TAYLOR

SIGNAL

COMPANY

CATALOGUE No. I

TAYLOR SIGNAL COMPANY

MANUFACTURER

OF

THE ELECTRIC INTERLOCKING SYSTEM

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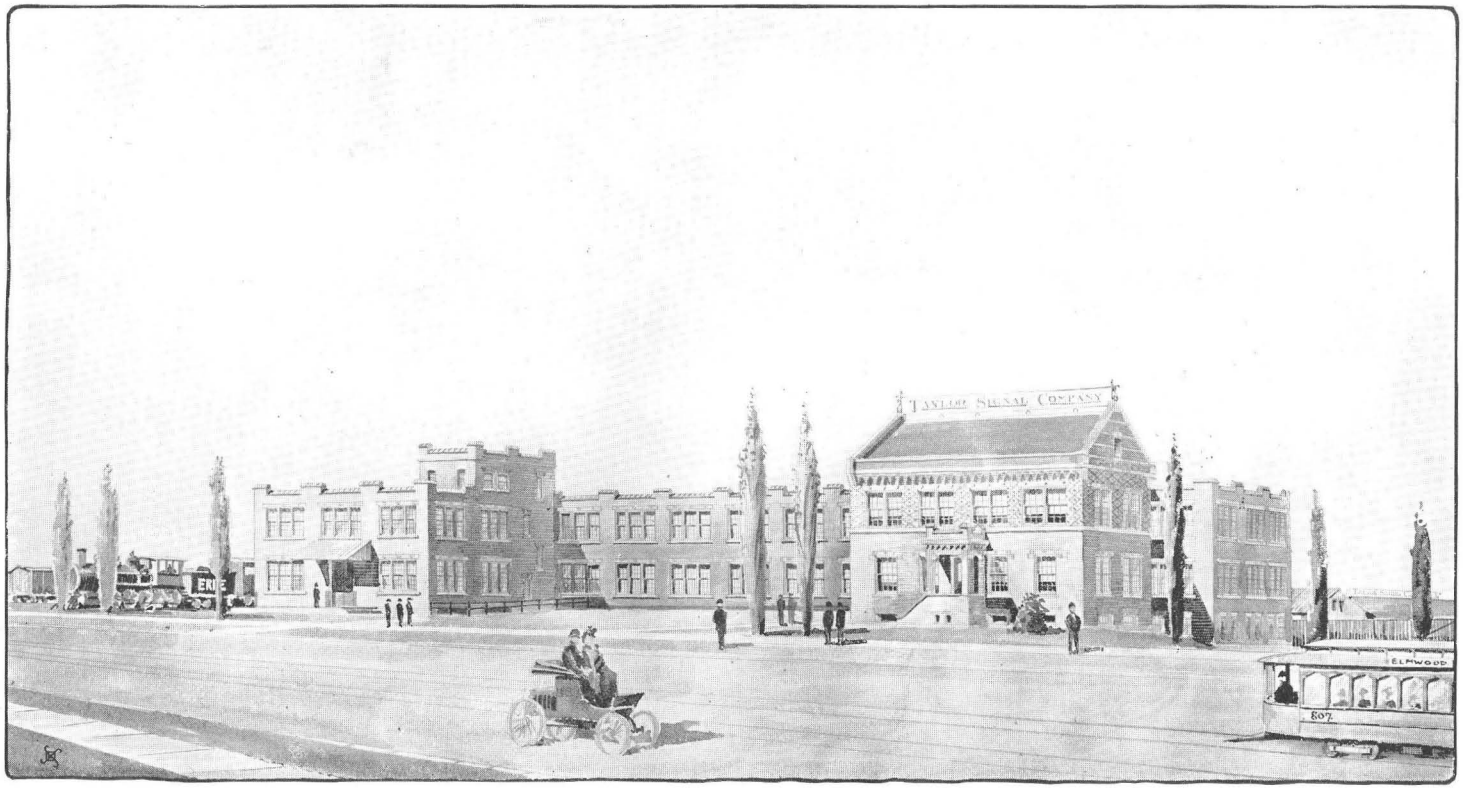
MAIN OFFICE AND WORKS
BUFFALO

WESTERN OFFICE
CHICAGO

1902



ELMWOOD AVENUE AND BELT LINE, BUFFALO, N. Y

PREFACE

IN THE last few years there has been a phenomenal increase in tonnage hauled on American railways, necessitating the purchase of more and better engines and cars of larger capacity, equipped with the best safety devices. Enormous sums have been expended in taking out curves, cutting down grades, laying additional main tracks,putting in new sidings and providing improved terminal facilities. But, notwithstanding all these improvements, many lines find it impossible to handle their business with sufficient dispatch to avoid congestion. This fact has led many progressive American railway managers to realize that if they are to secure the best and most economical returns from the great expenditures made for motive power, car equipment and tracks, suitable means must be provided to enable their trains to move with a minimum of delays and a maximum of safety; and this can only be realized when train orders are supplanted by an up-to-date block system and hand operated switches by a modern system of interlocking.

The very highest development of the art of signaling has been reached in this country but no American railway is nearly so thoroughly equipped with signaling as is the average English line.

This lack of signal equipment will be better comprehended after considering some simple statistics.

The first interlocking plant installed on the London and Northwestern Railway was put in service in 1859; fourteen years later, in 1873, there were in use on that line alone, 13,000 levers. At the same date there was not a single interlocking plant in use in the United States, the first plant in this country having been installed in the year 1874 by Messrs. Toucy and Buchanan at Spuyten Duyvil Jnc., in New York City.

At the present time there are in use on the 1800 miles of line of the London and Northwestern Railway approximately 36,000 interlocked levers, or an average of about 20 levers per mile of line, whereas there are only about 40,000 in use on all lines of the United States, or, approximately one lever to five miles of line, or about one per cent of the number of levers per mile used on the London and Northwestern Railway.

When it is remembered that probably more than one half of the interlocked levers in use in this country are at grade crossings, leaving fewer than 20,000

INTERLOCKING MACHINE, 16TH AND CLARK STREETS, CHICAGO.

levers used for station, yard and terminal work, whereas practically the entire 36,000 on the L. & N. W. are used for such work alone, it will be recognized that American railways are in general very poorly provided with modern signal appliances. In fact there is probably to-day not a single American railway that is nearly so thoroughly equipped as the London and Northwestern was twenty-seven years ago, though as might be expected, the devices in use on American lines having properly organized signal departments, capable of making suitable specifications, compare favorably with the best in use on European lines and, in numerous instances, large power plants are in use which are superior to anything ever devised abroad.

There can be no question as to the inability of most of our railways to move their trains with proper safety and dispatch during times when traffic is heavy; no competent railway operating officer doubts that proper systems of signaling would greatly aid in the safer and more rapid movement of trains and, while there are probably few American railway men who recognize fully how very far behind the best European lines our lines are in respect to the completeness of their signal equipment, this is becoming better understood every year and there is reason to believe that our most progressive lines will not much longer continue to limit the applications of interlocking to the protection of grade crossings with here and there a junction or yard plant.

Such being the case, it is probable that more signaling will be done in the near future than has ever before been done in this country and American railway managers will therefore find it greatly to their advantage to give serious consideration to the determination of what system of interlocking they can best use.

The earliest system employed and that in most general use at this time is the so called "mechanical interlocking" in which the switches or signals are manually worked by means of interlocked levers connected with them by pipe or wire lines.

When properly installed, this system has given satisfactory results; but, unfortunately, in the effort of railway men to secure cheap appliances and in the stress of competition between the various manufacturers of signaling devices, a great many of the installations made in this country are very imperfect and unsafe.

Experience has shown that, in order to secure a reasonable degree of safety, it is absolutely essential that the following requirements be met:—

All derails, movable point frogs, locks, switches and home signals should be worked by pipe; no signal should be worked by a single wire; all pipe and wire lines should be automatically compensated; all derails, movable point frogs and facing point switches should be provided with duplex facing point locks; all cranks and pipe compensators should be fixed on strong foundations set in best quality concrete; no facing point switch more than 600 feet from the

tower should be taken into the system; no lever should be overloaded by putting on it such a number of switches and bars as to prevent a man of average strength from throwing it with one hand.

Where these and other proper specifications have been followed, fair results have been obtained, though it has long been recognized by American railway operating officials that this system has inherent defects that render it, under certain conditions, unsafe. For example, in the event of the breakage of a pipe or wire operating a signal, there can be no absolute assurance that such breakage will be known by the leverman or that such signal will occupy a position corresponding with that of its lever or that it will not indicate "line clear" when, its lever being normal, another and opposing signal is set at "line clear."

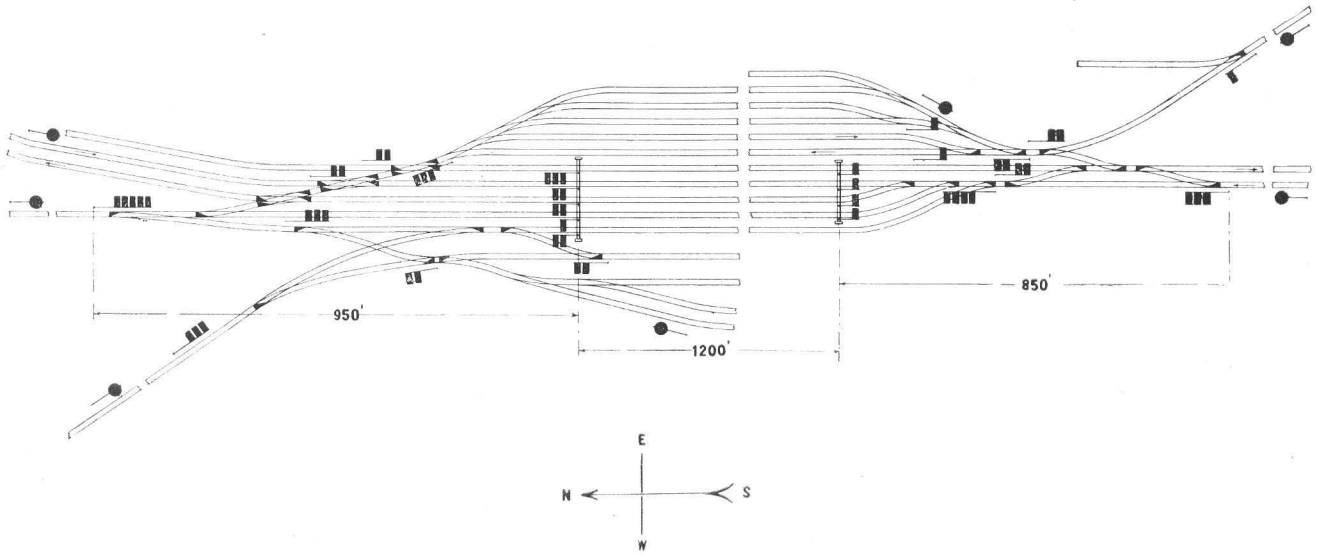
The fatigue incident to working mechanical levers is very great, so that it is frequently necessary to employ three eight hour levermen for a comparatively small plant where the number of lever movements is considerable; if the plant is very large, it is sometimes necessary to employ as many as eight men on each of three shifts.

Moreover, under certain conditions it is very costly to operate such a system. For example, in cases where the distance between the extreme switches to be operated is over 1,600 feet, it is generally necessary to provide two mechanical interlocking towers, each with its own set of levermen, as it is neither safe nor practicable to work such switches from one tower. It is interesting to note in this connection that under the English Board of Trade requirements, which are wisely drawn and rigidly enforced, no facing point switch may be operated at a distance exceeding 540 feet from the tower. Even at this distance it is considered that ordinary pipe lines are not sufficiently strong or safe and many English lines now employ a steel channel section, cut to 18-foot lengths and jointed by means of fish plates secured by six $\frac{1}{2}''$ bolts, this construction admitting of ready detection of rods weakened by corrosion and of their easy removal.

In order to overcome these and other disadvantages inherent in systems of mechanical interlocking, the "pneumatic system" was devised by Mr. George Westinghouse, Jr., the first working installation having been made at the crossing of the P. and R. and L. V. Railways, near Bound Brook, N. J., in 1884.

At the present time two varieties of this system are in use,one, popularly known as the "electro-pneumatic," in which air compressed to a working pressure of about 60 pounds is employed for moving switches and signals and in which the release locking is effected by electro-magnetic means; and the other, popularly known as the "low pressure pneumatic," in which air at a pressure of about 20 pounds is used for operation and in which compressed air effects the release locking.

Petange Station, Grand Duchy of Luxemburg.



Some of the advantages claimed for this system are as follows:—

The ability to operate switches and signals at any desired distance from the cabin; that switches are actually required to be moved and securely locked in the proper position before a signal governing traffic over them can be cleared; that each signal, when cleared, automatically locks the lever operating it in such manner as to prevent the release of levers controlling conflicting signals and switches, until such signal has been again placed completely at danger, thus effectually providing against the simultaneous display of two conflicting clear signals; that, there being no moving parts between cabin and switches and signals, wear of mechanism, lost motion and the troublesome and dangerous effects of expansion and contraction of mechanically operated pipes and wires are all eliminated; that much less room is required for leadout connections than in a mechanical plant and much valuable space is thereby saved; that cabins of much smaller and lighter design are used; that the operation of the machine requires so little physical exertion that one man can do the work that would in a mechanical plant require three or four.

There can be no doubt that both varieties of the pneumatic system are far better adapted for the working of large plants than the mechanical as both largely fulfill the claims above referred to.

It is, however, found that in the electro-pneumatic system a cross between the release locking (commonly known as "indication") wire and the common return wire (or ground), will have the same effect as would the closing of the indication circuit in the proper manner, thus giving a false indication, which in view of the fact that the safety of any power interlocking depends upon the reliability of its indications, is highly objectionable. It is also found that where the indication is given by means of compressed air the release locking is often effected very slowly in cases where switches or signals are located at a considerable distance from the tower and this, at a busy plant, is also very objectionable.

Another disadvantage of the low pressure pneumatic system is that if a switch, meeting any obstruction, fails to complete its movement and to give indication, it is necessary either for a repairman to go immediately to the switch and operate it by hand or for the leverman to force the indication, which is often done and is evidently dangerous. Thus, in one style of the pneumatic system there is the defect due to possibility of false indication and in the other the defect due to slow indication and to inability to reverse a switch which has not fully completed its movement. Some other disadvantages of the pneumatic systems are as follows:—

Liability to freezing of pipes and valves in extreme cold weather; high cost of furnishing power; danger of throwing near switches under trains when, owing to extreme cold weather, it is necessary to maintain higher than normal pressures in order to be able to work switches farthest from tower; high cost of

DERAIL AND SIGNAL ARRANGEMENT, WEST CHICAGO, ILL.

maintenance owing to rapid deterioration of iron pipe lines placed underground and subjected to action of various salts and alkalies found in soil and to electrolytic action from electric railway and lighting circuits; difficulty and cost of locating leaks and breaks in pipe lines under ground; extremely high cost of installing and operating medium sized and small plants or a small number of switches or signals located at a considerable distance from the tower in a large plant.

