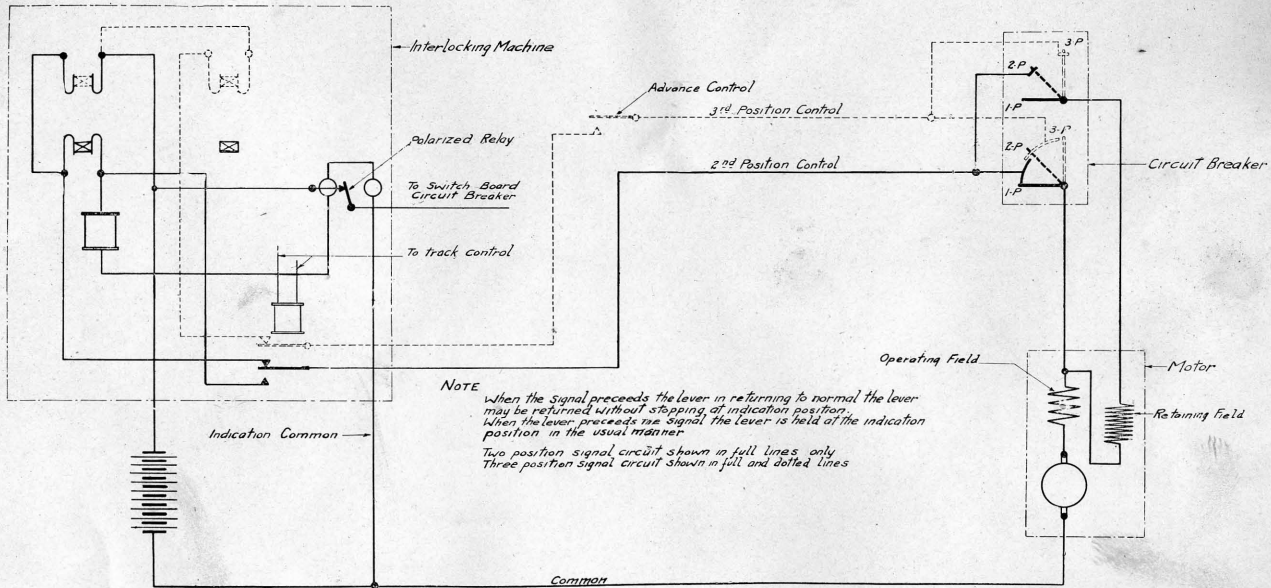


FIG. 23
MODEL 2-A SIGNAL CIRCUIT
110-Volt. 2 and 3 Position Non Slotted Signal



[35]

FIG. 24
MODEL 2-A SIGNAL CIRCUIT
110-Volt. 2 and 3 Position Slotted Signal.

