

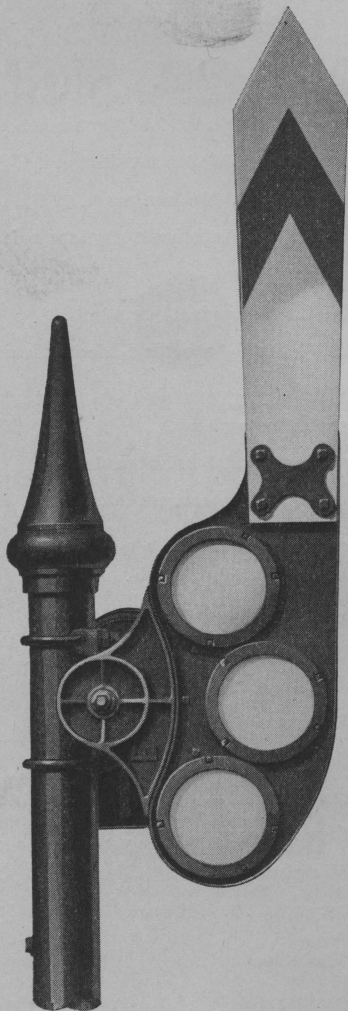
G. R. S.
MODEL 2A SIGNAL



GENERAL RAILWAY SIGNAL COMPANY
ROCHESTER, N. Y.

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G. R. S. MODEL 2A SIGNAL



2019
March, 1914

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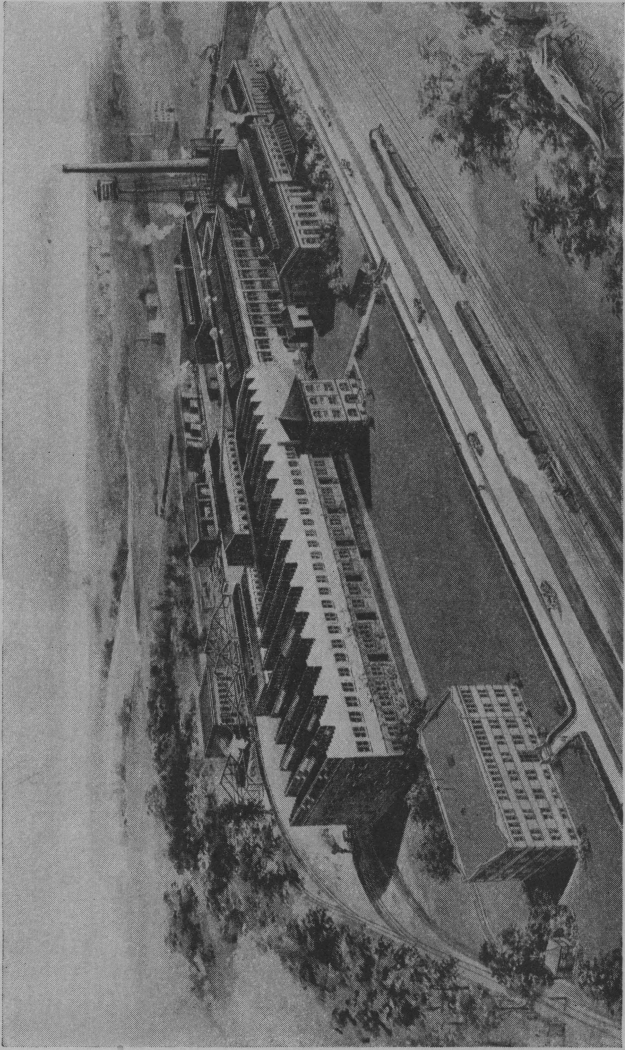
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MAIN OFFICE AND PLANT, GENERAL RAILWAY SIGNAL COMPANY, ROCHESTER, N. Y., U. S. A.

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 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 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.

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.

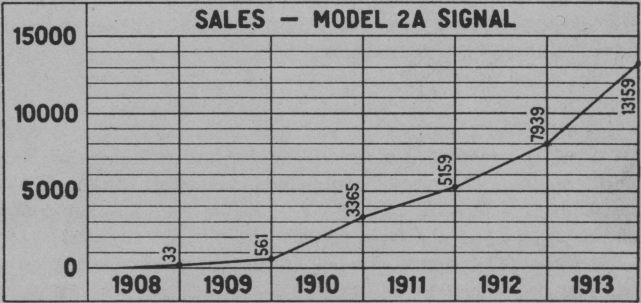
Fifth — The electrical means for retarding the signal arm when going to the caution or stop position.

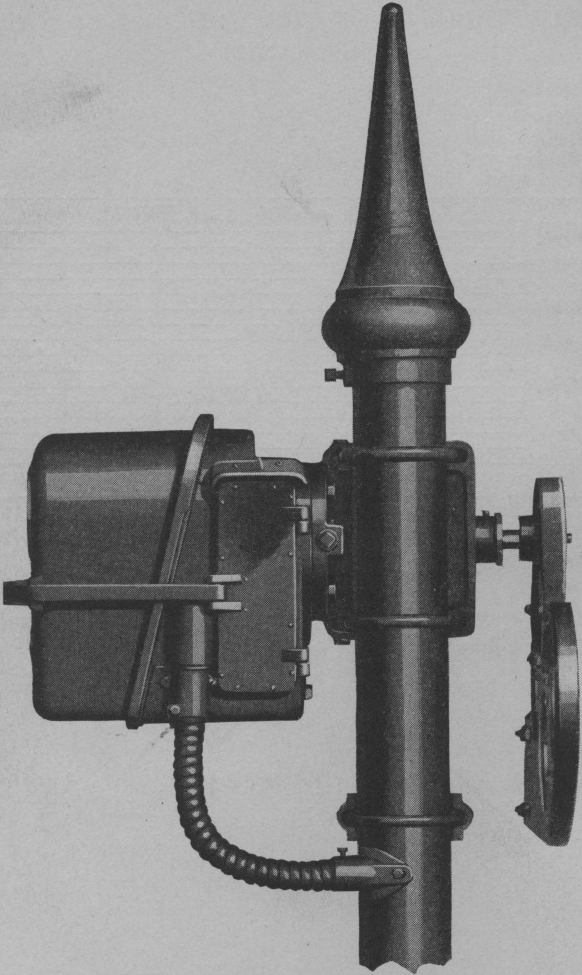
Sixth — The low operating and holding current required, resulting in long life of battery.

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 diagram on the opposite page shows the total number of Model 2A Signals that have been ordered previous to January 1, 1914, by eighty-eight railroads.





ADAPTABILITY OF THE MODEL 2A SIGNAL MECHANISM

Application.

Ground	}	Signal
Bridge		
Bracket		
Suspended		
Dwarf		

Control.

Automatic.
Semi-automatic.
Non-automatic.

Operation.

Ten to 650 volts D. C.
Fifty-five 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.

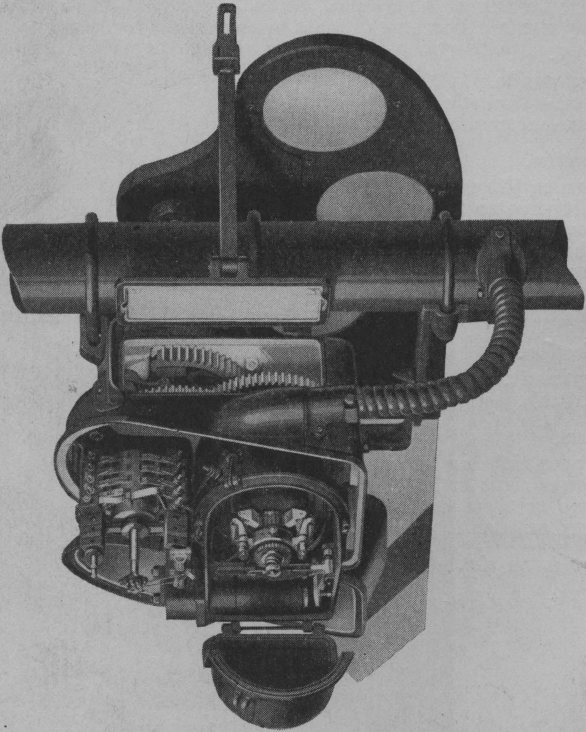


FIG. 1. MODEL 2A SIGNAL

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, 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.

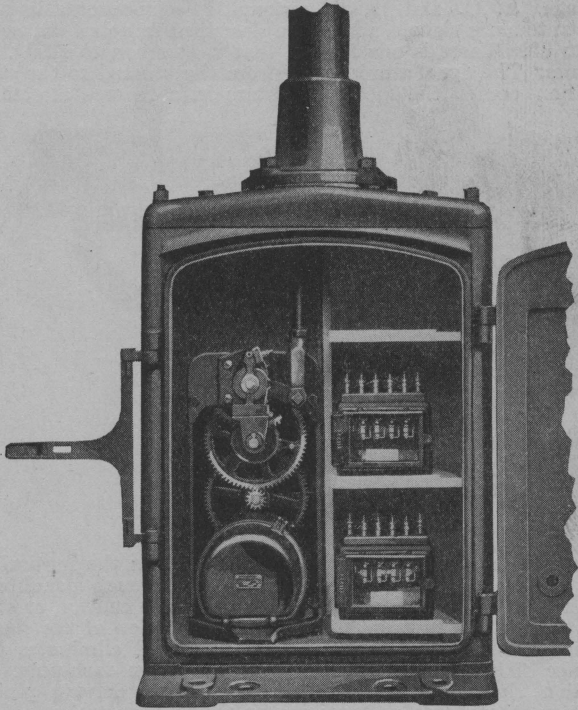


FIG. 2. MODEL 2A. BASE OF MAST MECHANISM

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 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 on pages 17 to 33. 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,

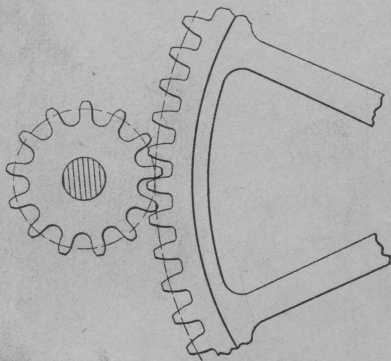


FIG. 3. CLEARANCE OF GEARS

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.

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

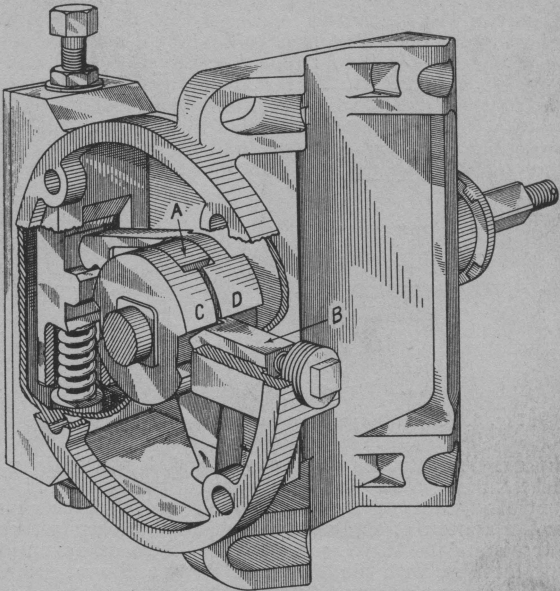


FIG. 4. COUPLING

engages the notches in the two discs of the coupling. The part of the dog B that engages the notch in disc D is square and the notch is also square 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.