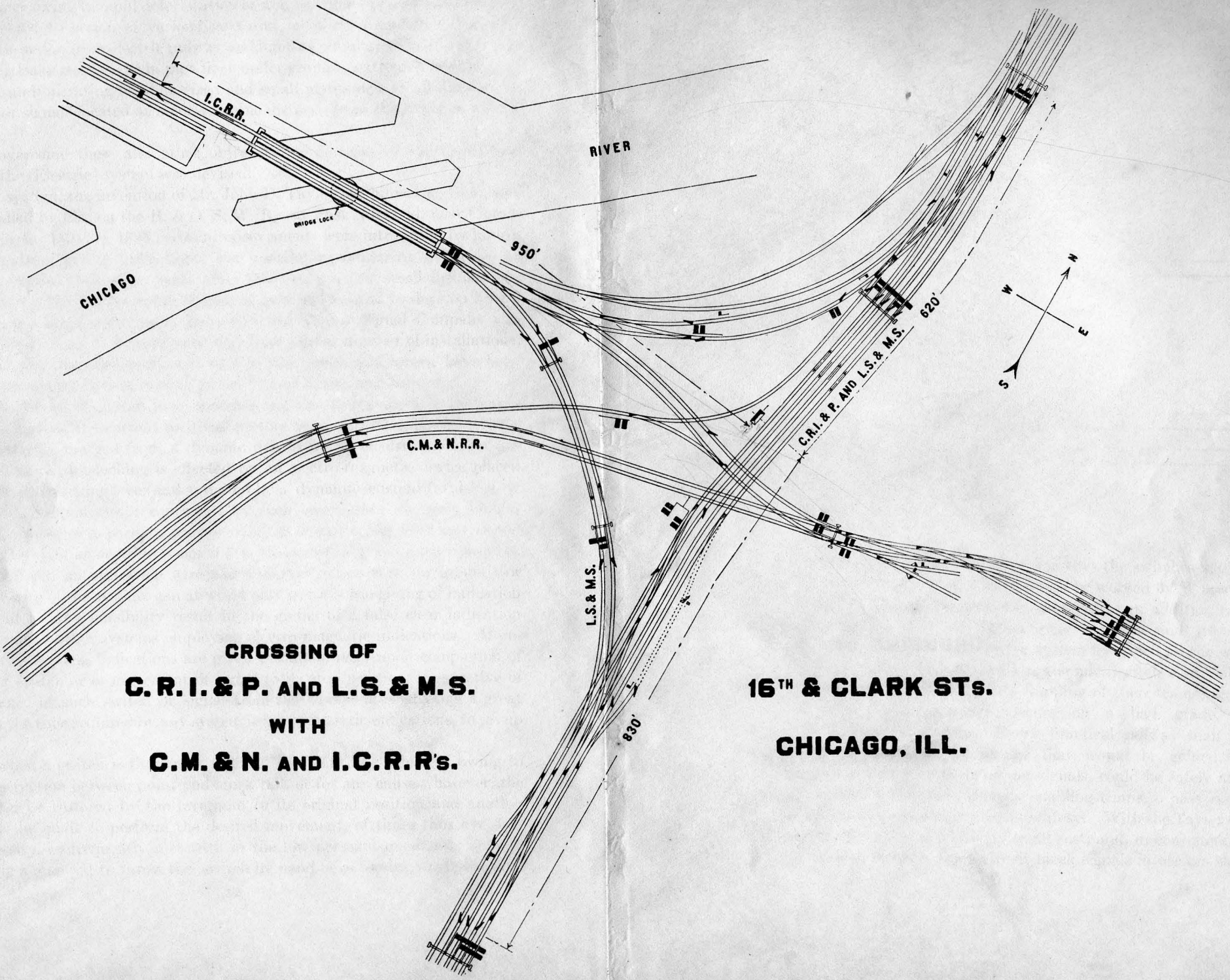
To overcome these and other objectionable features of the Pneumatic System, the 'Electric' system was devised.

This system, the invention of Mr. John D. Taylor of Chillicothe, Ohio, was first installed by him on the B. & O. S. W. Ry. at East Norwood, near Cincinnati, Ohio, in 1891; in 1893 certain improvements were introduced by him in the methods of giving indications, the installation remaining otherwise as originally made. For some years after 1893, only a few small installations were made by Mr. Taylor owing to lack of sufficient capital to develop his inventions on a large scale but in May, 1900, the Taylor Signal Company was organized in Buffalo, N. Y., and since that time a great number of installations, varying in size from the equivalent of 6 to 225 mechanical levers, have been made on important lines of railway in the United States and Europe.

In the Taylor electric system, switches and signals are operated by means of electric motors, the current for these motors being furnished generally by a storage battery, charged from a dynamo driven by an electric motor or gas engine. The release locking is effected by an electro-magnetic device placed under each interlocking lever and actuated by a dynamic current furnished by the switch or signal motor controlled by such lever, *when and only when a switch has moved to a position corresponding with that of the lever and is bolt locked in that position or when a signal arm has moved to its full danger position.* Crosses between an indication wire and common return wire (or ground) or any other wire of the system, can at worst only prevent the giving of indication and cannot by any possibility result in the giving of a false clear indication as can occur in other systems employing electro-magnetic indications. Moreover, in this system, indications are given *instantaneously* upon completion of locking of switch or of movement of signal to its stop position, irrespective of the distance of such switch or signal from the tower, thus effecting a great saving in the time required by any system using pneumatic indications, to set up a route.

If, when a switch is thrown, it fails to complete its movement owing to some obstruction between point and stock rail, or for any cause whatever, the switch can be restored by the leverman to its original position and another effort can be made to perform the desired movement, ofttimes thus avoiding the necessity, so frequently met with in the low pressure pneumatic system, of sending a man out to throw the switch by hand or of forcing the indication.

INSERT A



CROSSING OF

C. R. I. & P. AND L. S. & M. S.

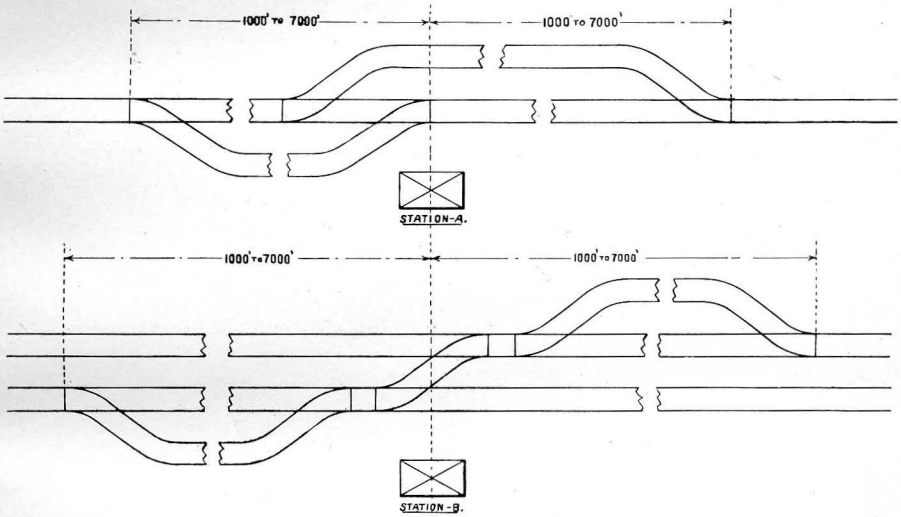
WITH

C. M. & N. AND I. C. R. R's.

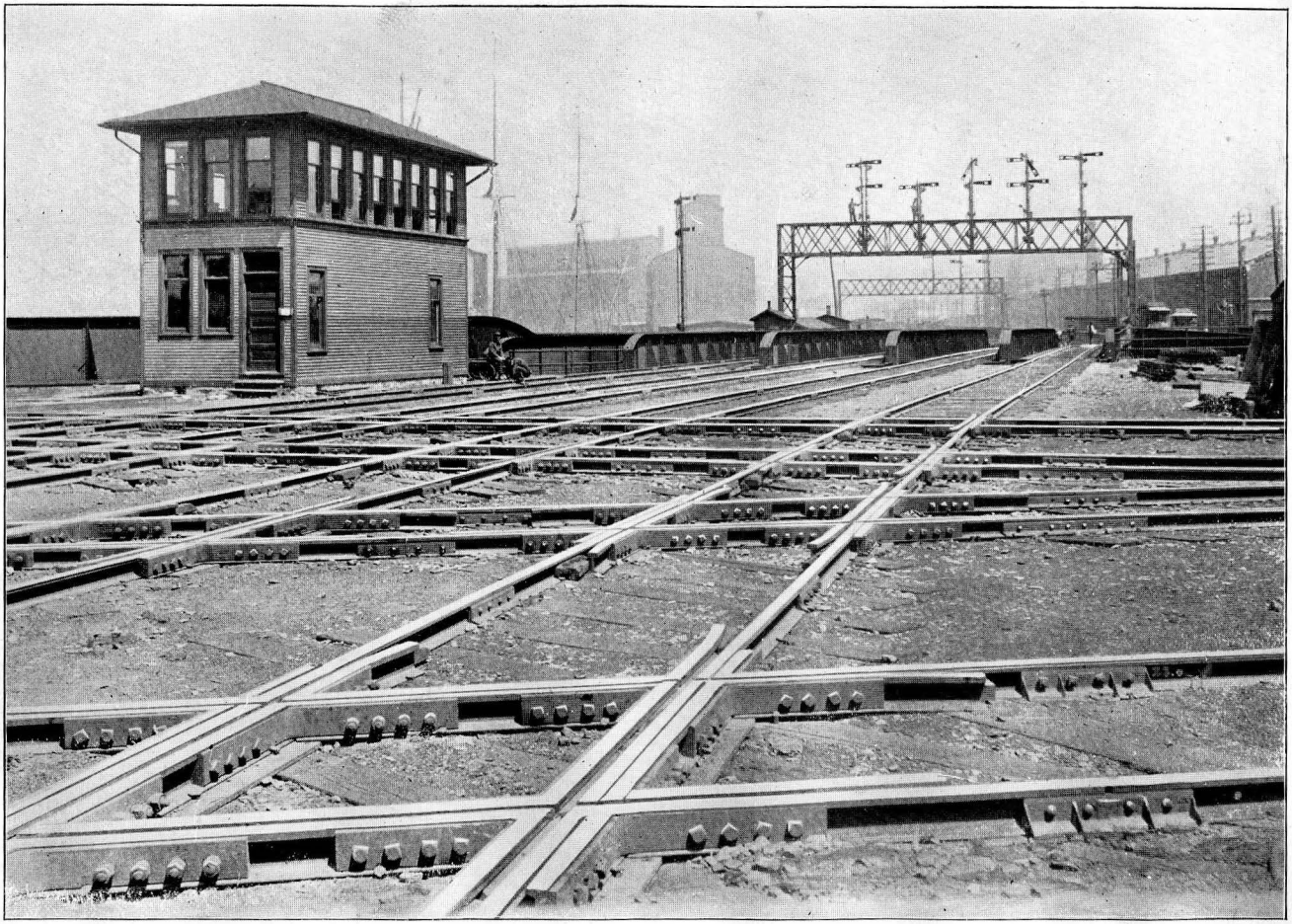
16TH & CLARK STs.

CHICAGO, ILL.

The elecrtic is the only power system that can be satisfactorily employed for the operation of plants having a small number of switches and signals. It is in service where as few as six working levers are employed and is perfectly adapted for use at all junctions, crossings, drawbridges, tunnels, stations, yards, passing sidings, etc., where the distance between extreme switches or signals is greater than can be safely covered with a mechanical plant, even though there be only a very few signals and switches to be operated. For example, consider the two following diagrams, the first one showing arrangement of passing sidings on a single track and the other, on a double track line:—



On a few of the best signaled American railways the switches and signals immediately adjacent to the station A or B, would be worked by a mechanical interlocking plant, but owing to the great cost of operating an addition mechanical interlocking plant at each of the extreme switches and the prohibitive cost of putting in a pneumatic power system by which all the switches and signals could be worked from the station, the inlet switches are left to be worked by the trainmen, necessitating the stopping of their trains; and if, as sometimes happens, such stoppage occurs on a bad grade, heavy trains may break in two in starting up. Every practical railway man will at once recognize the tremendous advantage that would be gained if these extreme switches, together with their proper signals, could be safely and economically worked from the station, thereby enabling trains to pass onto and out of passing sidings at speed and in absolute safety. With the Taylor electric system this can be effected at a relatively small cost, and, in conjunction with a system of automatic, electric, track circuit block signals in use on the open



CROSSING AT 16TH AND CLARK STREETS, CHICAGO

road, where there are no switches, this forms the ideal lock and block system and one, which we believe is destined to replace all others both in this country and in Europe.

In the electric system, the cost of producing power for the operation of switches and signals rarely or never exceeds one per cent of the cost in any other power system doing an equal amount of work. For example, if in a System using compressed air, the cost of coal and services of men employed in running power plant is $400.00 per month, the total cost of producing power for an electric plant doing precisely the same work, will rarely or never exceed four dollars monthly.

In this connection it will be interesting to note that at the South Englewood Taylor interlocking plant on the C. R. I. & P. R. R. where the average daily number of switches moved and signals cleared is 2250, the consumption of gasoline for running engine for charging storage batteries, was 68 gallons in 86 days, or one gallon for 2845 switch and signal operations. At 16th and Clark Sts., Chicago, Taylor interlocking plant at the crossing of the St. Charles Air Line with the C. R. I. & P. and L. S. & M. S. Rys., where the movement exceeds 600 trains daily, the consumption of gasoline during 153 days was 222 gallons for 642,600 switch and signal movements or 2894 per gallon or about 326 movements for one cent for power.

The cost of maintenance and renewals in an electric plant is only a small percentage of the cost in any other power plant. This can be readily understood from the fact that more feet of electrical conductors are employed in the electro-pneumatic system than are used in the Taylor system and there are all the pneumatic pipes; and, in the low pressure pneumatic system, more feet of iron pipe are used than feet of electric conductors in the Taylor system and anyone having experience with the rapid deterioration of iron pipes placed in the soils found about railways and subject to electrolysis, will have no difficulty in understanding how much shorter lived these underground pipes will be than well insulated copper wires placed in a suitable conduit above ground. Nor is it hard to understand how much more difficult and costly it will be to make repairs to such pipe placed several feet underground than it will be to repair a break or leak in a wire placed in a suitable conduit above ground.

In this connection, it is interesting to note that the B. & O. S. W. R. R. which was the first to install the Taylor system has found it far cheaper to maintain than an ordinary mechanical plant and this is particularly true where, through change in grade or alignment of tracks, any changes are required in the interlocking plant, such changes being many times more costly in any other system than in the Taylor electric. Moreover with the improved devices and methods of installation now used in this system, a far better showing will be made.

The operation of the electric system is absolutely unaffected by change in temperature, whereas pneumatic systems sometimes experience serious difficul-

ties owing to condensation and freezing of moisture contained in the compressed air, by which the mechanism becomes clogged and its working prevented.

Even where the working is not absolutely prevented under these conditions, it frequently becomes necessary to raise the pressure so high in order to compensate for losses in pressure at distant switches, that there is danger of throwing near switches under train, in case leverman makes an improper movement at such a time, as it is certain that as generally installed, detector bar connections are not sufficiently strong to resist any considerable increase above the normal working pressure in a pneumatic plant. It is therefore doubtful whether, during extreme cold weather, it is ever safe to attempt to work from one pneumatic machine, switches and signals located so far from the tower as to require any increase over normal working pressure. Unquestionably the safer practice, at such times, is to temporarily abandon the working of such switches and signals, as is often done, though this of course causes much troublesome delay and expense.

In the electric system no such condition exists, as the 'electric pressure' is exactly the same on the switch or signal motor located at a distance of five thousand feet as on one located five hundred from the tower; moreover, the system is so arranged that the throwing of a switch lever while train is over the switch would cause the blowing of a fuse on the machine, thereby opening the circuit.

In the foregoing statement no effort has been made to describe in detail the appliances and circuits employed in the Taylor electric system of interlocking; our object has been solely to point out the need of signal equipment on American railways and to state, without prejudice, the principal merits and defects of the several interlocking systems at present employed in order to aid such railway officials as have not had opportunity to acquaint themselves with the facts above set forth, to make an intelligent comparison between such systems.

The Taylor electric system is in the fullest accord with modern engineering practice which has shown, after years of experiment, that transmission of power to a distance can be more satisfactorily accomplished by means of electricity than by any other agency and, while there is no reason to doubt that this system will be improved in the future as in the past, we feel warranted in claiming at the present time that it represents the very highest development of the art of signaling, embodying features of safety, economy and general applicability not possessed by any other system in use in this country or abroad.

In the following pages will be found detailed descriptions of the principal circuits and appliances employed by the Taylor Signal Company and we shall be pleased, upon request, to furnish any additional information desired by railway officials upon this subject.

TAYLOR SIGNAL COMPANY.

INSERT B

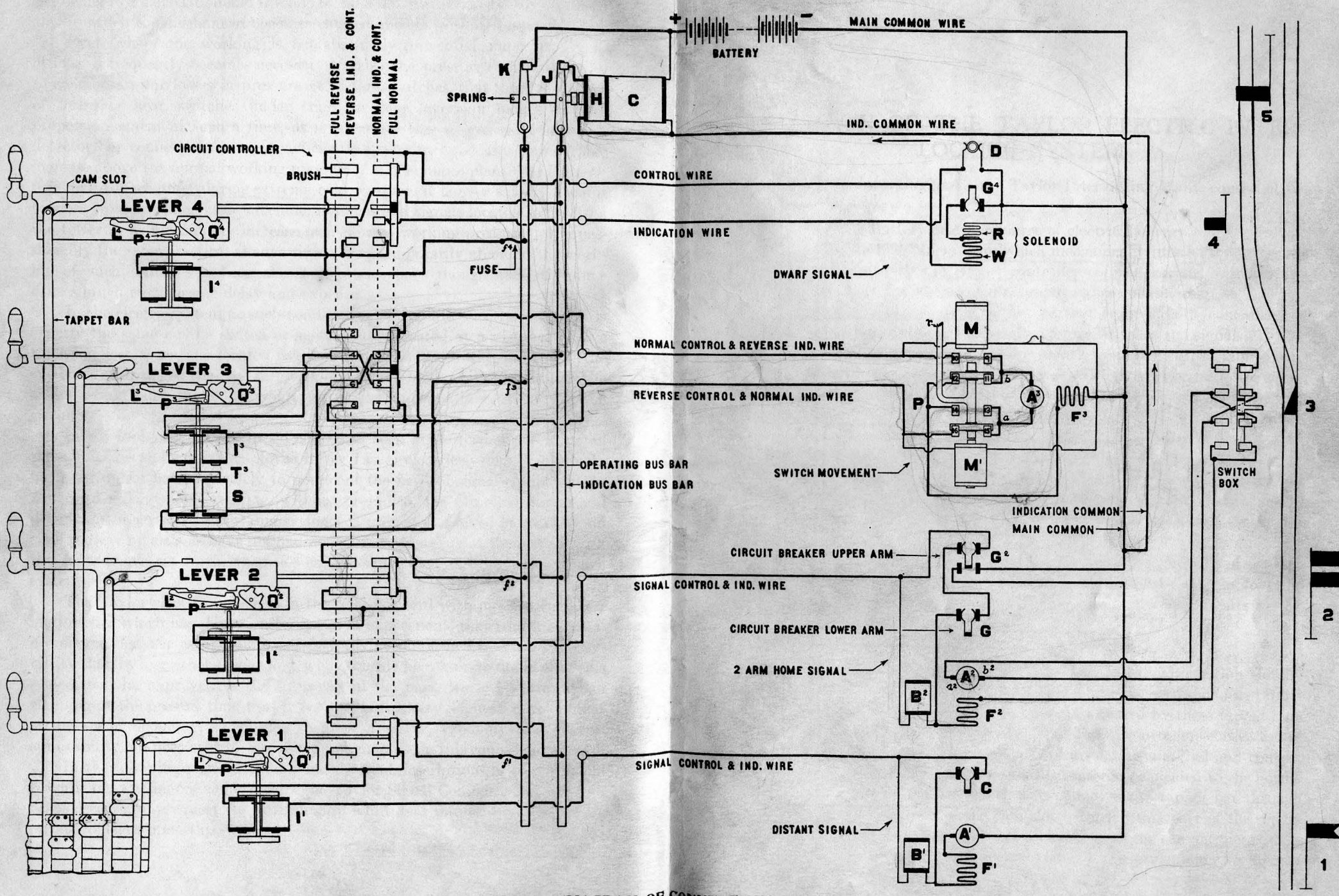


DIAGRAM OF CONNECTIONS

OPERATION OF THE TAYLOR ELECTRIC INTERLOCKING SYSTEM

The essential working parts of a Taylor Interlocking Plant consist of the following:

1—A Storage Battery or other source of electrical energy.

2—An Interlocking Machine, in which mechanically interlocked levers are suitably connected with the circuit controllers of the various switches and signals and are provided with electro-magnetic indication devices.

3—Insulated Wires for conducting current from circuit controllers of interlocking machine to the motors of the various switches and signals.

4—Switch and Signal Motors (or Solenoids), provided with suitable means for automatically opening operating circuit immediately after switch or signal has performed its proper movement and is locked in position and provided with suitable means for automatically closing indication circuit at the same time.

5—The various Signals and Switches to be operated.

Insert B shows a switch, a two arm home signal, a distant signal, a dwarf signal; and in diagramatic form, are shown the battery, interlocking machine, circuit controllers, indicating mechanism, wiring, switch and signal motors etc., required for the working of this switch and of these signals by the Taylor system.

The following description is designed to give complete information as to the functions of and relations existing between, the various devices employed in this system and particularly as to the controlling and indicating circuits:—

INTERLOCKING MACHINE

Each lever of the interlocking machine is provided with a cam slot by means of which intermittent motion is transmitted to the corresponding tappet bar. Interlocking between the several levers is effected by these tappet bars and by cross locking in the usual manner. The circuit controllers consist essentially of brushes supported on fixed blocks of insulating material and contact strips carried on movable blocks of insulating material connected to the levers.

During the first part of its travel, a lever moves the tappet bar through one half its stroke by means of the cam slot. During this part of the movement no change is made in the electrical connections as the contact pieces slide along the same brushes. This movement effects the preliminary locking of

routes conflicting with the new position of the lever. The middle part of the travel of the lever carries the contact pieces from brushes at one end of the controller to brushes at the other end. During this part of the travel the tappet bar remains stationary and the lever is stopped at this point by the latch L, where it is held until released by the indication magnet I. After release the lever can complete its travel. During this final movement the electrical connections remain as last formed and the tappet bar is moved the remainder of its stroke, releasing other levers not conflicting with the new position of the lever moved.

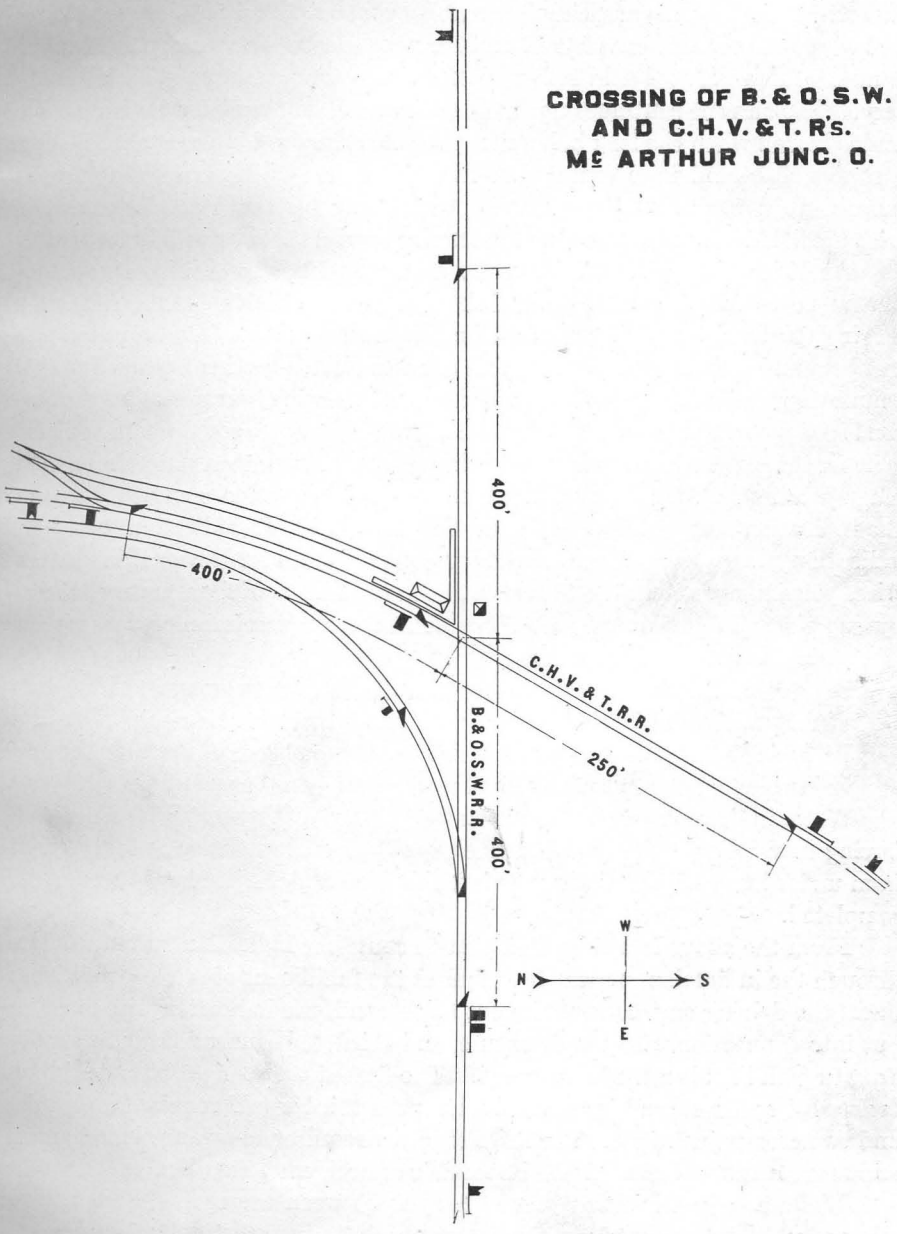
The switch movement is controlled by means of two wires in addition to the main common wire and the indication currents which are generated by the switch motor itself are transmitted through the same wires and an indication common. In one position of the lever one of these wires is the control wire and the other the indication wire. In the other position of the lever these conditions are reversed; that is, the wire which was before the control wire is now the indication wire and the indication wire becomes the control wire. Each of these wires is connected to two brushes in the circuit controller, one brush at each end. In one position of the lever one of these wires is connected to the positive end of the battery through the coils of the safety magnet S and operating bus bar, and the other wire is connected to the indication common through the coils of the indication magnet I and the indication bus bar. In the other position the connections are transposed.

SWITCH MOVEMENT

The switch movement is also controlled by a pole changing switch P, located at the switch. This pole changer is shifted automatically by the lock bolt in the last part of its movement and after it has passed entirely through the lock rod, connection being made between the movable part of the pole changer and the lock bolt by mechanism represented by the rod r, in the diagram. The pole changer consists essentially of two movable contacts and eight fixed contact points. Each armature terminal is connected to two of the fixed contact points. One field terminal is connected to two other fixed contact points and each control wire is connected to one of the two remaining fixed contact points. The other terminal of the field coils is connected to the main common. The connections are such that in one position of the pole changer, terminal *a*, of the armature is connected to one of the control wires and terminal *b* is connected to the field coils; in the other position, terminal *b* is connected to the other control wire and terminal *a* to the field coils.

In the diagram the functions are shown in the "normal" position. In this position the switch normal control wire is connected to battery, but no current flows because it is disconnected at the pole changing switch. If the lever

CROSSING OF B. & O. S.W. AND C.H.V. & T. R's. Mc ARTHUR JUNC. O.



3 is reversed, the reverse control wire is put in connection with battery and a current flows from positive side of battery, through contact K, operating bus bar, fuse wire f^3, safety magnet, circuit controller contacts 6 and 8, the reverse control wire, pole changer contacts 16 and 15, switch motor armature, pole changer contacts 11 and 12, the field coils to the main common return and back to battery. The current continues until the rail switch has completed its movement and is locked when the lock bolt shifts the pole changer, from contacts 15-16 to contacts 13-14 and from contacts 11-12 to contacts 9-10, disconnecting the reverse control wire from the armature, connecting the terminal *a* instead of *b* with the field coils and connecting the terminal *b* with the reverse indication wire.

An electric motor when driven by a current tends to develop an electro-motive force in opposition to the driving electro-motive force. After the driving current is cut off, the armature continues to rotate from acquired momentum and continues to develop this counter electro-motive force. The new connections made by the pole changer as above described are such that the current so developed leaves the armature at terminal *a*, passes through the field coils in the same direction as the driving current flowed, thus maintaining their magnetization, through the main common to the indication common, through the indication common, magnetic cut out H, switch J, indication bus bar, indication magnet I^3, circuit controller contacts 4 and 2, reverse indication wire, pole changer contacts 10 and 9 to the terminal *b* of the armature, thereby energizing indication magnet I^3, which effects the release of locking on lever 3 in the following manner:

Before indication current passes through indication magnet I^3, latch L^3 is in a position horizontal with lever 3 and is held in this position by the dog P^3 which thus prevents the completion of the stroke of lever 3, because the projection Q^3, engages with a similar projection on the end of L^3.

When indication magnet I^3 is energized, its armature T^3 is attracted, forcing upward a plunger which strikes dog P^3 in such manner as to throw it from under latch L^3 permitting the latch to drop and the stroke of lever to be completed.

From the above it will be seen that to cause the indication current to flow through the indication magnet I^3, requires the fulfillment of three conditions: First, the driving current must be cut off; second, the indication wire must be put into connection with the armature, and third, the connections between the armature and fields must be reversed. The first of these might be caused by a broken wire; the second by crossed wires; the third would require two breaks and two crosses just right. The three together require pre-arranged mechanism and movements which would be impossible of accidental creation.

While a switch is being moved a cross between the normal and reverse wires would send current from the battery back through the indication magnet, but a false indication is prevented in the following manner:

A safety magnet S, is placed beneath the indication magnet I^3 and the indication armature rests normally on the poles of the safety magnet. All current that flows from the battery to the control wires must pass through this safety magnet. In the case of a cross between the two wires, the whole current, both that flowing out through the switch motor and that flowing back through the indication magnet must pass through the safety coils so that if the whole current came back through the indication magnet, the current in this magnet could not exceed the current in the safety magnet; and since the armature rests on the safety magnet and is a quarter of an inch away from the indication magnet, the indication magnet cannot lift the armature. A break at the same time in any of the wires concerned, even in the safety coils themselves, would cut off the current since they are in series.

Putting the lever 3 back normal connects the normal control wire with battery through the safety magnet S. This sends a current through the switch motor entering the armature at *b* and leaving at *a*, that is, in reverse direction to that sent through it in reversing the switch, but the current flows through the fields in the same direction as before. The armature rotation is consequently reversed and the switch rail is moved back to its normal position. At the end of the movement the pole changer P, is shifted back to the position shown in diagram and the indication current is generated as before. It, however, leaves by the terminal *b* and returns to the terminal *a* through the normal indication wire which, before was the reverse control wire. All currents flow in the field coils in the same direction.