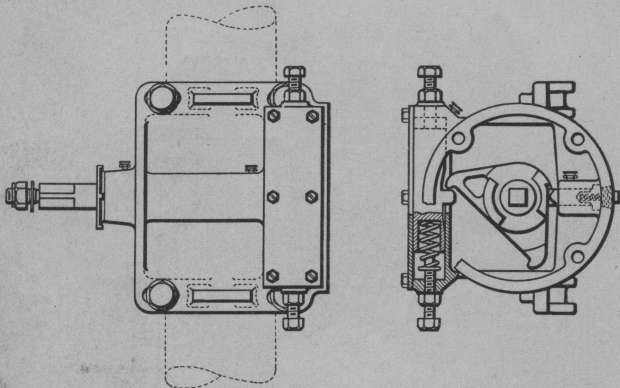


FIG. 5. CLAMP BEARING WITH ADJUSTABLE SPRING STOP

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 arrangement 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

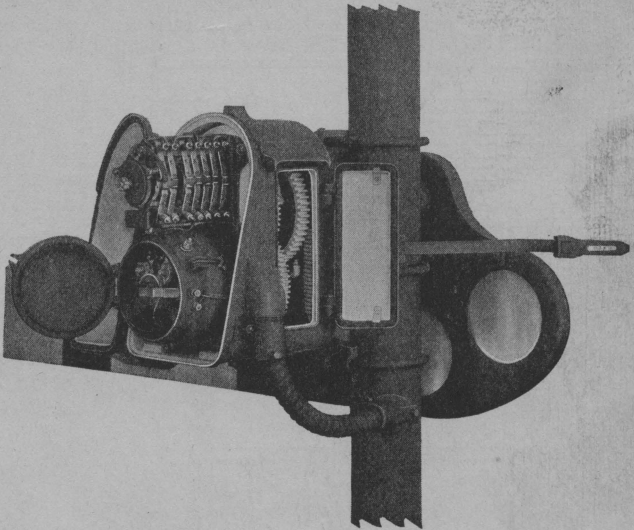


FIG. 6. MODEL 2A SIGNAL

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 led 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.

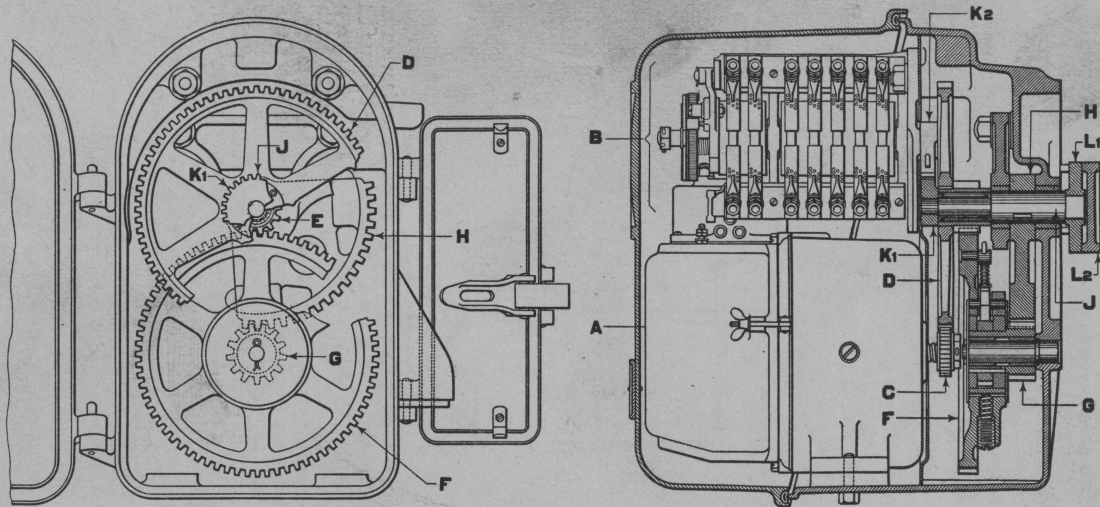


FIG. 7. MODEL 2A 10 AND 20 VOLT D. C. MECHANISM

A Motor
 B Circuit Controller
 C Driving Pinion
 D First Intermediate Gear
 E First Intermediate Pinion
 F Second Intermediate Gear

G Second Intermediate Pinion
 H Operating Sector
 J Driving Shaft
 K_1 - K_2 Segmental Gears
 L_1 - L_2 Universal Coupling

VARIOUS TYPES, MODEL 2A SIGNAL MECHANISMS

10 AND 20-VOLT D. C. MECHANISM

This mechanism is employed as an automatic block signal or as a power distant signal where battery indication is desired. It is also employed as a manually controlled, power operated, block or train order signal, as a crossing signal and for other uses. See circuit diagrams, pages 52, 53 and 54.

This mechanism is equipped with a four-pole series wound motor. The retaining device, shown in Fig. 8, provides a simple and reliable means for holding the signal in the caution and clear positions. It consists of an electro-magnet, the armature of which is attached to a movable member that carries a dog or pawl which engages with a toothed disc on

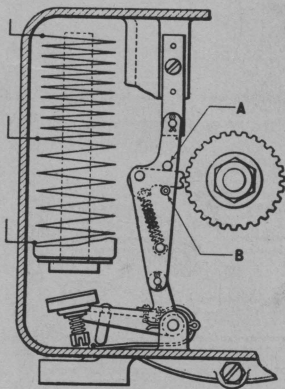


FIG. 8. RETAINING MECHANISM, LOW VOLTAGE SIGNALS

the armature shaft when the electro-magnet is energized. A stop pin "A" is placed above the dog for upper quadrant signals and below the dog as at B for lower quadrant signals, which allows the rotation of the motor armature in a direction to clear the signal and holds the signal in the caution or clear position until the circuit is broken, when the armature drops, disengaging the dog, which allows the signal to return to the caution or stop position. The retaining mechanism requires but a small current (0.018 amperes) for its operation resulting in long life of the battery. The air gap between the electro-magnet and its armature is 0.02 inches, which gives a high drop-away.

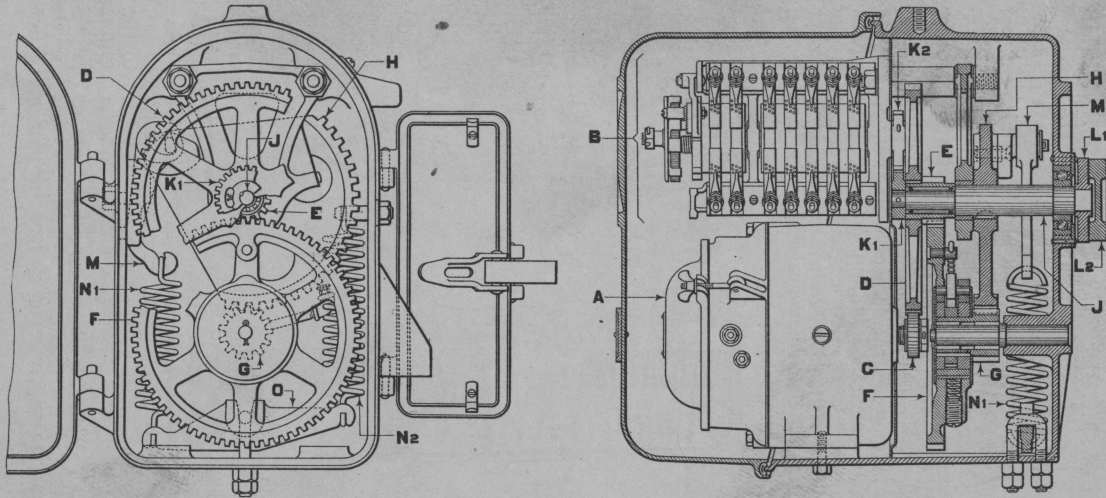


FIG. 9. MODEL 2A 25 VOLT D. C. SEMI-AUTOMATIC DYNAMIC INDICATION MECHANISM

A Motor
 B Circuit Controller
 C Driving Pinion
 D First Intermediate Gear
 E First Intermediate Pinion
 F Second Intermediate Gear
 G Second Intermediate Pinion

H Operating Sector
 J Driving Shaft
 K₁-K₂ Segmental Gears
 L₁-L₂ Universal Coupling
 M Hook
 N₁-N₂ Coil Springs
 O Equalizer

25-VOLT D. C. SEMI-AUTOMATIC DYNAMIC INDICATION MECHANISM

This mechanism is employed where the operation of a lever controlled power signal is also controlled by a track circuit, as in the case where automatic block signals extend through a mechanical interlocking plant. This mechanism is also employed as a dynamic indication, power, distant or home signal at a mechanical interlocking plant, in which case it eliminates one line wire, the relay and relay box, battery of potash cells and the battery well. See circuit diagrams, pages 55 and 56.

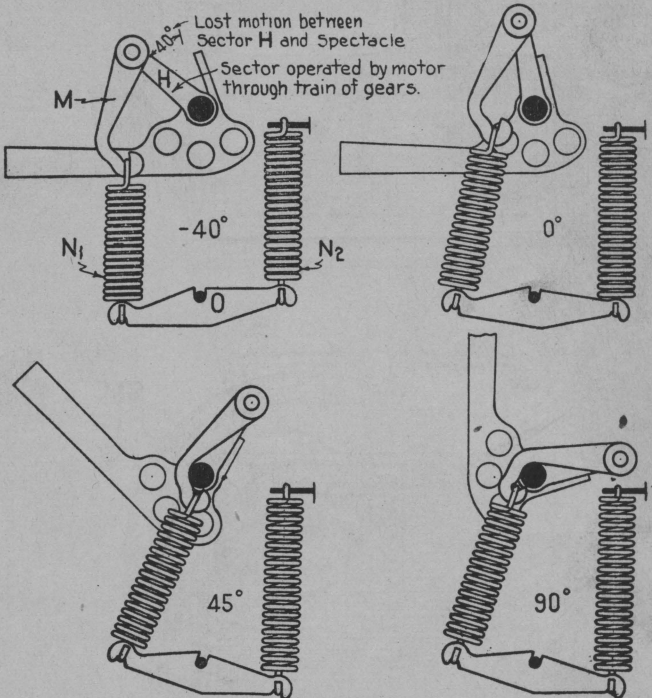


FIG. 10. SPRING ATTACHMENT. SEMI-AUTOMATIC MECHANISMS

This mechanism is equipped with a four-pole, series wound motor but differs from the preceding mechanism in that the armature constitutes the means for holding the signal in the caution and clear positions. The surfaces of two of the pole

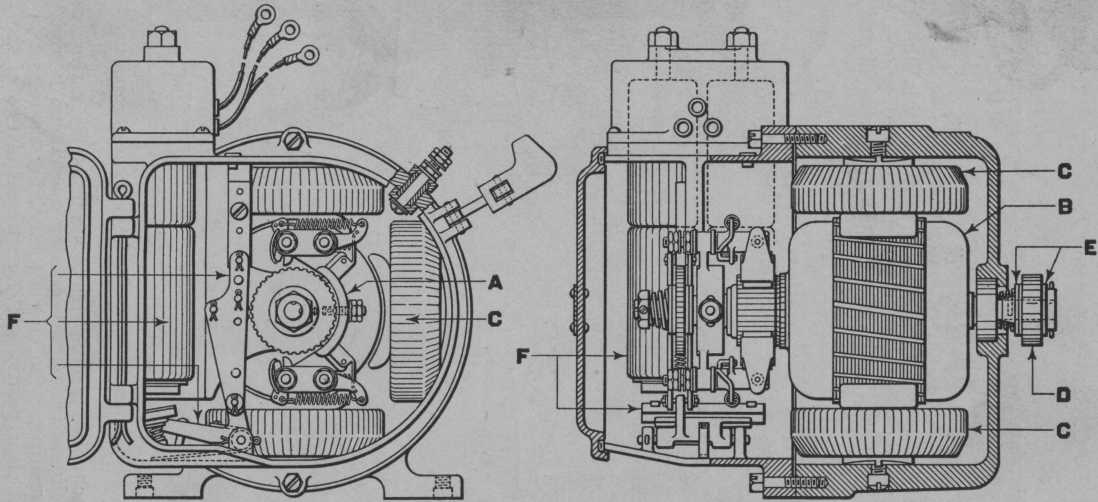


FIG. 11. 10 AND 20 VOLT D. C. MOTOR

A Brush Holder Bracket
 B Armature
 C Operating Field Windings

D Motor Pinion
 E Clutch
 F Retaining Mechanism

pieces are serrated, so that when the holding field windings are energized, the magnetic attraction between these pole pieces and the armature prevents rotation of the armature in either direction and holds the signal in the proper position. The high resistance of these windings reduces the holding current to a minimum.