The pole changer P, besides being operated automatically by the lock bolt in the final part of its movement is, during all the intervening time, under control of the lever by means of the magnets M and M′. The magnet M, has one terminal connected to the normal control wire and the other to the main common wire. The magnet M′, has one terminal connected to the reverse control wire and the other to the main common wire. When the normal control wire is connected to battery, current flows through the magnet M, and when the reverse control wire is connected to battery current flows through the magnet M′. These currents are strong enough to shift the pole changer whenever it is free from the lock bolt which is during the whole switch movement and all of the lock bolt movement except the first and last three quarters of an inch. If the lever 3 is reversed to reverse the switch, current is sent out through the reverse control, through the switch motor in the proper direction to reverse the switch and through the magnet M′. The current through the magnet M′ tends to hold the pole changer in position to maintain the current in the motor. If for any reason it is desired to put the switch back normal before it has completed its reverse movement, as, for instance, when the rails are blocked by snow, it is only necessary to put the lever back normal when a current is sent out through the normal control wire and the magnet M. The magnet M being energized

16TH AND CLARK STREETS, CHICAGO.

shifts the pole changer to the other side and into position to send the current from the normal control wire through the motor in the direction to put the rail switch normal, at the end of which movement the pole changer is shifted back to the position shown and the indication current is developed as before. No current is sent through the indication magnet when the magnet M shifts the pole changer, for the reason that the controller connected to the lever is in the wrong position with reference to the pole changer and none is developed should the magnet fail to work for the reason that the connections between the armature and field coils are wrong to develop it. They would have to be reversed for this to occur. A simple circuit breaker not shown in diagram, operated automatically by the switch movement is provided for cutting off current from the magnets M and M′ when the switch is home and locked in either position.

HIGH SIGNAL

The two arm home signal No. 2 is represented as being operated by one lever and one operating machine through a switch box connected to switch No. 3 as a selector. Each of the arms is provided with a counterweight lever to each of which one end of a chain is attached. The chain passes over a chain sheave attached to and rotated by the operating machine.

The chain sheave is provided with webs for gripping the chain. If the motor is rotated in one direction, one of the counterweight levers will be lifted, and if rotated in the opposite direction the other lever. The direction of rotation of the armature is determined by the position of the contacts in the switch box, and this is controlled by the position of switch 3. To each of the signal arms a circuit breaker is attached. The circuit breaker connected to the upper arm has two pairs of contacts, one pair for controlling its own motor circuit, and the other pair for closing the distant signal circuit, when the home signal is clear. The circuit breaker for the lower arm has only one pair of contacts, as there is no distant signal to be controlled by it. The signal controller connected to the signal operating lever in the interlocking machine has one normal and one reverse pair of stationary contacts, and one sliding contact piece connected with and moved by the lever. One of the reverse contact points is connected with the positive end of the battery, and one of the normal contact points is connected with the indication common wire; the other two contact points are connected with one terminal of the indication magnet, and the other terminal of the indication magnet is connected to the signal control wire, only one wire being required for either a single or double arm signal for both control and indication.

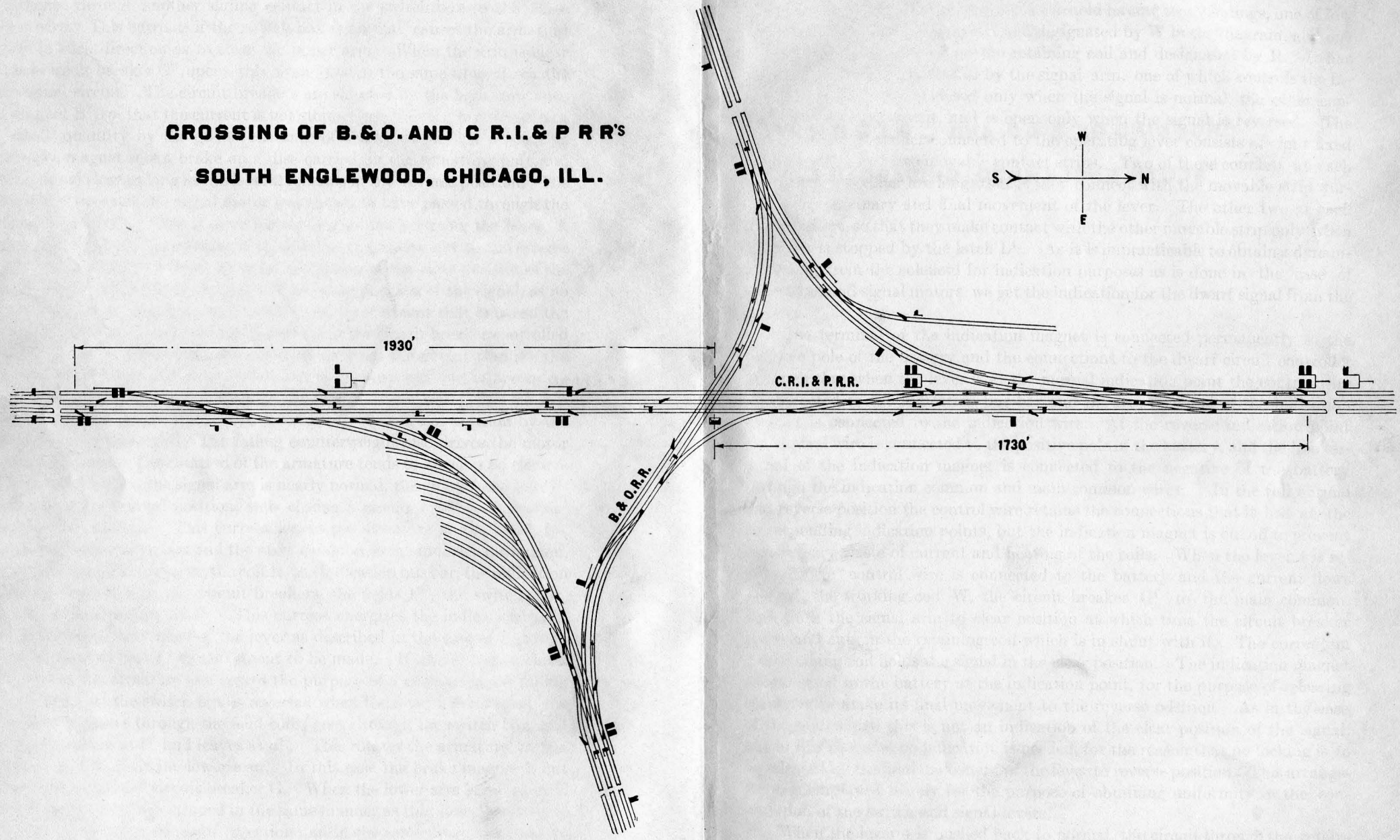
If the lever 2 is reversed, the control wire is connected with the battery through the indication magnet I^2 and the sliding contact piece of circuit controller. The current then flows through the indication magnet, the control

wire, the two circuit breakers G and G^2 in series, the field coils F^2, one of the sliding contacts of the switch box, the armature A^2 entering at a^2, and leaving at b^2, thence through another sliding contact in the switch box to the main common wire. This current, if the switch box is normal, causes the armature to rotate in such direction as to clear the upper arm. When the arm is clear the upper circuit breaker G^2 opens this circuit and at the same time closes the distant signal circuit. The circuit breakers are shunted by the high resistance brake magnet B^2 so that the current is not stopped entirely but is reduced to a very small quantity by the great resistance of the magnet. The energizing of the brake magnet sets a brake on a disc carried on the armature shaft, and holds the signal clear so long as the lever 2 remains in the reverse position. The current which operates the signal motor was shown to have passed through the indication magnet I^2. This is done for the purpose of releasing the lever 2, from the latch L^2 and permitting it to make its full movement to the reverse position. This is not in a strict sense an indication of the clear position of the signal, in fact no indication is necessary of the clear position of the signal, as no locking is released by the final movement of the lever except that between the home and distant signal and this is provided for in the circuit breaker controlled by the home signal. When the lever 2 is put normal the circuit through the brake magnet is broken at the controller, and the control wire put into connection with the indication common through the indication magnet. This releases the brake and permits the signal arm to return to the normal position by the action of the counterweight. The falling counterweight also drives the motor armature backwards. The rotation of the armature tends to develop an electromotive force and when the signal arm is nearly normal, the circuit breaker G^2 is replaced in its normal position, thus closing a circuit for the current developed in the armature. This current leaves the armature at the brush b^1, passes through the switch box and the main common to the indication common, through the indication common, the coil H, the indication bus bar, the indication magnet, the control wire, the circuit breakers, the fields F^2, the switch box, and back to the armature at a^2. This current energizes the indication magnet I^2 and effects the release of the lever as described in the case of a switch, permitting the final part of its movement to be made. It also serves to check the rotation of the armature and serves the purpose of a cushion to the falling counterweight. If the switch box is reversed when the lever 2 is reversed, the current after it passes through the field coils, goes through the switch box and enters the armature at b^2 and leaves at a^2. This rotates the armature in the proper direction to clear the lower arm. In this case the brake magnet is cut into circuit by the lower circuit breaker G. When the lower arm is put normal the indication current is developed in the same manner as that described for the upper arm. It flows in the same direction and in the same wires except as to direction in the armature and the two wires connecting it with the switch box.

INSERT C

CROSSING OF B. & O. AND C R.I. & P R R'S

SOUTH ENGLEWOOD, CHICAGO, ILL.

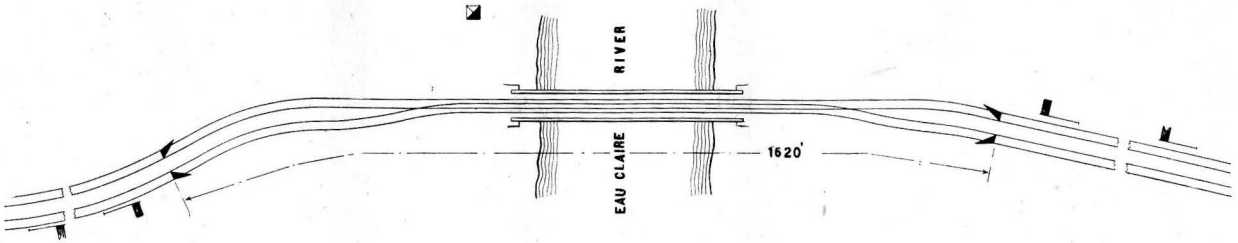


DWARF SIGNAL

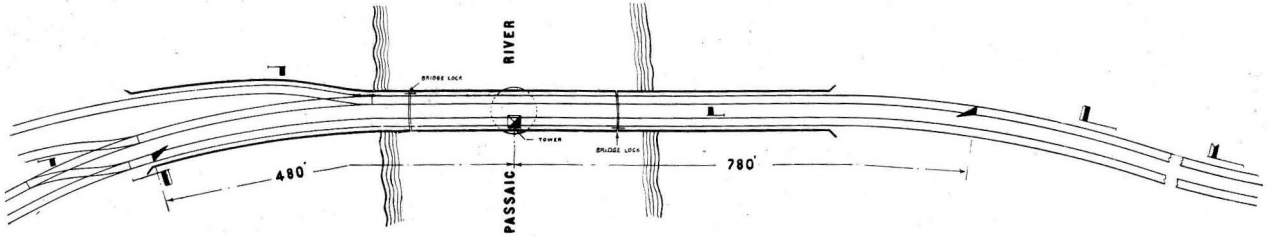
The dwarf signal is operated by a solenoid having two windings, one of low resistance called the working coil and designated by W in the diagram, and one of very high resistance called the retaining coil and designated by R. It has two circuit breakers controlled by the signal arm, one of which controls the indication circuit, and is closed only when the signal is normal, the other controls the working circuit, and is open only when the signal is reversed. The dwarf circuit controller connected to the operating lever consists of eight fixed contact pieces and two movable contact strips. Two of these contacts at each end of the controller are long, that is they connect with the movable strip during the preliminary and final movement of the lever. The other two at each end are short, so that they make contact with the other movable strip only when the lever is stopped by the latch L^4. As it is impracticable to obtain a dynamic current from the solenoid for indication purposes as is done in the case of the switch and signal motors, we get the indication for the dwarf signal from the battery.

One terminal of the indication magnet is connected permanently to the positive pole of the battery and the connections to the dwarf circuit controller are such that when the lever is at the normal indication point the control wire is connected to the indication bus bar and the free terminal of the indication magnet is connected to the indication wire. At the reverse indication point the control wire is connected to the positive pole of the battery, and the free terminal of the indication magnet is connected to the negative of the battery through the indication common and main common wires. In the full normal and reverse position the control wire retains the connections that it has at the corresponding indication points, but the indication magnet is cut off to prevent unnecessary waste of current and heating of the coils. When the lever 4 is reversed, the control wire is connected to the battery and the current flows through the working coil W, the circuit breaker G^4 to the main common. This pulls the signal arm to clear position at which time the circuit breaker opens and cuts in the retaining coil which is in shunt with it. The current in the retaining coil holds the signal in the clear position. The indication magnet is connected to the battery at the indication point, for the purpose of releasing the lever to make its final movement to the reverse position. As in the case of the high signal this is not an indication of the clear position of the signal, but in this case also no indication is needed, for the reason that no locking is to be released by the final movement of the lever to reverse position. This arrangement is employed merely for the purpose of obtaining uniformity in the construction of the switch and signal levers.

When the lever 4 is pushed back to normal, the circuit through the retaining coil is broken and the signal falls back to normal. When it reaches the



C. ST. P. M. & O. R. R. BRIDGE, EAU CLAIRE, WIS.



D. L. & W. R. R. DRAW BRIDGE, NEWARK, N. J.

normal position, the circuit breaker D connects the indication wire with the common at the signal; and as the movement of the lever to normal has put the free terminal of the indication magnet I^4 in connection with the indication wire, a current flows through the indication magnet and effects the release of the lever from the latch L^4, permitting it to be pushed back into full normal position.

PROTECTION FROM CROSSES

To guard against the bad effects of crosses between any of the wires, we employ the following very simple and effective scheme: J and K are two electrically independent switches held normally closed by current in the coil C. The switch K, when open, cuts off the battery from all functions. The switch J, when open, cuts off all wires from the indication common. Current energizing the coil C flows from the positive pole of the battery through the coil, the indication common and the main common, back to battery. Another coil of low resistance H, is placed on the same magnet core with the coil C. This coil H is cut into the indication common and forms part of it. All indication currents from switch and signal motors flow through the indication common in the direction indicated by the arrow, and the winding of the coil H is such that a current in this direction tends to help the coil C in holding the switches closed. It can easily be seen that since the indication common is connected at its outer end to the main common and this to the negative pole of the battery that any current that might flow from the battery through the coil H would flow in the direction opposed to the arrow. Current in this direction in the coil H tends to neutralize the effect of the current in C, and throw the cut out open.

It will be seen by an inspection of the diagram that all wires which would be next operative, that is, wires that are in operative connection at the function are connected at the interlocking machine to the negative pole of the battery through the indication bus bar, the switch J, the coil H, the indication common and the main common so that current reaching any of these wires on account of being crossed with a live wire will flow back through the coil H in a direction to open the cut out and thus cut off the current which might otherwise effect a movement not wanted.

The resistance of this return path through the coil H is made less than that through the motor and main common, so that the greater part of the current, due to a cross, must flow back through the coil H. The windings of the coils H and C are so proportioned that any current, due to a cross, strong enough to move a motor will throw the cut-out open and cut off all current from the crossed wires before it has time to move the motor.

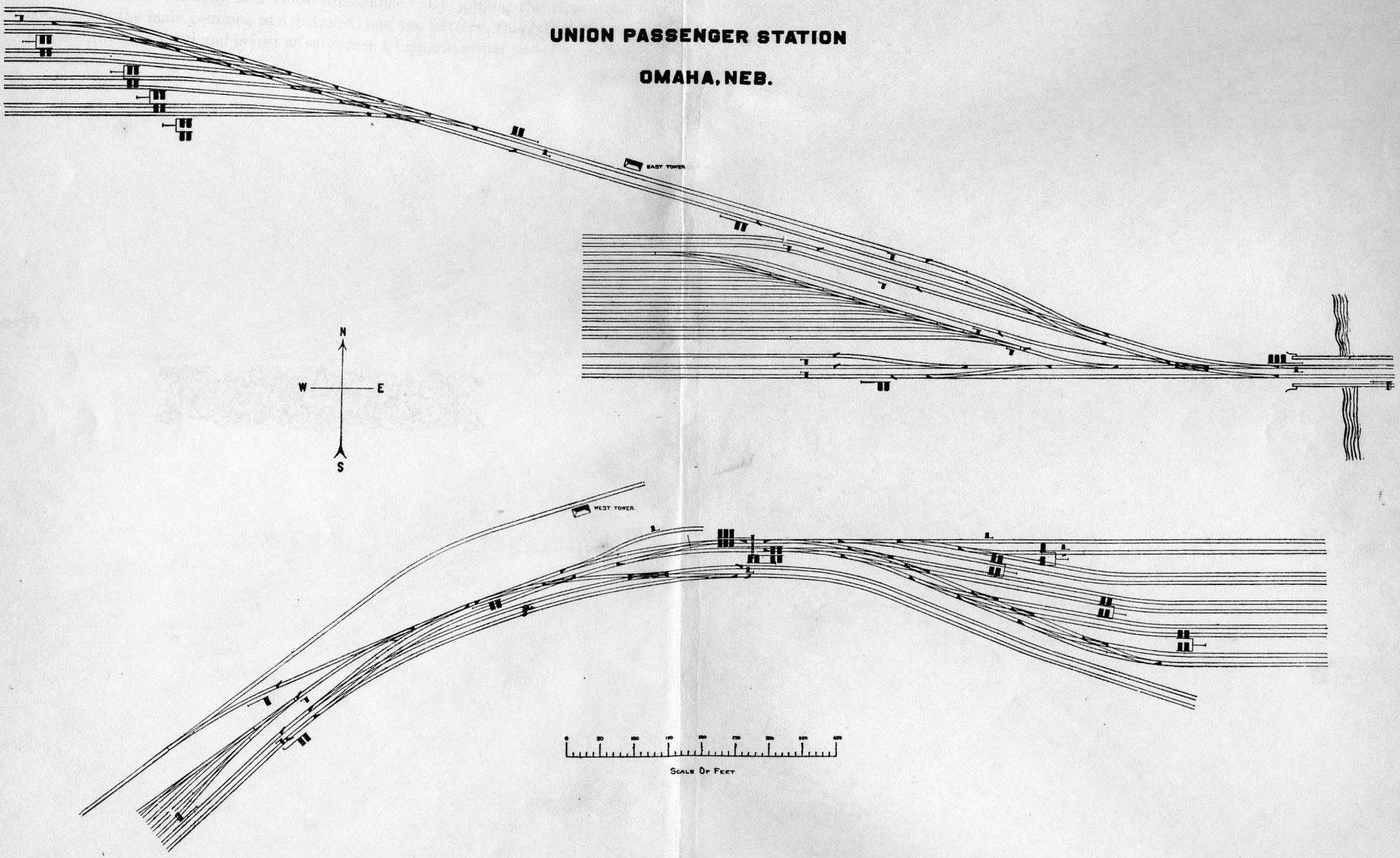
The indication common is led out to a distance from the tower where it is joined to the main common. This is done to avoid the effects of the drop in

potential in the main common due to the working of a switch or number of switches. If the indication common were connected directly at the battery, this fall of potential would tend to send a current back through the indication wires of the other functions not being operated and would in some cases open the cut out unnecessarily and cause annoyance. By joining the indication common to the main common at a distance from the battery, this fall of potential is entirely avoided and is just as safe since a break in either would open the cut out.

INSERT D

UNION PASSENGER STATION

OMAHA, NEB.



ORDER SECTION

HOW TO ORDER

TO ORDER APPARATUS LISTED

All of our latest devices and many of those which have been superseded are illustrated, described and listed on the following pages. To order successfully, give, in addition to the regular shipping instructions, etc., the **ORDER NUMBER** and **SECTION NUMBER** together with such additional specifications as are required. The following examples will indicate the desired practice. Example 1. For a dozen Switch Motor Brushes, the order should read, "12-No. 566 Sec 10." Example 2. For a complete 110 Volt Signal Machine with Pole Fastenings for mounting on an Iron Pole $6\frac{5}{8}$" outside diameter, the order should read, "1-No. 1255 Sec 25, 110 Volts, Clamp 777."

TO ORDER APPARATUS NOT LISTED

Some of the appliances first installed, and which have been superseded by improved devices, are not illustrated. We are, however, prepared to furnish duplicates of all such apparatus. In ordering a device of this kind, give its correct name and exact location, together with such additional information as circumstances warrant. The proper name may be found by reference to a like part that is illustrated.

PATTERN NUMBERS ARE NOT ORDER NUMBERS

Attention is called to the fact that the listed order numbers are not the numbers which occasionally appear on castings. Therefore, in ordering, care should be taken to see that the proper order number is given and not the pattern number.

BOLTS, LAG SCREWS, ETC

Commercial bolts, screws, lag screws, etc., are not furnished except where otherwise stated as, for example, in 2607 Sec 12, etc. In Section 39 is given a list of the commercial bolts, screws, cotter pins, etc., listed herein.

SYSTEM EMPLOYED IN THE LISTS AND CUTS

Wherever feasible, we have shown assembled, or in groups, the parts that naturally belong together and by so doing, have indicated with greater clearness than could be done by description, the use and location of the individual parts. To each of these groups we have given, in heavy type, a number, which, if rightly used, will facilitate the finding of any small part, thus: If 088 section 5 is called for, it will be found listed as a Cotter Pin for 2560, which number, being shown in heavy type, is quickly located. Wherever both new and old parts are shown in the same cut, those of later date will be found listed in connection with the number for the assembled device. Thus, under 1255 section 25, binding posts 1713 and brush holders 1687 are shown because binding posts 2557 and brush holders 2558, which are illustrated, have been superseded by the former numbers.

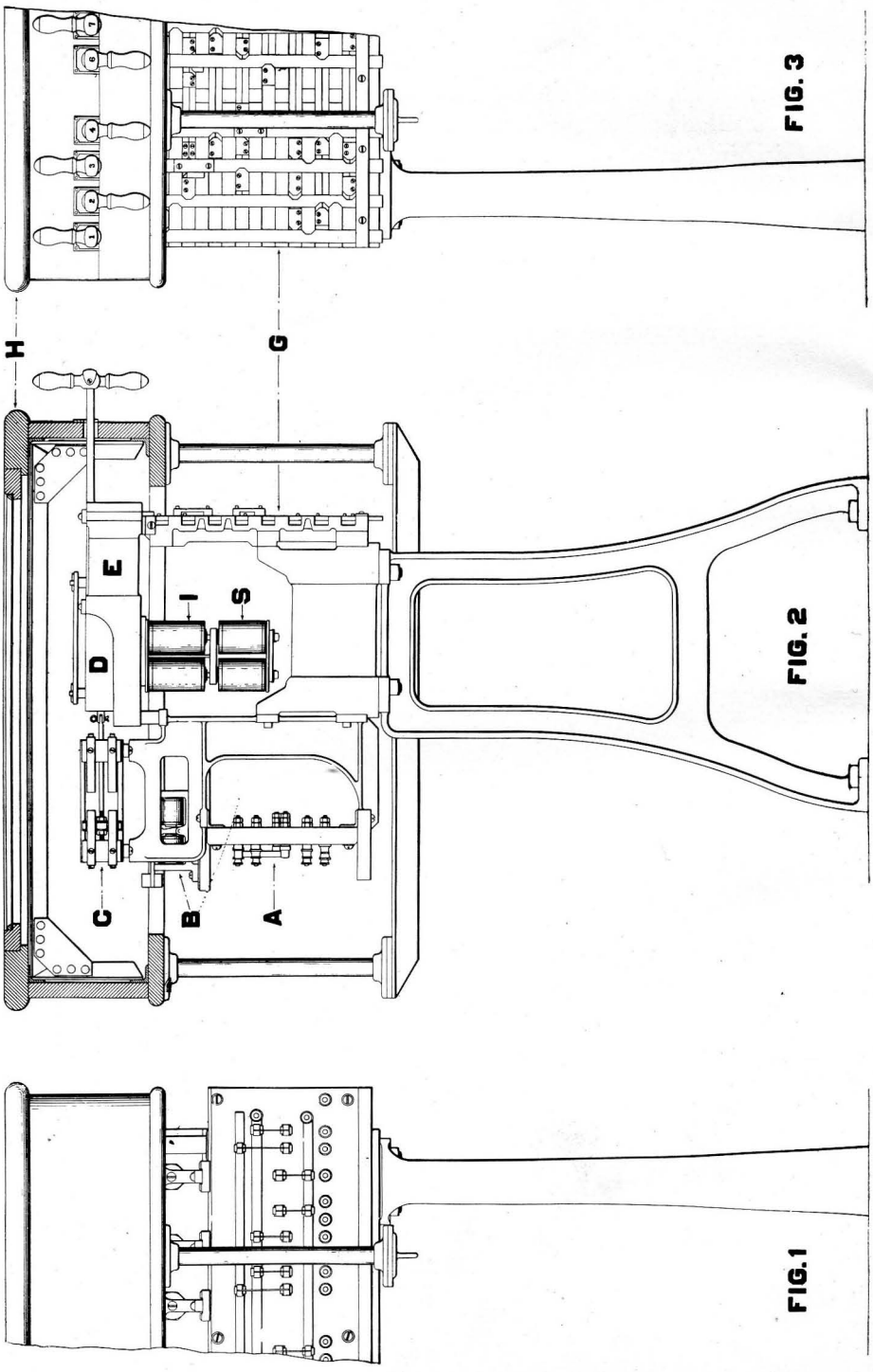


FIG. 3

FIG. 2

FIG. 1

INTERLOCKER

DESCRIPTION

A standard Interlocking Machine is shown on the opposite page. Fig. 1 is a rear view showing the terminal and fuse board, Fig. 2 an end view, with the case cut away to show the relative location of parts and Fig. 3 is a front view showing the locking. It consists in general of the frame work, the case (H), the terminal and fuse board (A), the locking (G) and the various levers (D), with their guides (E), controllers (C) and magnets (I and S).

FRAME WORK

The frame work is made in three styles, depending upon the number of sections (a section consists of 8 lever spaces) and the amount of locking. For machines not exceeding one and one-half sections, the construction shown on pages 35 and 39 is employed, in which a single pedestal is used, supporting the whole. For machines exceeding one and one-half sections and having a moderate amount of locking, the construction on the opposite page is employed, in which two or more legs are used for supporting the mechanism. For machines having a great amount of locking, the construction is similar to that indicated on the opposite page, with the exception that a double row of locking plates is used, one above the other. This is known as a "Double Tier" interlocker.

The various parts included in the frame work are shown in section 4.

CASE

The case shown at (H), is intended to enclose the controllers and levers only, leaving the terminal board and locking exposed. Glass doors in the top permit access to all enclosed parts. These doors, if desired, may be sealed or locked to prevent tampering with the indication mechanism. The construction is such that any lever, guide, controller or magnet may be conveniently removed when necessary.

TERMINAL AND FUSE BOARD

The terminal and fuse board, as its name implies, is the place where all wires terminate and where the various circuits are fused..

It consists of a slate slab, made in sections, which, with its three bus bars, runs the entire length of the machine. The upper is the operating bus bar to which all switches are connected; the lower is the operating bus bar to which all signals are connected and the middle is the indication bus bar common to all switches and signals. In the cut, insert B, both upper and lower bars are shown as one. The various incoming wires, together with those from the battery, the various magnets and from the circuit controllers, terminate in binding posts or fuse posts, as the case may be, which are mounted on the board in an orderly and systematic manner. The terminals and fuses for each lever are directly under it and numbered to correspond. The arrangement is such

that any wire, magnet or other electrical part may be conveniently and quickly disconnected from all others for testing purposes.

The connecting wires, running from the terminal board to the various controllers, are made up in sets, bent to fit and taped together as shown in section 7.

LOCKING

The locking parts are shown in section 6 and consist of the tappet bars, dogs, guides, etc. Locking between the various levers is effected by the tappet bars and cross locking in the usual manner.

LEVERS, CONTROLLERS, MAGNETS, ETC

The various parts to be described under this head are shown in figures 2, 4 and 5.

The lever (D) slides in its guide (E), is held in place by the caps (F) and by the adjacent lever guide. The lever is provided with a cam slot (U), which gives an up and down movement to the tappet bar (V). The dotted circles (1 to 5), in the cam slot (figure 4) indicate the position of the tappet bar which corresponds with like numbered positions of Z. The lever is connected to a sliding contact block (Z) by the rod (W), the contact block being thereby forced to move with the lever and to assume the positions 1 to 5. The levers are provided with handles of different colors, as required, and explained in section 5. A short lever (shown at 3096, section 5) is used when two switches are to be operated at once. It is always used in connection with a standard lever to which it is connected by a bar (1413, section 5), also shown above lever (D), figure 2. The short lever has no cam slot, the locking being provided for in the long lever. It is, however, provided with its lever guide, controller and set of magnets, the same as a long lever.

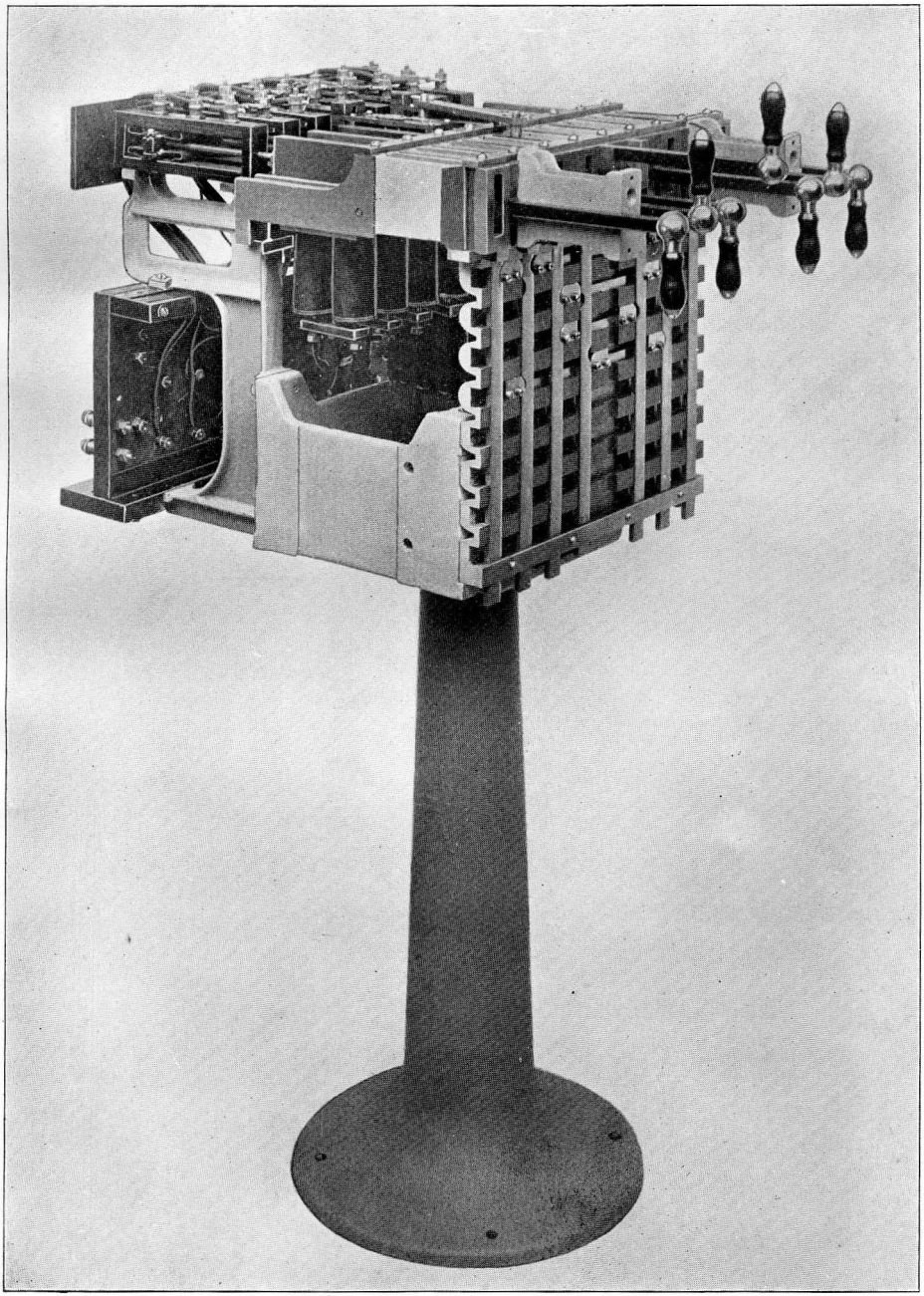
The lever guide (E) is fastened to the frame work. The springs, latch, dog, cam, etc., are all mounted on this guide, as shown in figures 4 and 5, and are held in place by the adjacent guide.