The spring attachment shown in Figs. 9 and 10 operates in connection with the driving shaft and provides the means for rotating the motor armature to generate the indication current after the signal has returned to the stop position. The coupling is constructed so that there are forty degrees of lost motion between the driving shaft and spectacle shaft. The rotation of the motor armature through these forty degrees does not move the signal arm but produces tension in the springs. The tension in the springs does not exert any torque on the mechanism after the signal arm has been moved a few degrees from the stop position and has no function in connection with the return of the signal arm to the stop position.

When a train enters the track section governed by the signal, the track relay is de-energized which breaks the operating and holding circuits in the motor and the signal arm returns to the stop position but the springs are not released until the lever is returned to its normal indication position which breaks the holding circuit and releases the motor armature. The tension of the springs rotates the armature to the normal position which generates the indication current.

The operation of the mechanism from the minus forty-degree position to the zero position is controlled by a lever in the interlocking machine but the movement of the mechanism from the zero position to the forty-five-degree or ninety-degree position depends upon the track circuit and the signal in advance.

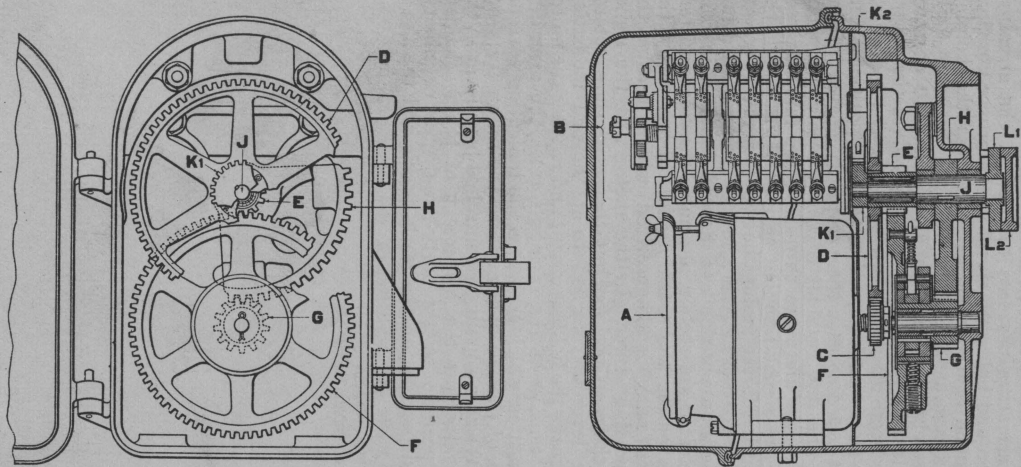


FIG. 12. MODEL 2A 110 VOLT D. C. MECHANISM

A Motor
 B Circuit Controller
 C Driving Pinion
 D First Intermediate Gear
 E First Intermediate Pinion
 F Second Intermediate Gear

G Second Intermediate Pinion
 H Operating Sector
 J Driving Shaft
 K₁-K₂ Segmental Gears
 L₁-L₂ Universal Coupling

110-VOLT D. C. MECHANISM

This mechanism is usually employed as a high signal or dwarf signal in connection with G. R. S. dynamic indication electric interlocking plants where a non-automatic signal is required. This mechanism may also be employed as an automatic block signal, power operated manual block signal, crossing signal and for other uses where 110-volt D. C. current is available. See circuit diagram, page 57.

This mechanism is equipped with a four-pole series wound motor, similar to the motor in the preceding mechanism, the difference being that it is constructed to operate on 110 volts. The method of holding the signal arm in the caution and clear positions is the same as in the preceding mechanism. The contacts on the circuit controller that control the operating circuits are arranged to snap, other circuits have drag contacts.

A dynamic indication current is generated by the motor, just before coming to rest, when the signal is returning from clear or caution to the stop position, which can be utilized to operate the indication magnets of an electric interlocking machine, a style B or other electric lock, on a mechanical interlocking machine.

110-VOLT D. C. SEMI-AUTOMATIC MECHANISM]

This mechanism is the one now generally furnished with G. R. S. Dynamic Indication Electric Interlocking, not only where there are track circuits, but where there is any probability of track circuits being installed. See circuit diagram, pages 58 and 59.

This mechanism is practically the same as the preceding mechanism but with the addition of the spring attachment, described in connection with the 25-volt semi-automatic mechanism. The spring attachment performs the same function in the 110-volt as in the 25-volt mechanism.

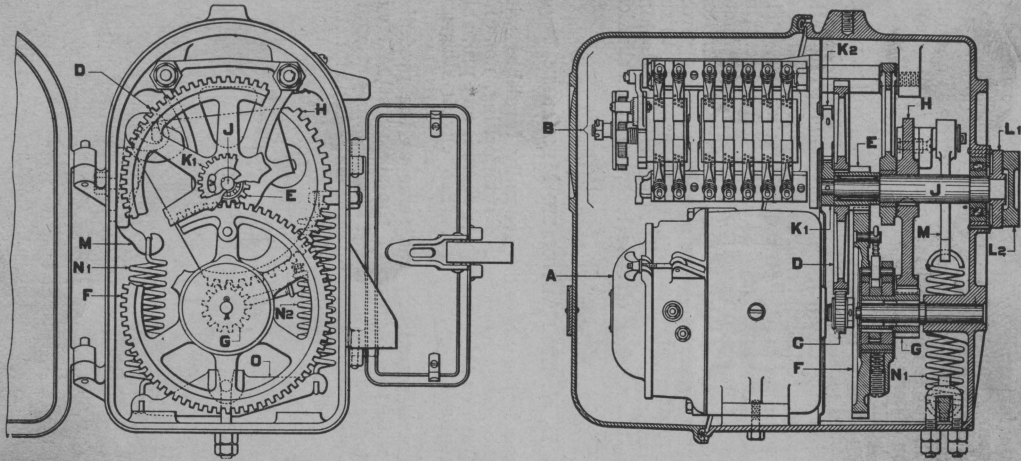


FIG. 13. MODEL 2A 110 VOLT D. C. SEMI-AUTOMATIC MECHANISM

A Motor
B Circuit Controller
C Driving Pinion
D First Intermediate Gear
E First Intermediate Pinion
F Second Intermediate Gear
G Second Intermediate Pinion

H Operating Sector
J Driving Shaft
K₁-K₂ Segmental Gears
L₁-L₂ Universal Coupling
M Hook
N₁-N₂ Coil Springs
O Equalizer

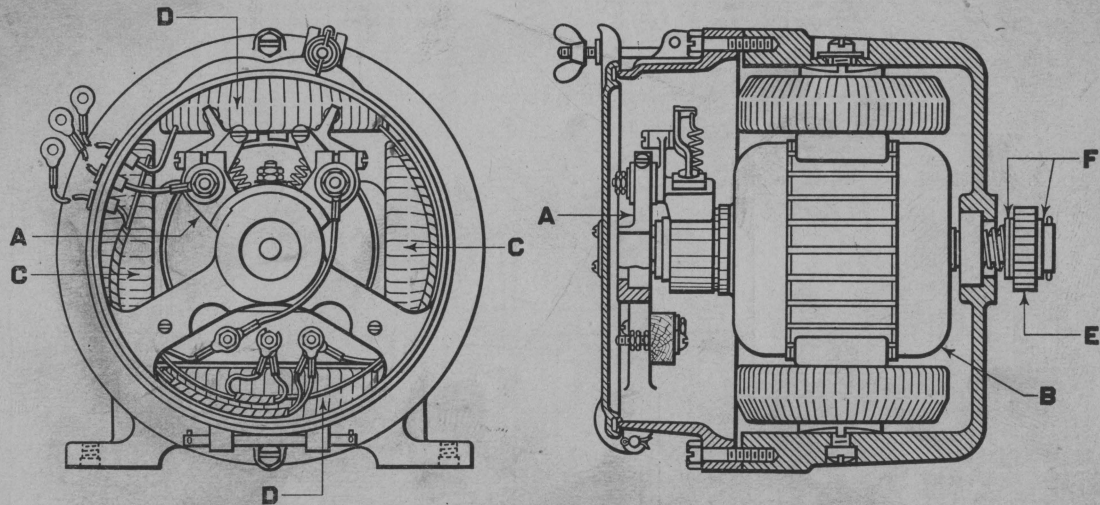


FIG. 14. 110 VOLT D. C. MOTOR

A Brush Holder Bracket
 B Armature
 C Operating Field Windings

D Holding Field Windings
 E Motor Pinion
 F Clutch

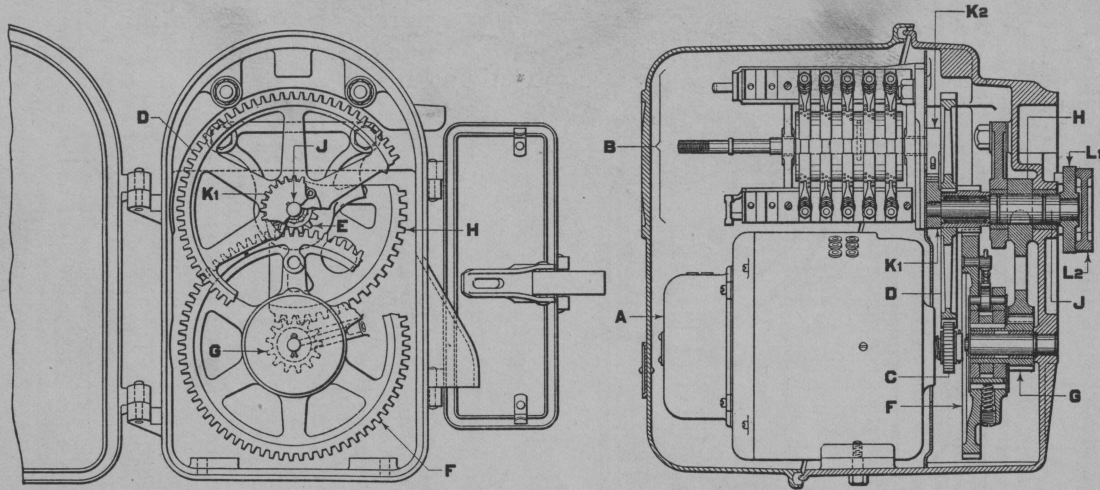


FIG. 15. MODEL 2A A. C. MECHANISM

A Motor
 B Circuit Controller
 C Driving Pinion
 D First Intermediate Gear
 E First Intermediate Pinion
 F Second Intermediate Gear

G Second Intermediate Pinion
 H Operating Sector
 J Driving Shaft
 K₁-K₂ Segmental Gears
 L₁-L₂ Universal Coupling

ALTERNATING CURRENT MECHANISMS

The A. C. mechanisms are the same as the D. C. mechanisms with the exception of the motors which are of the series commutating type or the induction type. Present practice favors the induction motor as it is simple in construction, having few wearing parts, no commutator nor brushes and although more current is required to operate it than the series motor, the cost of the additional current is more than compensated by the lower maintenance cost and the greater reliability which results. See circuit diagrams, pages 60 and 61.

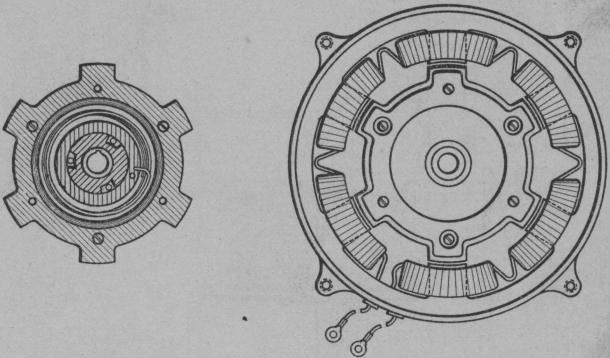


FIG. 16. HOLD CLEAR ROTOR AND STATOR. A. C. MECHANISMS

The induction motor furnished with A. C. mechanisms is in reality a two-phase motor arranged to operate on single phase current by means of an impedance which is connected in series with one of the windings to obtain the necessary phase displacement. Both windings are in service while the motor is operating, which eliminates the necessity of contacting devices such as are ordinarily used with single phase motors to interrupt the current through the starting winding after the motor has developed its normal speed.

In both motors the signal is held in the caution and clear positions by means of a stator winding and a laminated iron core or rotor, shown in Fig. 16. The rotor is loosely mounted on the armature shaft and operates in connection with a clutch. The rotor does not rotate with the armature shaft when the operating windings are energized but when the signal arm is moved to the caution or clear position, the stator windings are energized, the clutch becomes effective, the magnetic attraction between the poles of the rotor and stator prevents rotation of the armature shaft and holds the signal arm in the proper position. When the holding circuit is broken,

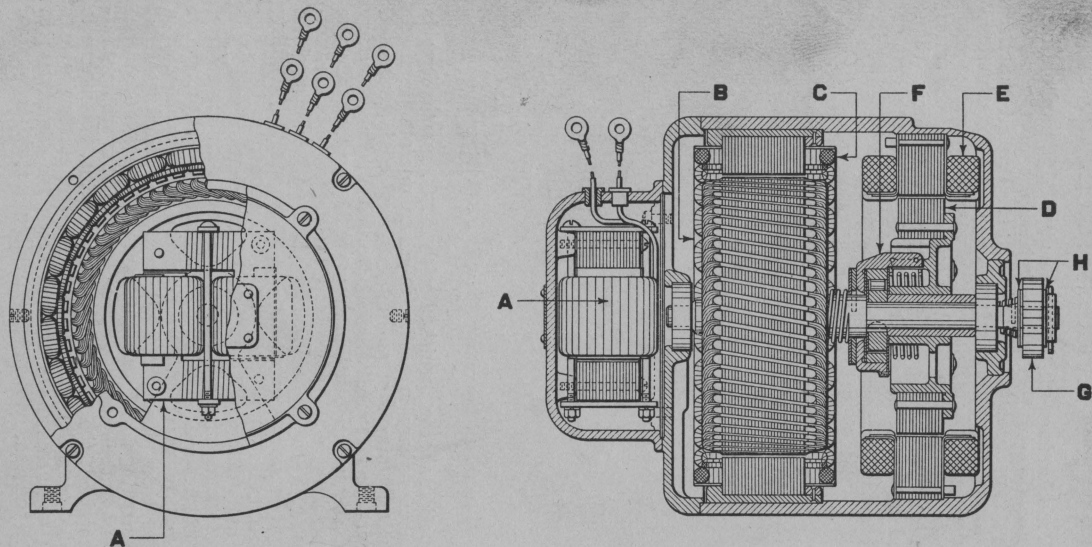


FIG. 17. A. C. INDUCTION MOTOR

A Impedance
B Operating Rotor
C Operating Stator
D Hold Clear Rotor

E Hold Clear Stator
F Clutch, Hold Clear Rotor
G Motor Pinion
H Clutch

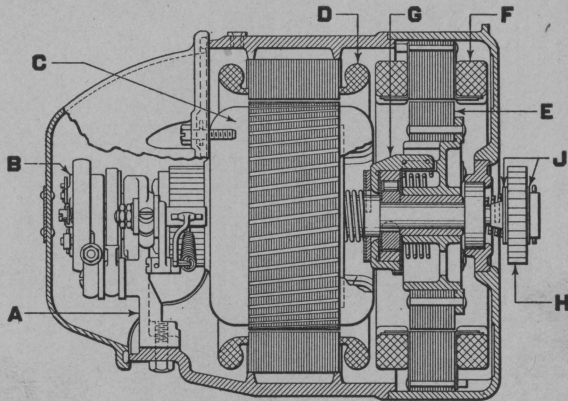
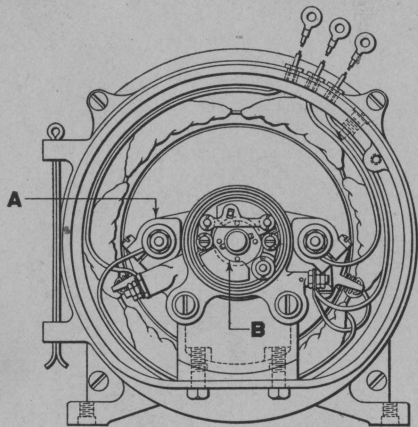


FIG. 18. A. C. SERIES COMMUTATING MOTOR

- | | | | |
|----------|-----------------------------------|----------|--------------------------|
| <i>A</i> | Bearing Bracket and Brush Holders | <i>F</i> | Hold Clear Stator |
| <i>B</i> | Centrifugal Governor | <i>G</i> | Clutch, Hold Clear Rotor |
| <i>C</i> | Operating Rotor | <i>H</i> | Motor Pinion |
| <i>D</i> | Operating Stator | <i>J</i> | Clutch |
| <i>E</i> | Hold Clear Rotor | | |

which results when the track relay is de-energized or when the lever is returned to the normal indication position, the stator windings are de-energized which releases the rotor and the signal returns to the caution or stop position.

This arrangement of holding the signal arm in the caution and clear positions is similar in principle to the arrangement provided in the 25-volt and 110-volt D. C. mechanisms.

The adjustable stop and spring buffer, shown in Fig. 24, checks the momentum of the signal arm when it returns to the stop position.

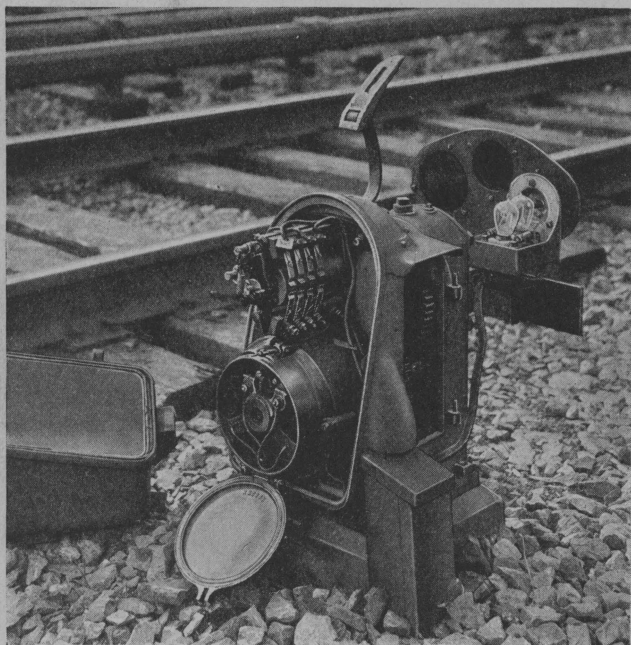


FIG. 19. A. C. MODEL 2A DWARF SIGNAL. ELECTRIC DIVISION,
NEW YORK CENTRAL R. R.

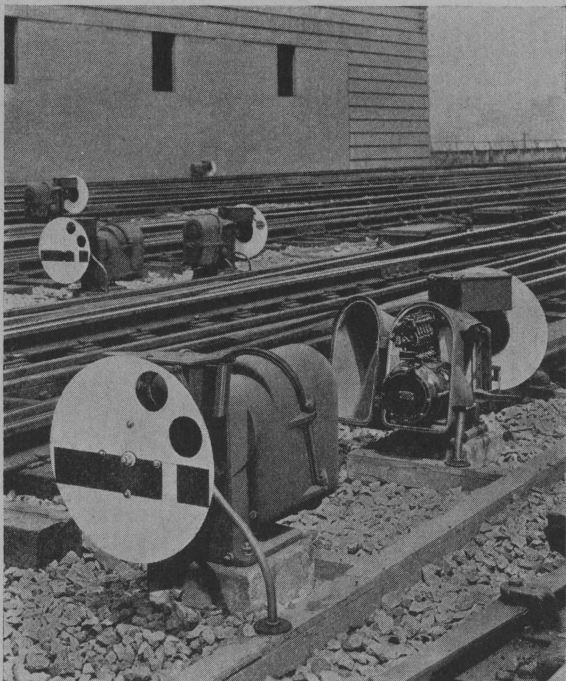
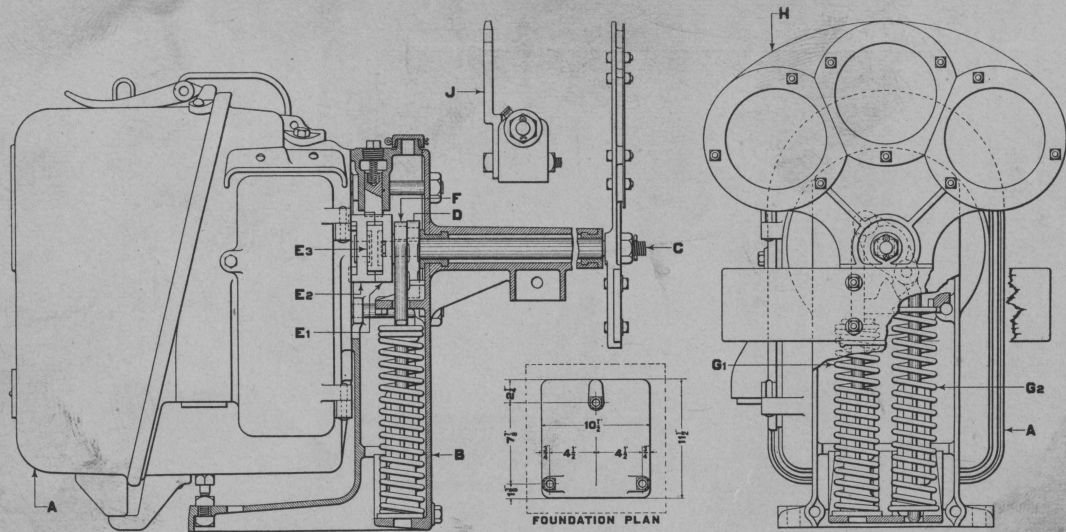


FIG. 20. MODEL 2A DWARF SIGNALS, CHICAGO TERMINAL,
CHICAGO & NORTHWESTERN RY.



A Mechanism
B Mast and Bearing
C Spectacle Shaft
D Spring Arm
*E*₁-*E*₂-*E*₃ Universal Coupling

F Rod for Returning Springs
*G*₁-*G*₂ Returning Springs
H Spectacle
J Lamp Bracket

MODEL 2A DWARF SIGNAL

When employed as a dwarf signal, Figs. 19 and 20, the Model 2A mechanism provides the same facilities as in the high signal mechanism and the use of dynamic indication eliminates the additional indication wire that is required with other power dwarf signals. Dwarf signal mechanisms may be equipped with any of the preceding types of A. C. or D. C. motors.

The mechanism is mounted on a low stand, as shown in Figs. 21 and 22, which serves as a mast and bearing. The return of the signal to the normal position, when the operating and holding circuits are broken, is insured by the springs shown in Figs. 21 and 22, instead of counterweighting the spectacle, which is impracticable owing to the limited clearance. The Model 2A Dwarf Signal occupies little space, as shown in Fig. 27, and is especially desirable at terminals where the track centers are close.