The magnets (I and S) are fastened to the lower surface of the lever guide, as shown. I is the indicating magnet and is used on all levers. S is the safety magnet, used only on switch levers.

The controller (C) consists of the brushes, (X-X, Y-Y) fastened to fixed blocks of insulating material, shown at either end of the controller, and the sliding contact (Z), with its connecting rod (W). The number, kind and arrangement of brushes are shown in section 5, also in diagramatic form in the circuit, insert B.

The indication selector (B) is used only with switch levers. It is operated by the working current and so connected that it throws in one direction, when the lever is reversed, and in the other when it is put normal. Its function is to close only that indication circuit which corresponds with the position of the lever and leaves the other open.

INTERLOCKER



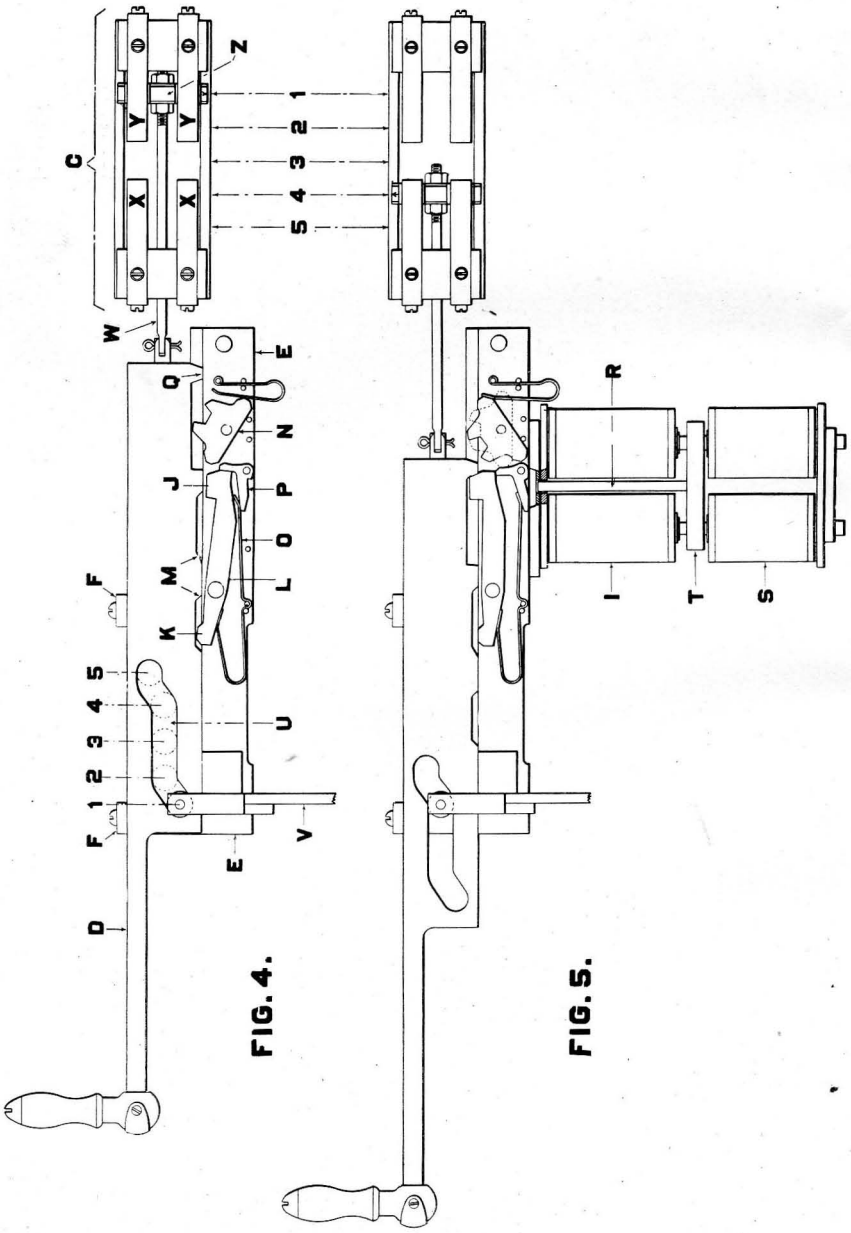


FIG. 4.

FIG. 5.

INTERLOCKER

OPERATION

The method by which a lever is prevented from completing its stroke, and thereby unlocking conflicting levers, until the function, controlled by said lever has assumed a position corresponding with its new position, will be understood by following the changes which take place as the lever is moved through a complete stroke.

Taking as an example the switch lever illustrated on page 36, in which figure 4 represents the lever in its "full normal" position (1) and figure 5 the same lever in its "reverse control and indication" position (4).

In passing from position 1 to 2, the tappet bar (V) is raised, thus locking all conflicting levers and the projection (M), on lever (D), coming in contact with projection (K), on latch (L), causes said latch to assume its figure 5 position, thus bringing projection (J) into the path of the tooth (Q), as shown in figure 5.

In moving from position 2 to 3, the tooth (Q) coming in contact with a similar projection on the cam (N) causes it to revolve into the horizontal position (shown dotted in figure 5), thus forcing dog P into the position (figure 5) and locking L in its horizontal position.

In moving from 3 to 4, the cam (N) is revolved into the position shown by full lines (figure 5) and the lever is stopped at position 4 by the tooth (Q) coming against projection J. Meanwhile Z, having come into contact with brushes X-X, completes the battery circuit to the motor, causes the switch to be thrown and locked in position, the indication current to be sent back through magnet I, lifting armature T and causing plunger R to strike dog P and throw it out from under latch L. The latch, being thus released, drops to its figure 4 position and permits the lever to move from position 4 to 5 thus completing the stroke and, by lifting tappet bar V, unlocking the levers which do not conflict with the new position of lever D.

The stroke from reverse to normal acts in the same way. Signal levers also operate in the same manner, with the exception that on the reverse stroke, when contact Z is in position 4, current is sent through magnets I from the battery, giving an artificial indication and allowing the lever to pass to position 5 for the reasons explained on page 24. The function of the safety magnet (S) is explained on page 21.

In conclusion we wish to call attention to the following facts:

1st. Due to the locking, the lever (D) could not have been moved at all had any conflicting routes been set up.

2nd. That being free to move and, by virtue of the mechanical construction employed, the lever (D) is forced to stop at position 4 and hence prevented from passing to position 5 and unlocking conflicting levers until an indication is received which, in the Taylor system, is proof positive that the switch has been moved to, and locked in, a position corresponding with that of the lever.

3rd. That a lever once moved to, or beyond position 3, it can neither move forward beyond position 4 nor back beyond position 2 without an indication, which cannot be given unless the function is locked in a position corresponding with that of the lever.

DIMENSIONS

Attention is called to the small amount of space required by the Taylor interlockers.

The width over the case is less than three feet. The over all length in inches may be found by multiplying the total number of lever spaces by 2 and adding about nine inches extra for the case.

Thus a nineteen section machine (152 spaces), the largest thus far built, would be about 26 feet long requiring a tower 12′ x 30′ inside dimensions.

ILLUSTRATIONS

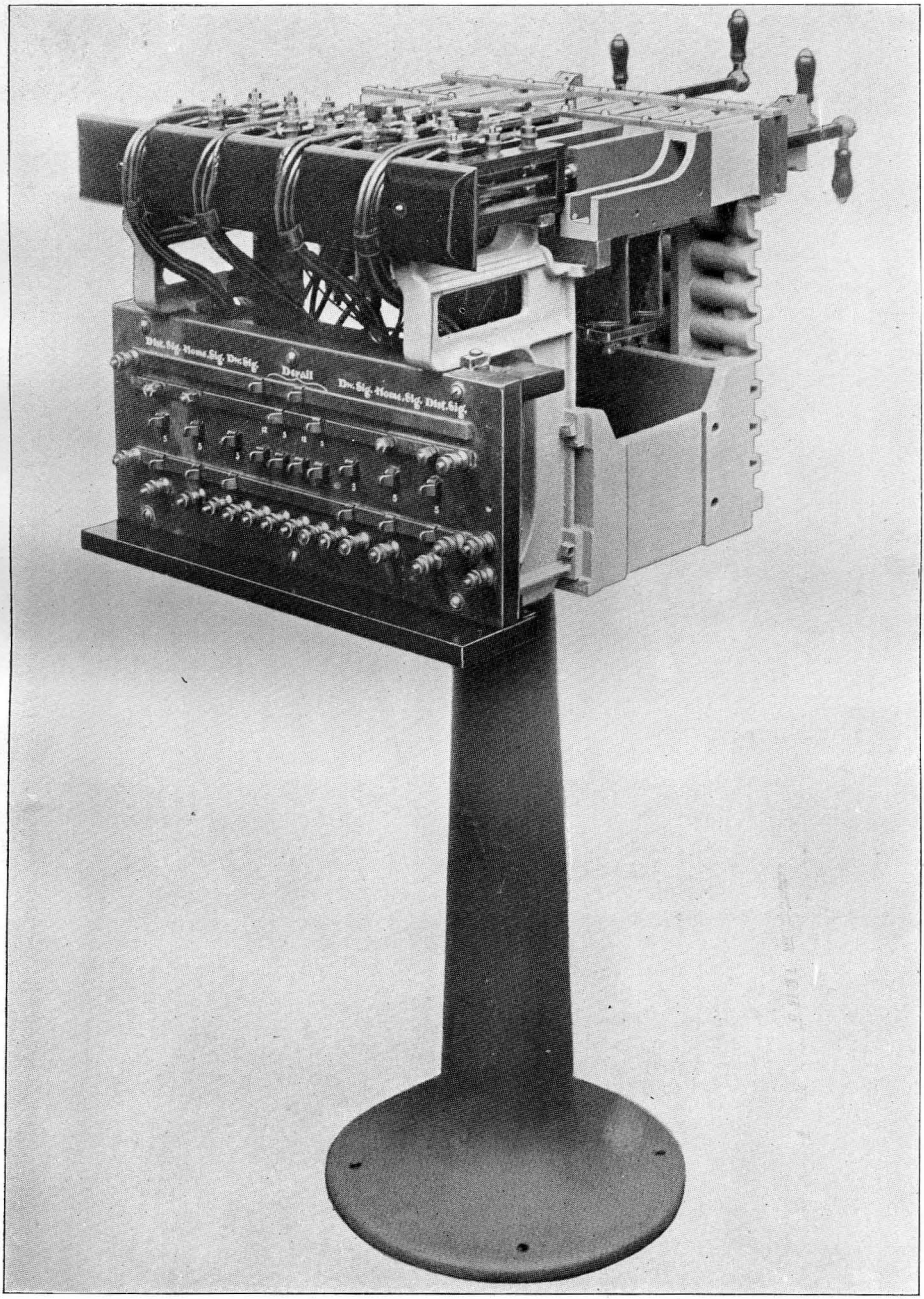
On pages 35 and 39, is illustrated in two views, the type employed when not exceeding 12 lever spaces are required. While not up to date in all particulars, the cuts serve to indicate the compactness and general arrangement. The incoming wires are brought up through the hollow interior of the pedestal. A case, not shown, goes with the machine.

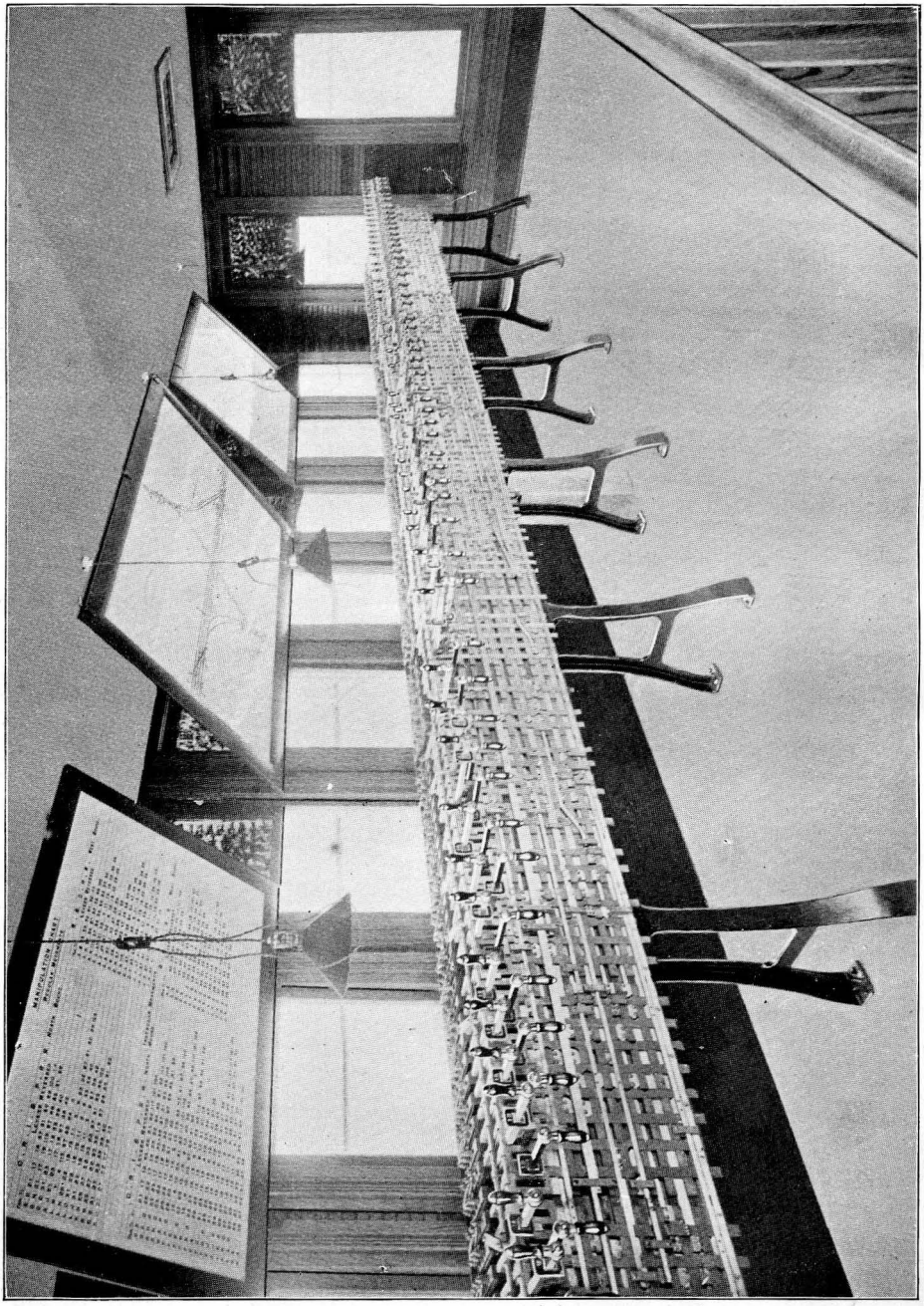
On page 6 is shown the nineteen section machine, in use at the crossing of the C. R. I. & P. and L. S. & M. S. R. R.'s, with the C. M. & N. and I C. R. R.'s at 16th and Clark Streets, Chicago. The corresponding track plan is shown on insert A.