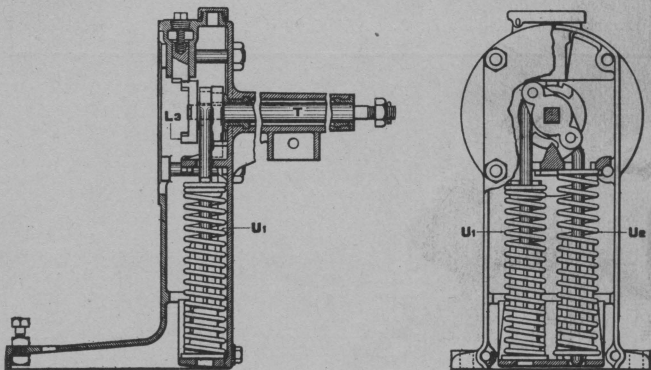


FIG. 22. MODEL 2A DWARF SIGNAL BEARING

OPERATING DATA MODEL 2A SIGNALS

These figures are approximate and vary with the type of spectacle casting and semaphore blade used.

Type of Mechanism	Operating Current Amperes	Holding Current Amperes	Clearing Time Seconds
10-Volt D. C. Motor	2.2	0.018	10
20-Volt D. C. Motor	1.0	0.025	6
25-Volt D. C. Motor	1.8	0.380	6
110-Volt D. C. Motor	0.82	0.250	6
110-Volt A. C. Motor, 25 Cycles	3.65	0.380	10.5
110-Volt A. C. Motor, 60 Cycles	4.25	0.620	9
Dwarf Signal 110-Volt D. C. .	0.65	0.210	5.5

INSTRUCTIONS COVERING THE INSTALLATION AND MAINTENANCE OF MODEL 2A SIGNALS

STORING MECHANISMS

All mechanisms should be stored in an upright position and, if possible, in a dry place, and should not be removed from their boxes until they are installed. Avoid disconnecting or removing the motors from the mechanism cases.

INSTALLATION

In assembling mechanisms which are shipped separately from the pole bearings or in reassembling mechanisms which have been disassembled for any purpose, the surface of all exposed mechanical joints must be cleaned and smoothly coated with white lead before assembly, to insure that they are water-tight.

Whenever it becomes necessary to bolt a mechanism to its pole bearing, see that the semaphore shaft and mechanism are approximately in their "stop" positions. Then rotate the semaphore shaft backward and forward slightly by hand while tightening the bolts, to be sure that no binding takes place during the process.

When working on a mechanism, the motor door should always be kept closed except when necessary to do work inside of the motor.

After a mechanism has been wired, the wire entrance should be sealed to prevent the circulation of air between the inside and outside of the case. Neglect to thoroughly seal may result in trouble due to the probable accumulation of frost or dirt on the circuit breaker parts. If conduit is used between the mechanism case and the pole, the wire entrance or conduit should be likewise sealed.

ADJUSTMENTS

All signals are properly adjusted before shipment, the only adjustments ordinarily required in the field being those due to differences in the semaphore spectacles as follows: If the blade is not horizontal when in its stop position, it can be brought to such position by means of adjusting screw A (see Fig. 24). Spring C, adjusted by screw D, should hold block B firmly against screw A, due allowance being made in the spring adjustment for any increase in weight of the signal arm, due to an accumulation of ice or sleet. Fig. 24 shows relation of adjusting screws, spring, block, etc., when used with upper quadrant signals; this will be reversed when applied to lower quadrant signals.

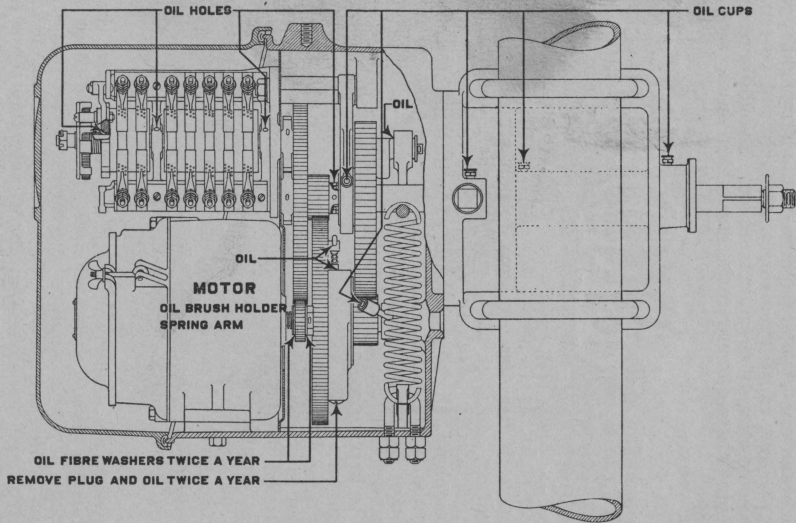


FIG. 23. OILING DIAGRAM FOR MODEL 2A SEMI-AUTOMATIC SIGNAL MECHANISM AND CLAMP BEARING

Having adjusted the blade to the horizontal position, the circuit breaker frame should, if necessary, be rotated bodily a sufficient amount to cause the blade to assume its exact forty-five or ninety-degree position in operation.

Individual adjustment of the circuit breaker contact springs should not be necessary under ordinary conditions. If required, great care should be exercised to see that all contacts are adjusted to open and close as shown on the circuit plan which accompanies each signal mechanism.

In replacing a circuit breaker which may have been removed from the mechanism for any cause, great care should be taken to see that the circuit breaker operating segments mesh properly. Otherwise, it will be impossible for the blade to

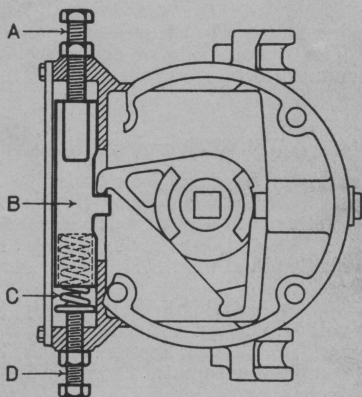


FIG. 24. SECTION OF CLAMP BEARING SHOWING SEMAPHORE SPECTACLE ADJUSTMENT

assume its proper positions in operation except by extreme adjustment of the contacts and circuit breaker.

LUBRICATION

See that all moving parts are thoroughly lubricated with oil that will not thicken in cold weather or dry up in hot weather. "Hydrol," "Polar Ice," or "Three-in-One" oils have been found satisfactory. Use an oil can with a nine-inch curved spout.

After lubrication, the signals should be operated several times, in order to work the oil thoroughly into the bearings. The word "oil" on the diagram, Fig. 23, will indicate what parts require lubrication. If the mechanism has become rusty, especial care should be taken to see that all parts are operating freely before attempting to put the signal in service.

MAINTENANCE

Ordinarily in maintaining a signal, the only requirements are that the connections be kept tight, contacts clean, and the mechanism suitably oiled and cleaned.

Avoid disturbing the commutator or brushes in any way unless found necessary. A commutator in good condition will have a dark glossy appearance. If, however, it should become dirty, it should be cleaned by chamois skin moistened with oil, any surplus oil to be wiped off of the commutator by a dry piece of chamois.

Use a chamois skin in cleaning the circuit-breaker contacts.

If it should become necessary to put a new brush into a motor, the brush should, after having been put in position, be seated to the commutator by drawing thin, fine sandpaper under the brush while the brush is being pressed against the commutator. The smooth side of the sandpaper should be against the commutator. Use "00 Single Finishing Flint" sandpaper.

CATALOG REFERENCES — MODEL 2A SIGNAL

- Model 2A Signal Assemblies and Accessories,
Catalog Section H, Part 1.
- Model 2A Low Voltage (10 and 20 volt) Signal Mechanism,
Catalog Section H, Part 2.
- Model 2A 25 volt Semi-automatic Dynamic Indication Signal
Mechanism,
Catalog Section H, Supplement Part 2.
- Model 2A 110 volt D. C. Signal Mechanism,
Catalog Section H, Part 3.
- Model 2A 110 volt Semi-automatic Dynamic Indication Signal
Mechanism,
Catalog Section H, Supplement Part 3.
- Model 2A A. C. Signal Mechanism,
Catalog Section H, Supplement Part 4.
- Model 2A Dwarf Signal Mechanism,
Catalog Section H, Part 5.
- Model 2A Base of Mast Signal Mechanism,
Catalog Section H, Part 6.

TESTS

If the signal has been properly adjusted and lubricated it will operate freely. If in doubt as to whether a signal is sufficiently free in operation, a drop-away test should be made as follows: Connect an adjustable resistance in series with the motor. Gradually reduce it until the motor will just move the blade upward. Just before reaching the forty-five-degree position, quickly insert sufficient resistance to just permit the motor to start backward, moved by the weight of

the blade grip. The current which will permit it to start backward from a given position should be approximately fifty per cent. of the current required to move it up to that position. The same process should be repeated in the ninety-degree position or sixty-degree, as the case may be.

The signal having been oiled and operated a few times, see that the blade snubs properly in descending and also that the ratcheted main gear F (Figs. 7, 9, 12, 13 and 15) clicks approximately three or four times in so doing. The number of clicks can be regulated by the adjusting screw on the ratcheted main gear.

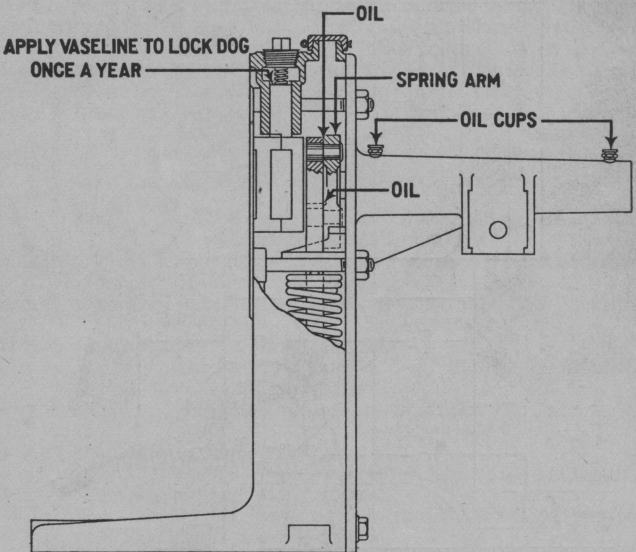


FIG. 25. OILING DIAGRAM FOR MODEL 2A DWARF BEARING

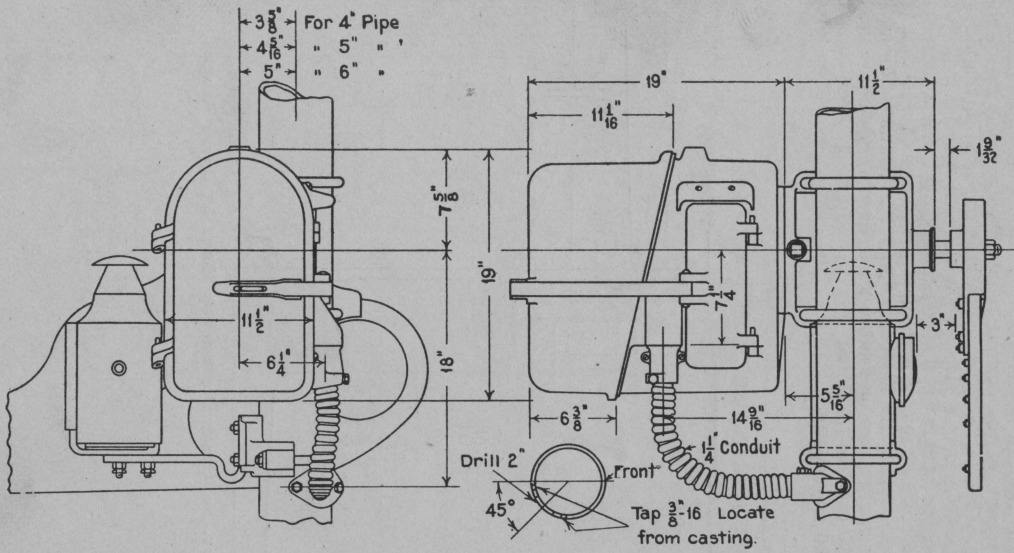


FIG. 26. DIMENSIONS OF MODEL 2A SEMI-AUTOMATIC SIGNAL
 Wires carried from Mast to Signal Mechanism in Flexible Conduit (see Fig. 28)

NOTE.