On page 40 is shown the seventeen section interlocker, in use at the crossing of the C. R. I. & P. and B. & O. R. R.'s at South Englewood, Chicago.

The corresponding track plan is shown on insert C.

INTERLOCKER





INTERLOCKING MACHINE, SOUTH ENGLEWOOD, CHICAGO.

INTERLOCKER

The following list of parts will indicate what is required when it is desired to add a new lever to an existing interlocker of the type shown on page 32.

Order No.	LIST OF PARTS.		
3174	Switch Lever parts required when adding a long Lever 3097 Sec5 :— Terminals, etc., 2318 Sec 7, Lead Wires 3082 Sec 7, Lever 3097 Sec 5, Guide 3098 Sec 5, Controller 2560 Sec 5, Magnets 2754 Sec 5, Indication Selector 2550 Sec 5, and parts, as follows, to be specified: Grip 3073, 3074, 3077 or 3078 Sec 5, Caps 1222 or 1445 Sec 5, Tappet Bars 3152 or 3153 and other locking parts Sec 6		
3175	Switch Lever parts required when adding a short Lever 3096 Sec 5 .— Terminals, etc., 2318 Sec 7, Lead Wires 3082 Sec 7, Lever 3096 Sec 5, including Bar 1413 with two Studs 1412 Sec 5, Guide 3098 Sec 5, Controller 2560 Sec 5, Magnets 2754 Sec 5, Indication Selector 2550 Sec 5, and Caps 1222 or 1445 Sec 5, as specified. No locking parts required		
3176	High Signal Lever parts:— Terminals, etc., 2319 Sec 7, Lead Wires 3081 Sec 7, Controller 2676 Sec 5, Lever 3097 Sec 5, Guide 3098 Sec 5, Magnets 2759 Sec 5, and parts as follows, to be specified:—Caps 1222 or 1445 Sec 5, Grip 3075 or 3076 Sec 5, Tappet Bars 3152 or 3153 and other locking parts Sec 6		
3177	Dwarf Signal Lever parts:— Terminals, etc., 2320 Sec 7, Lead Wires 3080 Sec 7, Controller 2673 Sec 5, Guide 3098 Sec 5, Magnets 2763 Sec 5 and parts as follows, to be specified:— Caps 1222 or 1445 Sec 5, Tappet Bar 3152 or 3153 and other locking parts Sec 6		

INTERLOCKER

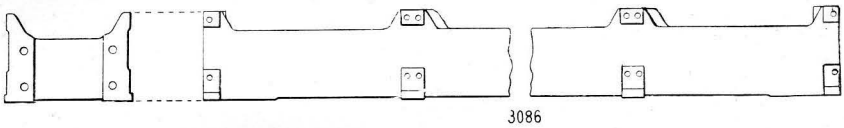
Order No.	FRAME.
011	Bolt with Nut, holding single beds to legs 1493
012	Bolt with Nut, holding single beds to stand 2338
0149	Bolt with Nut, holding double beds to legs 1376
1048	Nut for 3065
1104	Screw holding Bracket 1393 and others to beds
1179	Bar supporting Controllers, drilled as required
1303	Single bank (8 lever) locking plate
1362	Double bed, 24 levers
1363	Double bed, 32 levers
1376	Leg for 1362 or 1363
1393	Bracket supporting Controllers, superseded by 1568
1437	Bar supporting Lever Guides, drilled as required
1493	Leg for 3086, over 12 levers
1557	Bracket supporting Terminal Board, superseded by 1568
1568	Bracket supporting Controllers and Terminal Board
1642	Half bank (4 lever) locking plate
2338	Stand for 3086, 12 levers and under
2451	Screw holding Brackets 3094 or 3095
2453	Screw holding Bar 1179 to Brackets 1393 or 1568
2462	Screw holding bar 1437 to Brackets 1393 or 1568
2474	Screw holding 1303 or 1642
3065	Bolt used on long interlockers for joining beds
3086	Single bed made in various lengths, varying by fours, from 8 to 48 levers
3094	Bracket for supporting right end lever guide
3095	Bracket for supporting left end lever guide

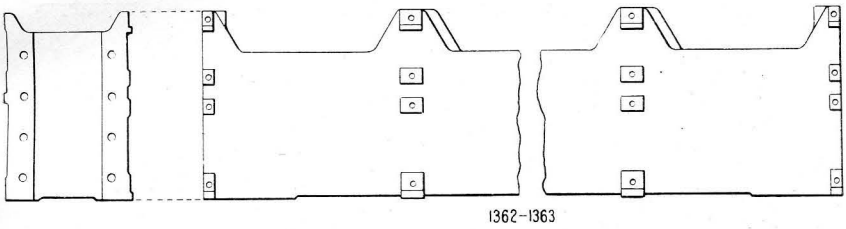
PAGE 42.

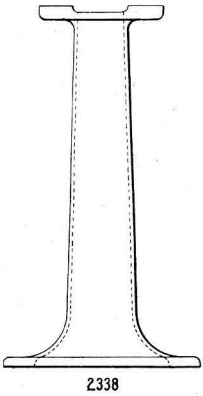
1362 Should read 1363.
1363 Should read 1362.

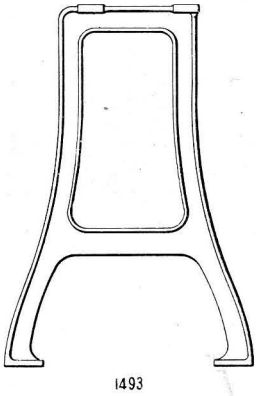
INTERLOCKER

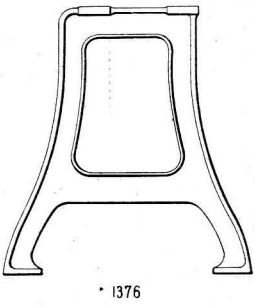
FRAME

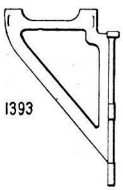


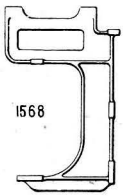


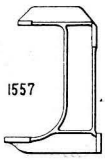


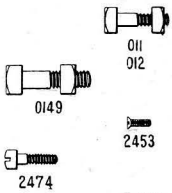


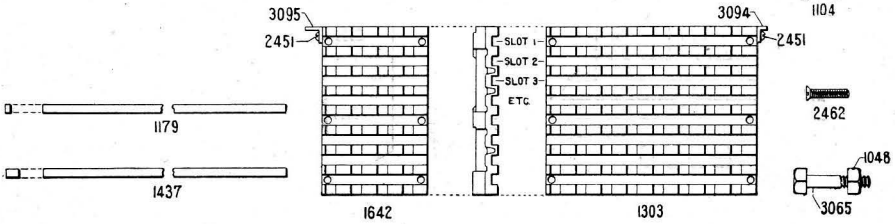




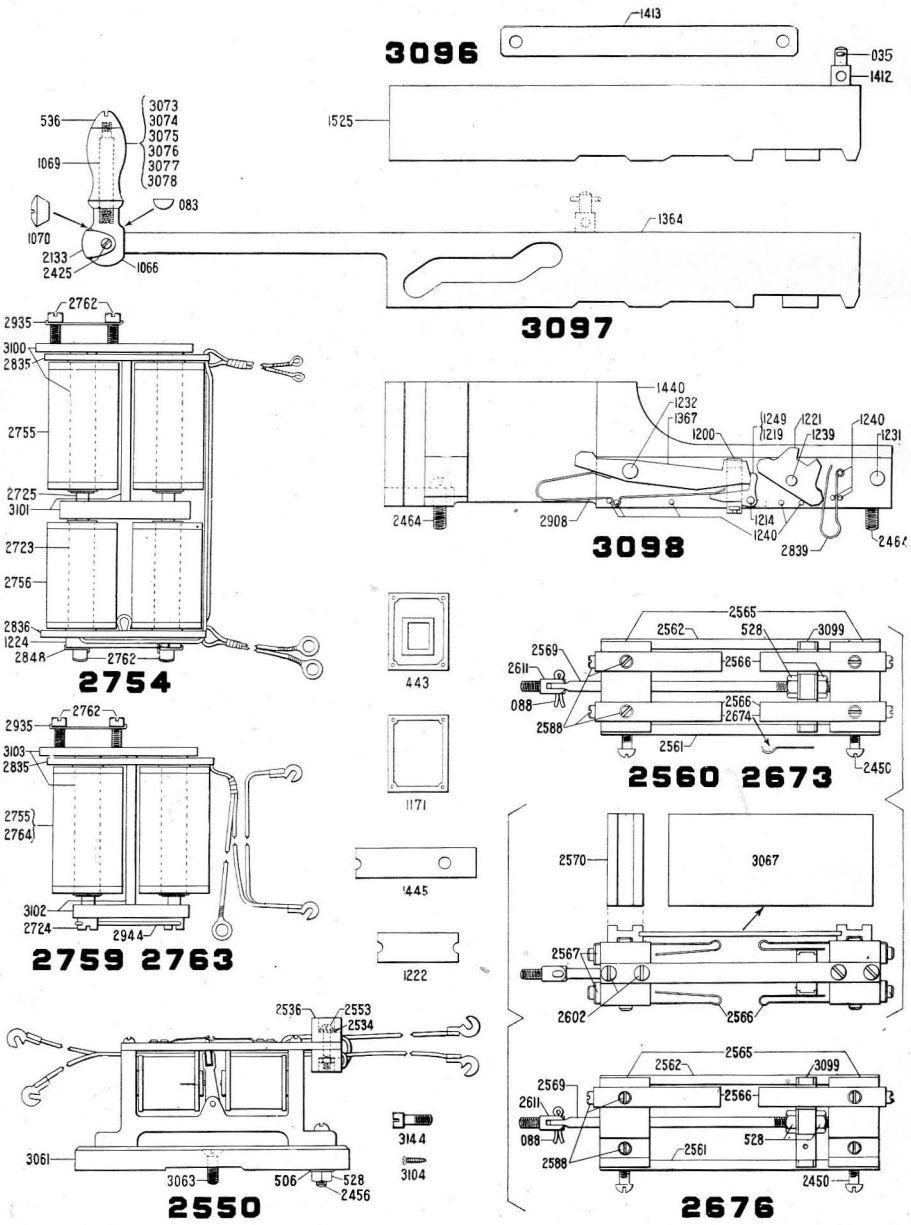








LEVERS, CONTROLLERS, MAGNETS, ETC.



INTERLOCKER

Order No.	LEVERS, CONTROLLERS, MAGNETS, ETC.
035	Cotter Pin for 3096
083	Key for 3097, holding Base 1066
088	Cotter Pin for 2560 and others
443	Number Plate
506	Washer for 2550
528	Nut for 2550, also 2560 and others
536	Grip Nut for 3097
1066	Grip Base for 3097
1069	Threaded Rod for 3097
1070	Nut for 3097
1171	Blank Number Plate for spare space
1200	Latch for 3098 for Switch Levers only
1214	Dog Pin for 3098
1219	Dog for 3098, with projection, shown dotted, formerly used on Signal Guides
1221	Cam for 3098
1222	Cap holding Levers to Guides
1224	Yoke for 2754
1231	Spacing Pin for 3098
1232	Latch Pin for 3098
1239	Cam Pin for 3098
1240	Small Pin for 3098
1249	Dog for 3098
1364	Lever for 3097
1367	Latch for 3098
1412	Stud for 3096, also used in 3097 as noted in 3096
1413	Bar connecting 3096 to Stud shown dotted on 3097
1440	Guide for 3098
1445	Cap holding End Levers to Guides
1525	Lever for 3096
2133	Number Plate for 3097
2425	Screw for 3097
2450	Screw for 2560 and others
2456	Screw for 2550

PAGE 45.

443	Superseded by different Plate. (in ordering give name of interlocking plant and lever number.)
1171	Superseded by different plate. (In ordering give name of interlocking plant and lever number.)
2560	Superseded in recent machines by Controller 3252. (In ordering give name of interlocking plant and lever number.)
2566	Superseded in recent switch controllers by Spring 3256. (In ordering give name of interlocking plant and lever number.)

2674	Spring for 2673
2676	High Signal Controller, Complete
2723	Core for 2754
2724	Brass Screw for 2759 or 2763
2725	Stud for 2754
2754	Indicating and Safety Magnets complete for Switch Lever

INTERLOCKER

Order No.	LEVERS, CONTROLLERS, MAGNETS, &c.
2755	Indicating Magnet Coils for 2754 or 2759
2756	Safety Magnet Coil for 2754
2759	Indicating Magnets complete for High Signal Lever
2762	Screw for 2754, 2759 or 2763
2763	Indicating Magnets complete for Dwarf Signal Lever
2764	Indicating Magnet Coil for 2763
2835	Insulating Guide for Terminal Wires for 2754, 2759 or 2763
2836	Insulating Guide for Terminal Wires for 2754
2839	Cam Spring for 2098
2848	Lock Washer for 2754 or 3144
2908	Latch Spring for 3098
2935	Lock Washer for 2754, 2759 or 2763
2944	Pin, Locking Screws, for 2759 or 2763
3061	Block for 2550
3063	Screw holding 2550
3067	Insulator, for separating Controllers, for 2560 and others.
3073	Black Grip for 3097 for Switch
3074	Blue Grip for 3097 for Derail
3075	Red Grip for 3097 for Home Signal
3076	Green Grip for 3097 for Distant Signal
3077	Yellow Grip for 3097 for Movable Point Frog
3078	Brown Grip for 3097 for Crossing Bar or Lock Levers
3096	Short Lever, Complete, used with and moved by 3097 when two Switches are operated together
3097	Long Lever, Complete, for Switch or Signal, with Grip as specified. (See 3073, etc.)
3098	Lever Guide with Dogs, Latches, etc., complete for Levers 3096 or 3097, specify whether for Switch or Signal Lever
3099	Contact Block with Contacts complete for 2560 and others
3100	Magnet Cores, riveted to Supporting Plate, for 2754
3101	Armature, with Plunger riveted in, for 2754
3102	Armature, with Plunger riveted in, for 2759 or 2763
3103	Magnet Cores, riveted to Supporting Plate, for 2759 or 2763.
3104	Wood Screw holding Number Plates 443 or 1171
3144	Screw holding Caps 1222 or 1445

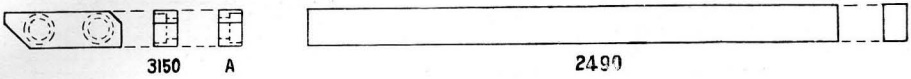
PAGE 46.