GAUGE OF TRACKS IS 4'-9"
 WHEN GAUGE OF TRACKS IS 4'-8½"
 THE CLEARANCE BETWEEN SIGNAL
 AND MAXIMUM EQUIPMENT LINE WILL
 BE ½" GREATER.

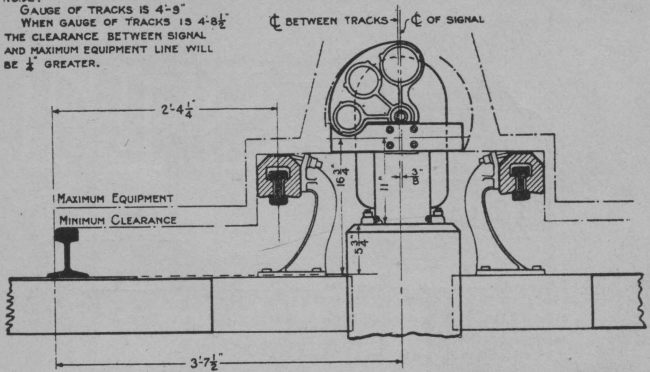


FIG. 27. DIAGRAM SHOWING CLEARANCE BETWEEN MODEL 2A DWARF SIGNAL AND THIRD RAIL. ELECTRIC DIVISION, NEW YORK CENTRAL & HUDSON RIVER R. R. Twelve-foot Track Centers

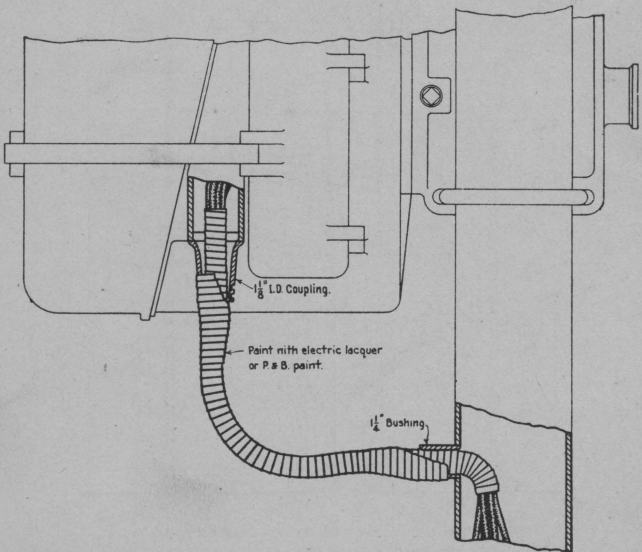


FIG. 28. METHOD OF TAPING WIRES RUNNING FROM MAST TO SIGNAL MECHANISM (see Fig. 26)

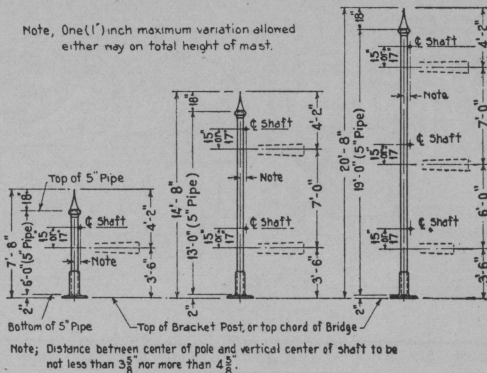


FIG. 29. BRACKET POST AND BRIDGE SIGNAL MASTS
R. S. A. Drawing 1037, Dated 1910

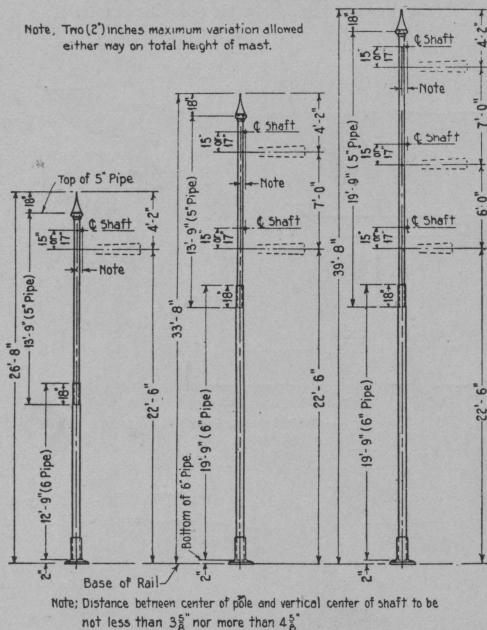


FIG. 30. GROUND SIGNAL MASTS
R. S. A. Drawing 1035, Dated 1910

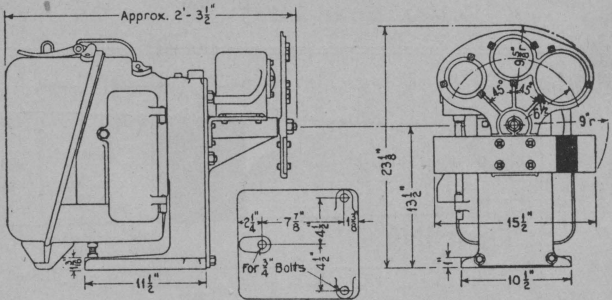


FIG. 31. DIMENSIONS OF MODEL 2A THREE POSITION, NON-AUTOMATIC DWARF SIGNAL, EQUIPPED WITH ELECTRIC LAMP

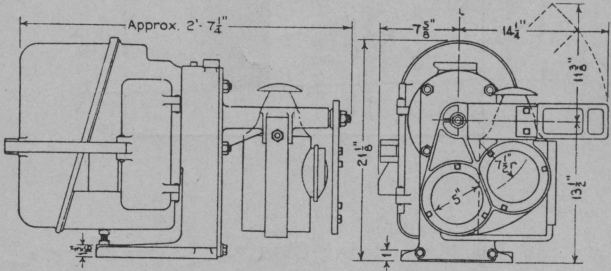
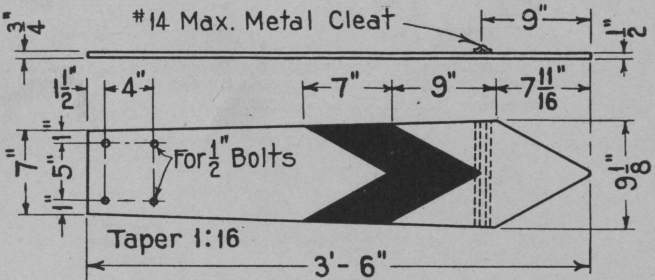
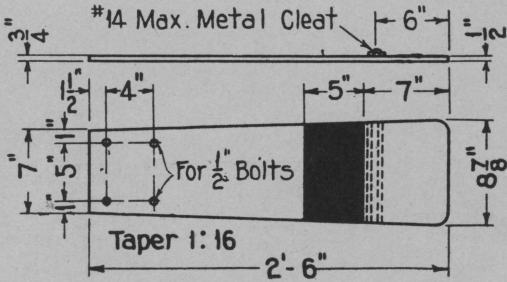
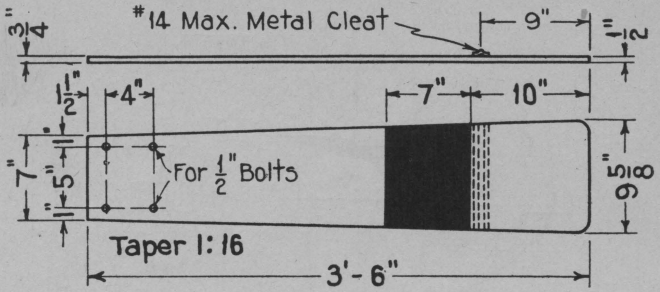


FIG. 32. DIMENSIONS OF MODEL 2A TWO POSITION, NON-AUTOMATIC DWARF SIGNAL, EQUIPPED WITH OIL LAMP
Spectacle R. S. A. Drawing 1233, October, 1912



Where stripes are used the dimensions shown are recommended

FIG. 33. BLADES FOR UPPER QUADRANT SIGNALS
R. S. A. Drawing 1065, Dated 1911

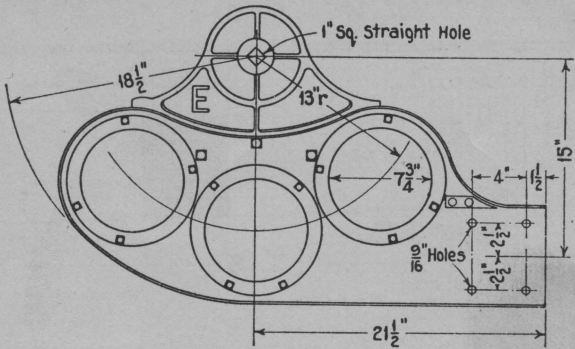


FIG. 34. SEMAPHORE SPECTACLE
R. S. A. Design "A" Drawing 1040, October, 1912

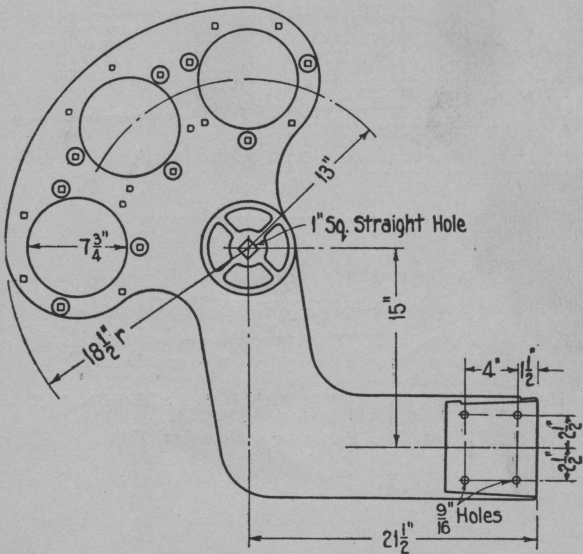
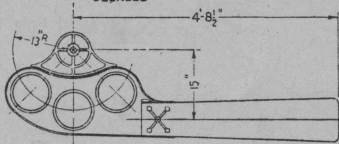
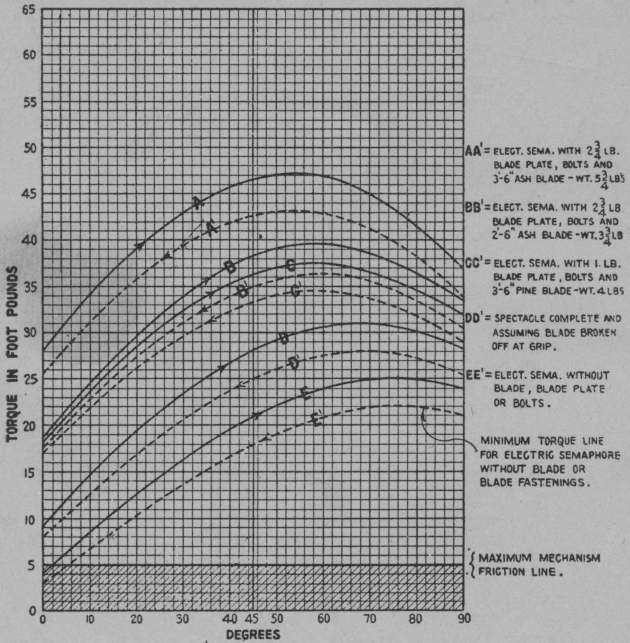


FIG. 35. SEMAPHORE SPECTACLE
R. S. A. Design "B" Drawing 1041, October, 1912

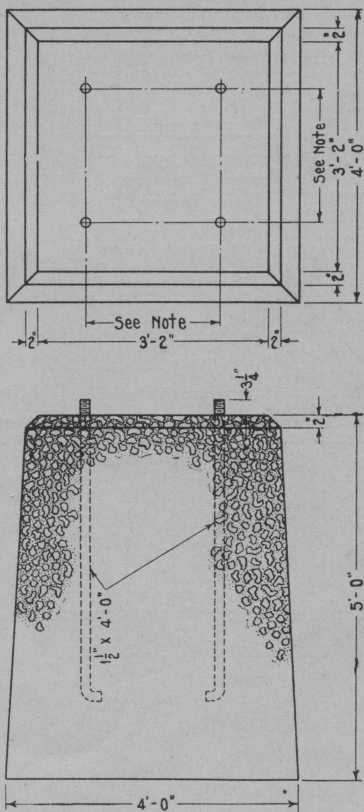
NOTE: FULL LINES REPRESENT TORQUE FOR SPECTACLE MOVEMENTS 0° TO 90° [STOP TO PROCEED]
 DOTTED LINES REPRESENT TORQUE FOR SPECTACLE MOVEMENTS 90° TO 0° [PROCEED TO STOP]



NOTE: SPECTACLE EQUIPPED WITH 8 3/8" ROUNDELS AND RETAINING RINGS IN ALL CASES.

FIG. 36. TORQUE CURVES FOR R. S. A. DESIGN "A" SEMAPHORE SPECTACLE

R. S. A. Plan 1064. Issue December, 1912



NOTE: 20" for Pipe Bracket Post.
 22" for Channel Column Bracket Post.

FIG. 37. BRACKET POST FOUNDATION
 R. S. A. Drawing 1108, Dated 1909
 (70.3 Cubic Feet of Concrete)

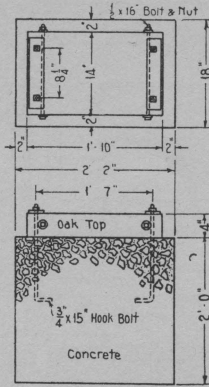


FIG. 38. DWARF SIGNAL FOUNDATION FOR MODEL 2A,
 MODEL 3 or ONE ARM MODEL 2 DWARF SIGNAL
 (6.5 Cubic Feet of Concrete)

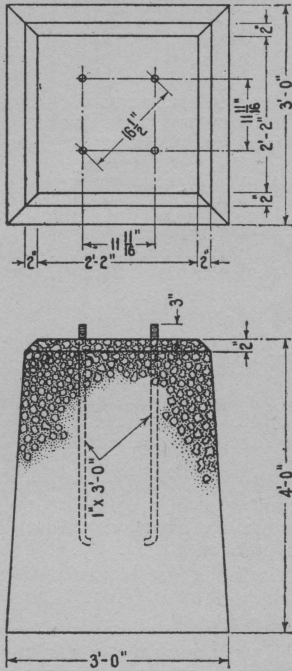


FIG. 39. GROUND SIGNAL MAST FOUNDATION
 R. S. A. Drawing 1107, Dated 1909
 (30.25 Cubic Feet of Concrete)

SHIPPING WEIGHTS MODEL 2A SIGNALS
R. S. A. DIMENSIONS

	Shipping Weights, Pounds
Pipe Bracket Post complete, narrow deck	3400
Pipe Bracket Post complete, wide deck	3800
1 Arm Ground Signal complete, 22' 6" base to center of arm	1270
1 Arm Ground Signal complete, 29' 6" base to center of arm	1430
2 Arm Ground Signal complete, 22' 6" base to center of lower arm	1850
2 Arm Ground Signal complete, 28' 6" base to center of lower arm	2000
3 Arm Ground Signal complete, 22' 6" base to center of lower arm	2420
1 Arm Bracket or Bridge Signal complete, 3' 6" base to center of arm	710
1 Arm Bracket or Bridge Signal complete, 10' 6" base to center of arm	900
2 Arm Bracket or Bridge Signal complete, 3' 6" base to center of lower arm	1310
2 Arm Bracket or Bridge Signal complete, 9' 6" base to center of lower arm	1450
3 Arm Bracket or Bridge Signal complete, 3' 6" base to center of lower arm	1860
The above signals complete with mechanism, ladders, spectacles, blades, lamp brackets, foundation bolts, etc.	
Cantilever bracket complete	200
Dummy Mast	300
Fixed Arm complete	130
Model 2A, 110-volt Signal Mechanism complete, with clamp bearing (Fig. 199)	350

DWARF SIGNALS

Model 2A Dwarf Signal complete (Figs. 204, 205)	380
Model 2, 1 Arm Dwarf Signal complete (Fig. 207)	150
Model 2, 2 Arm Dwarf Signal complete (Fig. 206)	300
Model 3, 1 Arm Dwarf Signal complete (Fig. 208)	140

The above signals complete with spectacle, blade, lamp bracket, foundation bolts, etc.

CIRCUIT DIAGRAMS

MODEL 2A SIGNALS

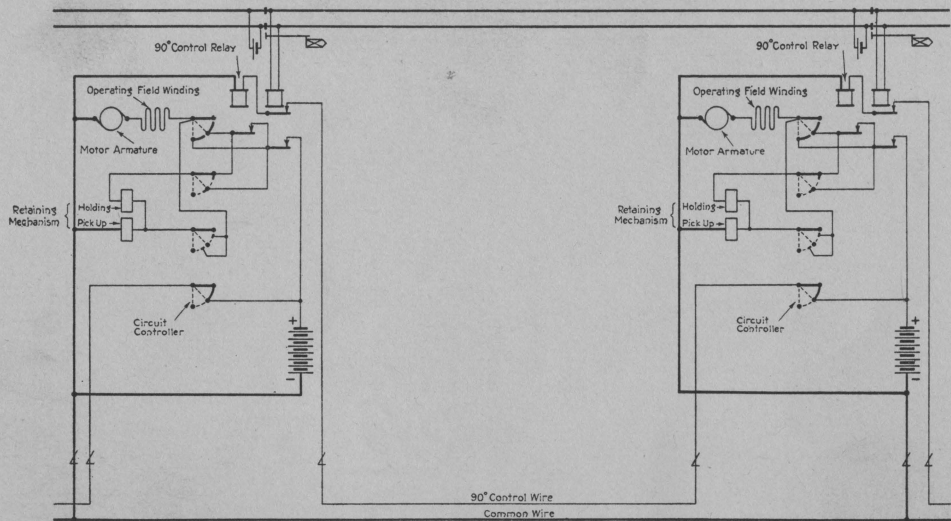


FIG. 40. CIRCUIT DIAGRAM. THREE POSITION D. C. AUTOMATIC SIGNAL, 10 OR 20 VOLT MOTOR

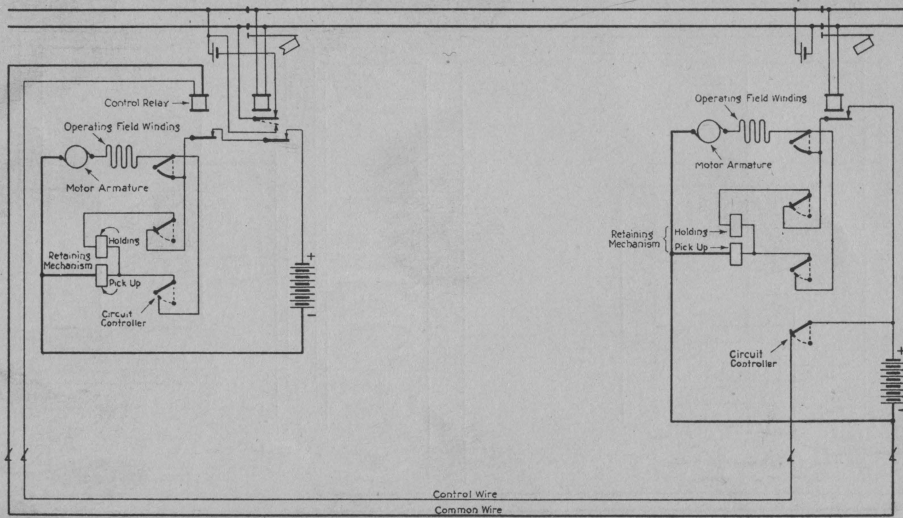


FIG. 41. CIRCUIT DIAGRAM. TWO POSITION D. C. AUTOMATIC SIGNAL, 10 OR 20 VOLT MOTOR

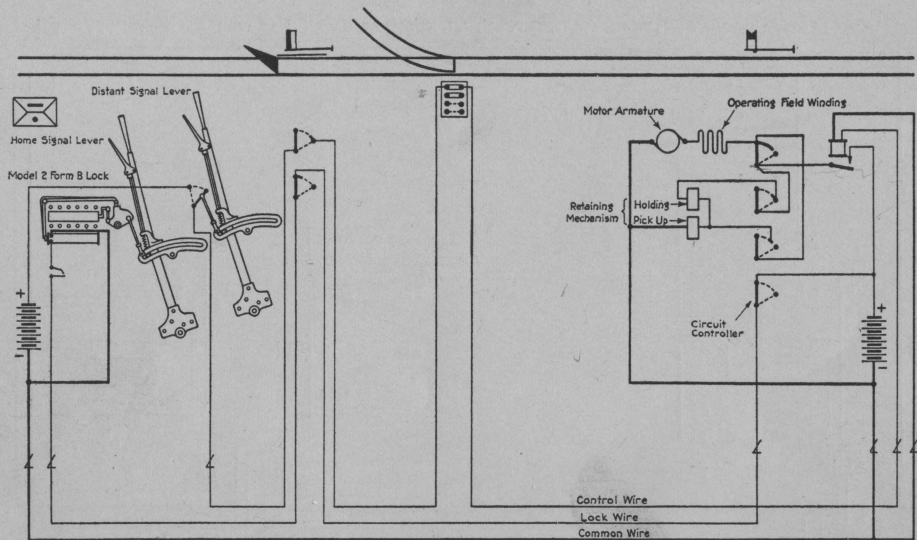


FIG. 42. CIRCUIT DIAGRAM. TWO POSITION D. C. POWER DISTANT SIGNAL, BATTERY INDICATION, 10 OR 20 VOLT MOTOR

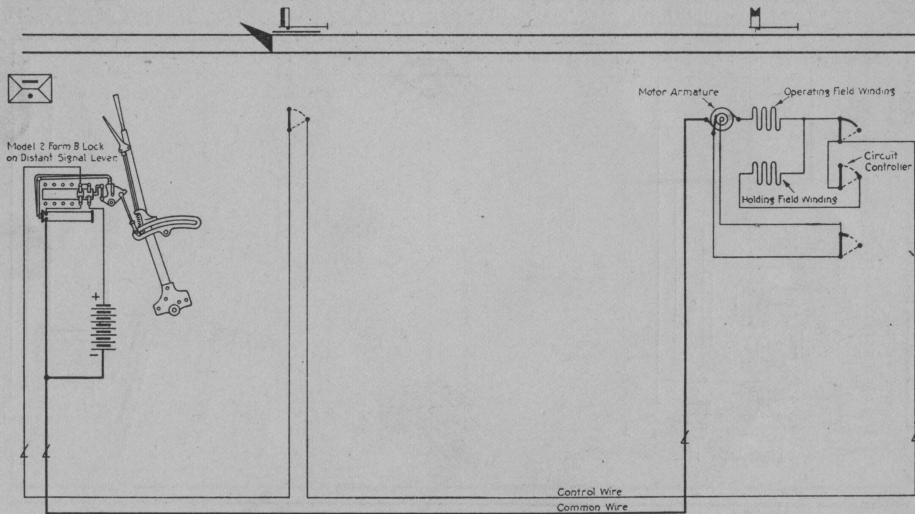


FIG. 43. CIRCUIT DIAGRAM. TWO POSITION D. C. POWER DISTANT SIGNAL, DYNAMIC INDICATION, 25 VOLT MOTOR

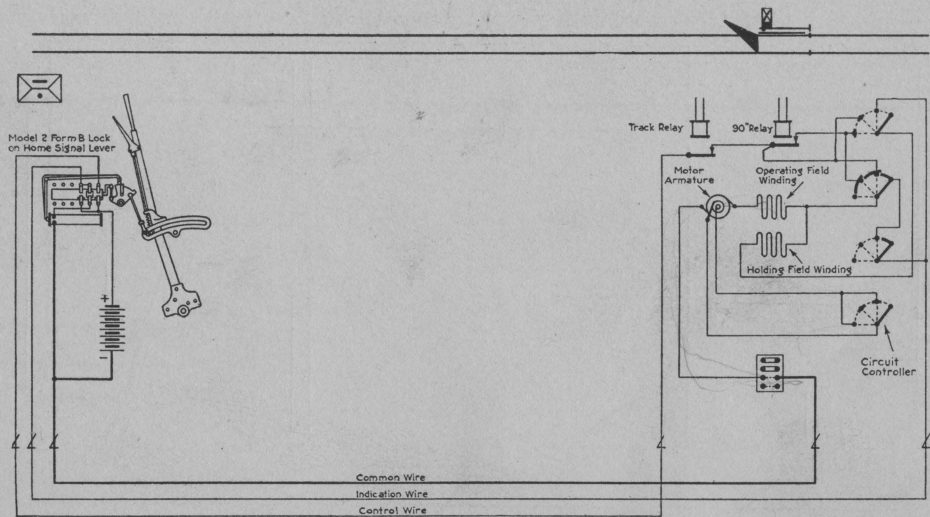


FIG. 44. CIRCUIT DIAGRAM. THREE POSITION D. C. SEMI-AUTOMATIC, DYNAMIC INDICATION POWER HOME SIGNAL. MECHANICAL INTERLOCKING. 25 VOLT MOTOR

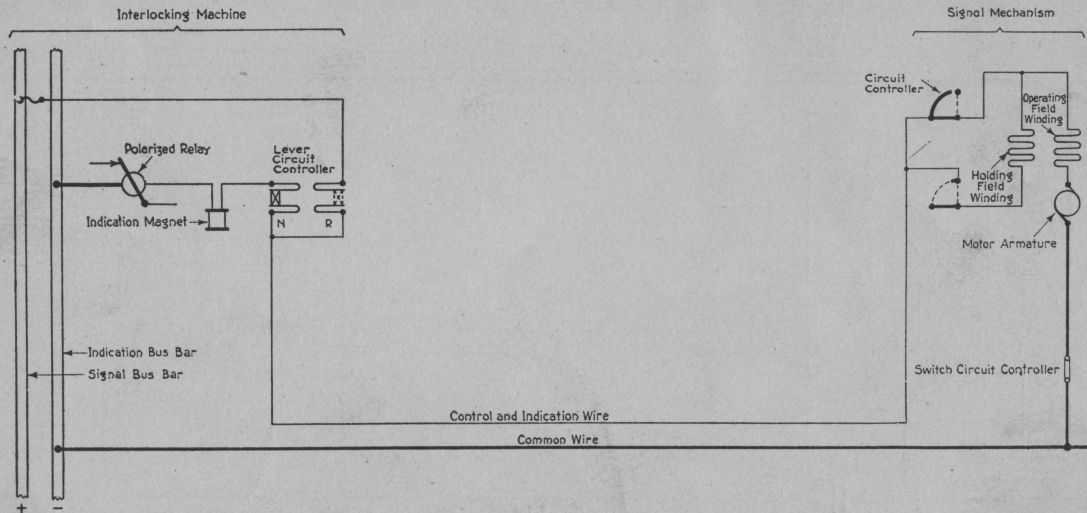


FIG. 45. CIRCUIT DIAGRAM. TWO POSITION D. C. NON-AUTOMATIC SIGNAL. 110 VOLT MOTOR

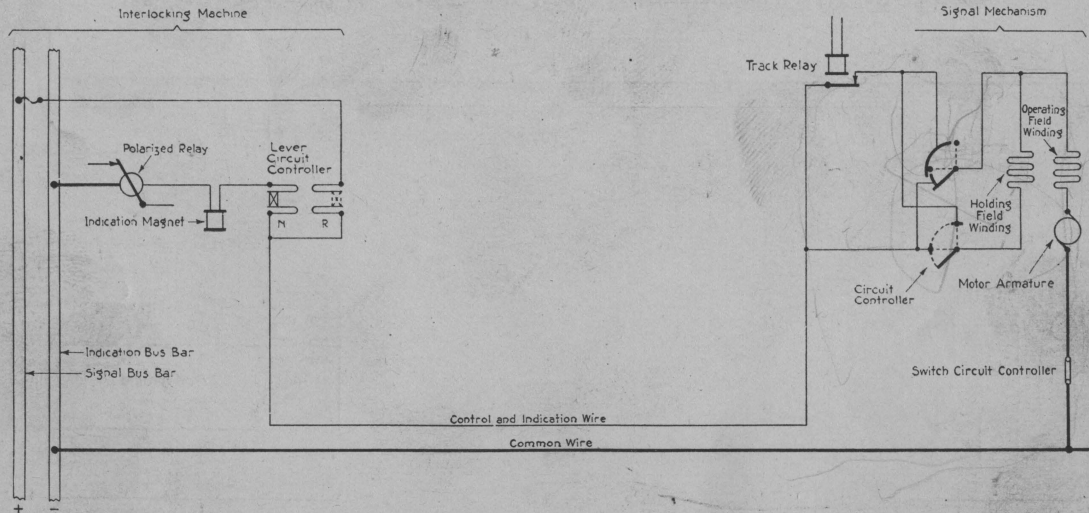


FIG. 46. CIRCUIT DIAGRAM. TWO POSITION D. C. SEMI-AUTOMATIC SIGNAL, 110 VOLT MOTOR

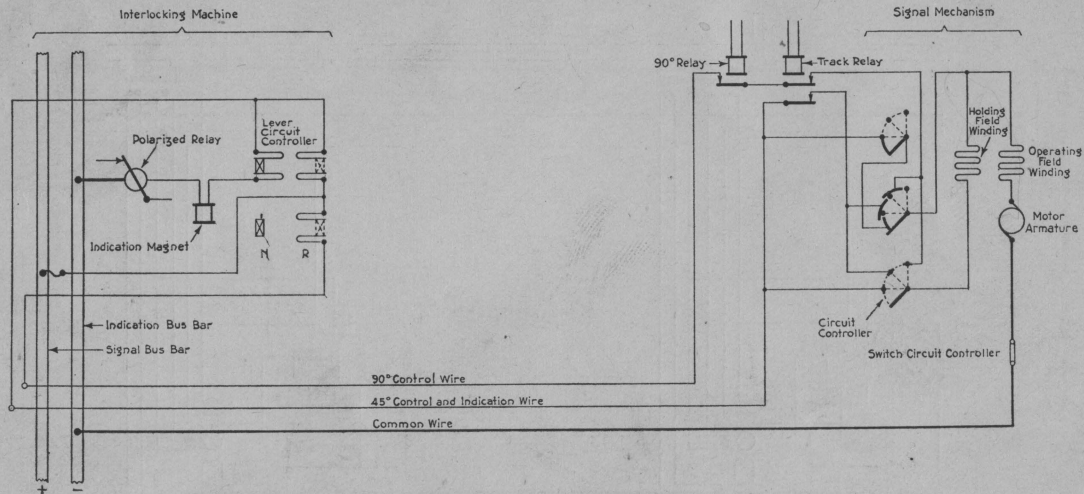


FIG. 47. CIRCUIT DIAGRAM. THREE POSITION D. C. SEMI-AUTOMATIC SIGNAL, 110 VOLT MOTOR

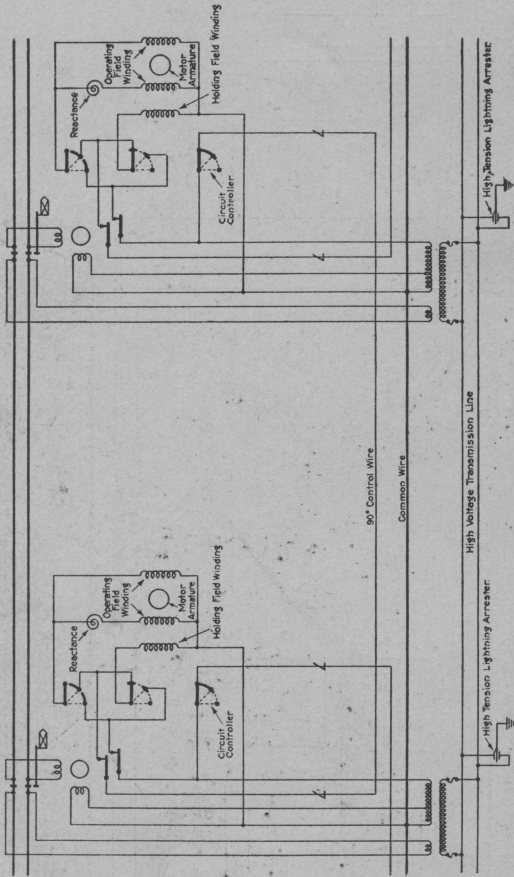


FIG. 48. CIRCUIT DIAGRAM. THREE POSITION A. C. AUTOMATIC SIGNAL, INDUCTION MOTOR

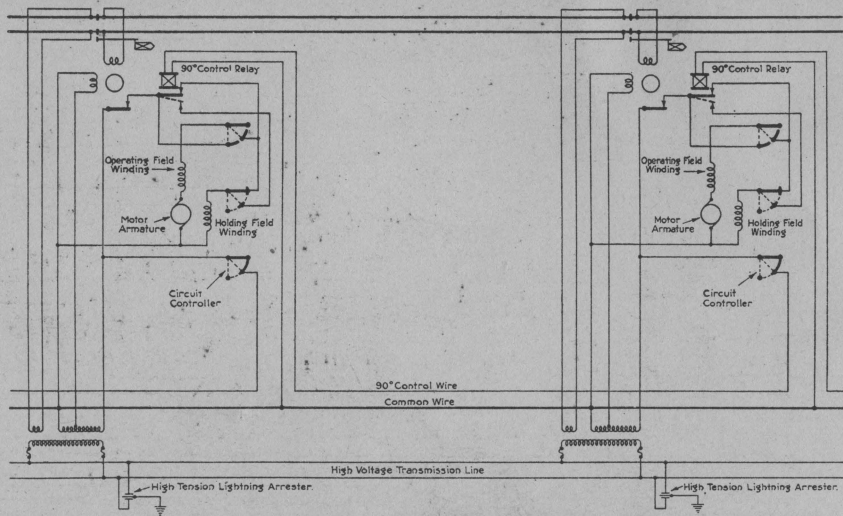


FIG. 49. CIRCUIT DIAGRAM. THREE POSITION A. C. AUTOMATIC SIGNAL, SERIES COMMUTATING MOTOR

The Caxton Company
Cleveland Rochester