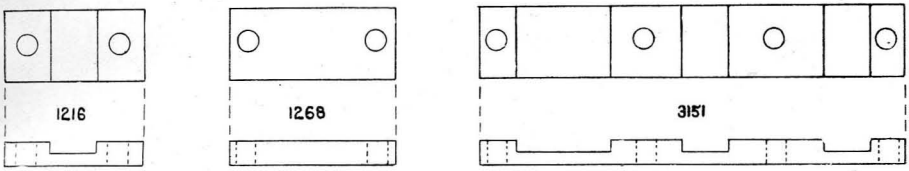
3067 Superseded by glass Insulator 4022.

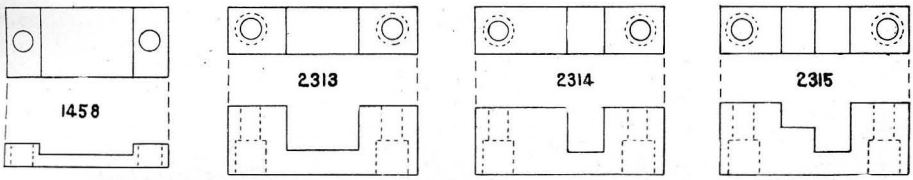
3099 Superseded in recent switch controllers by Contact Block 3253. (In ordering give name of interlocking plant and lever number.)

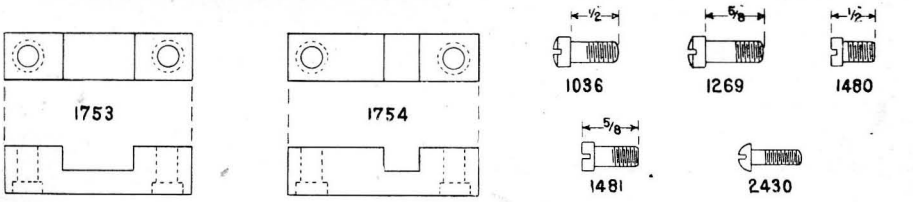
INTERLOCKER

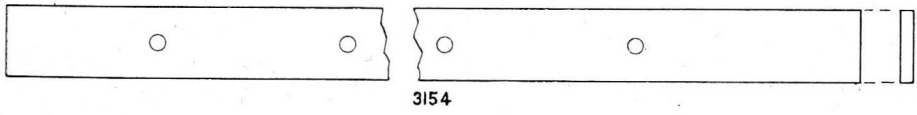
DOGS, GUIDES AND TAPPET BARS

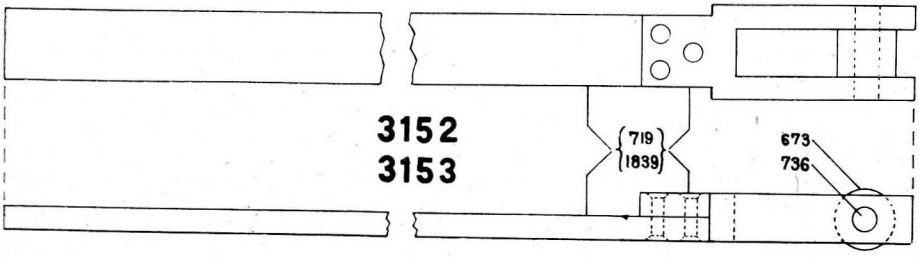






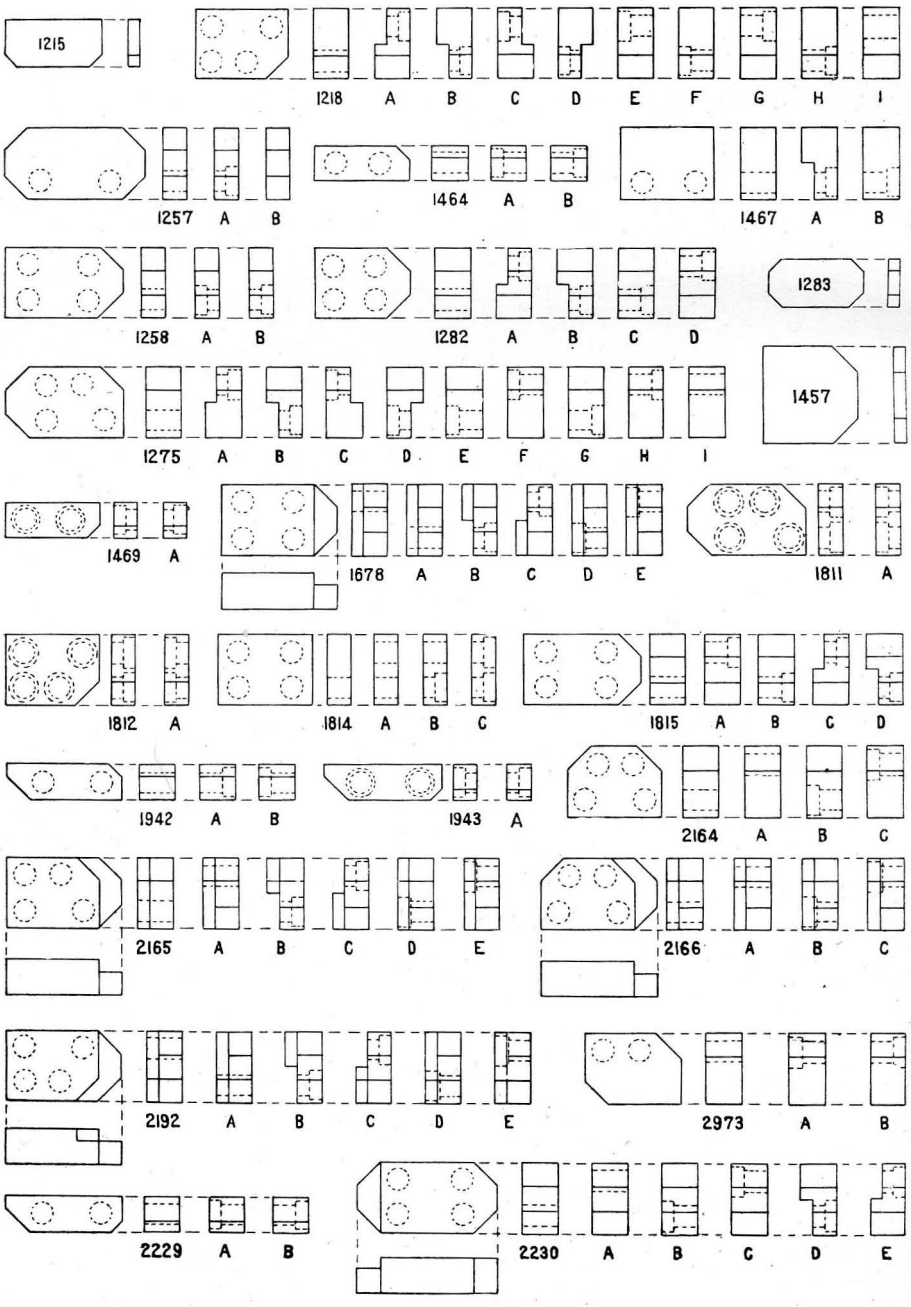






INTERLOCKER

DOGS, GUIDES AND TAPPET BARS



DOGS, GUIDES AND TAPPET BARS

1—All dogs are shown in front and end view and, where necessary, in side view. All possible drillings are shown in dotted lines on the front view of each dog. The end views show only the drilling that goes with each number. All dogs are shown one half size to facilitate selection in ordering.

2—In ordering dogs for repairs, it would be advisable to refer to the proper dog sheet and give, in addition to the catalogue number, the lever numbers between which the dog is used and also the slot number (see note) in which it slides. For example: "1258-A, Levers 22-23, Slot 4." NOTE: The slots are numbered from the top downwards as indicated on the locking plate, 1303 section 4.

3—The one way guides,1216 etc., are standard and may be ordered by catalogue number. Guides of more than one way, 3151 for example, are special and will have to be specified in detail or their location given by stating the lever number and whether the guide is the 1st, 2nd, 3rd or 4th one down, commencing at the top.

Order No.		LIST OF PARTS		
673		Roller for 3152 or 3153		
719		Tappet bar for 3152		
736		Pin for 3152 or 3153		
1036		Screw		
1215		Loose Locking Dog		
1216		Guide for Dogs 1215 or 1283		
1218		Back locking Dog		
1218	A	Front " "		
1218	B	" " "		
1218	C	" " "		
1218	D	" " "		
1218	E	Back " "		
1218	F	" " "		
1218	G	" " "		
1218	H	" " "		
1218	I	" " "		
1257		" " "		
1257	A	" " "		
1257	B	Blank " "		
1258		Back " "		
1258	A	" " "		
1258	B	" " "		
1268		Retaining Guide for Dog 1257-B		
1269		Screw		
1275		Back locking dog		
1275	A	Front " "		
1275	B	" " "		
1275	C	" " "		
1275	D	" " "		
1275	E	Back locking dog		
1275	F	" " "		

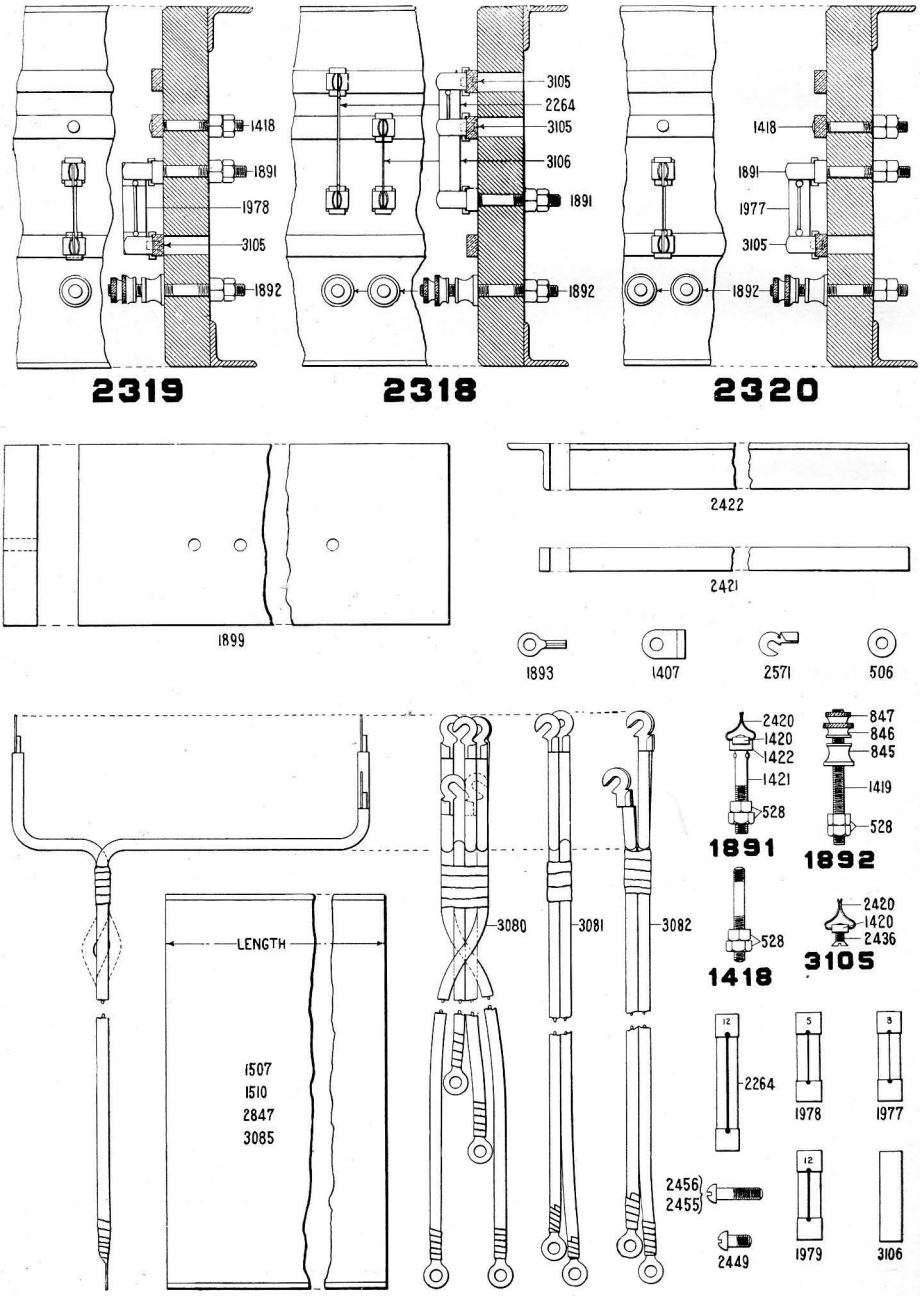
INTERLOCKER

Order No.		LIST OF PARTS		
1275	G	Back locking Dog		
1275	H	" " "		
1275	I	" " "		
1282		" " "		
1282	A	Front " "		
1282	B	" " "		
1282	C	Back " "		
1282	D	" " "		
1283		Loose " "		
1457		" " "		
1458		Guide for Dog 1457		
1464		Back locking Dog		
1464	A	" " "		
1464	B	" " "		
1467		" " "		
1467	A	Front " "		
1467	B	Back " "		
1469		Front " "		
1469	A	" " "		
1480		Screw		
1481		Screw		
1678		Back locking Dog		
1678	A	" " "		
1678	B	Front " "		
1678	C	" " "		
1678	D	Back " "		
1678	E	" " "		
1753		Retaining Guide for 2 strips 2490		
1754		Retaining Guide for 1 strip 2490		
1811		Front locking Dog		
1811	A	" " "		
1812		" " "		
1812	A	" " "		
1814		Coupling Dog		
1814	A	" "		
1814	B	" "		
1814	C	" "		
1815		Back locking Dog		
1815	A	" " "		
1815	B	" " "		
1815	C	Front " "		
1815	D	" " "		
1839		Tappet Bar for 3153		
1942		Back locking Dog		
1942	A	" " "		
1942	B	" " "		
1943		Front " "		
1943	A	" " "		
2164		Back " "		
2164	A	" " "		
2164	B	Front or back locking Dog		
2164	C	" " " " "		
2165		Back locking Dog		
2165	A	" " "		
2165	B	Front " "		
2165	C	" " "		
2165	D	Back " "		

INTERLOCKER

Order No.		LIST OF PARTS		
2165	E	Back locking Dog		
2166		" " "		
2166	A	" " "		
2166	B	" " "		
2166	C	" " "		
2192		" " "		
2192	A	" " "		
2192	B	Front " "		
2192	C	" " "		
2192	D	Back " "		
2192	E	" " "		
2229		" " "		
2229	A	" " "		
2229	B	" " "		
2230		" " "		
2230	A	" " "		
2230	B	" " "		
2230	C	" " "		
2230	D	Front " "		
2230	E	" " "		
2313		Retaining Guide for 2 strips 2490		
2314		Retaining Guide for 1 strip 2490		
2315		" " " 2 strips "		
2430		Screw, holding Cap 3154 to Locking Plates		
2490		Dog Strip, used for connecting the various Dogs or Dog Strips which move together		
2973		Back locking Dog		
2973	A	Front or back locking Dog		
2973	B	" " " " "		
3150		Front locking Dog		
3150	A	" " "		
3151		3 way Guide, in ordering see Paragraph 3 above		
3152		Tappet Bar, Complete, length 16 inches, for single tier Interlocker		
3153		Tappet Bar, Complete, length 28¾ inches, for double tier Interlocker		
3154		Cap retaining lower ends of Tappet Bars		

TERMINAL AND FUSE BOARD



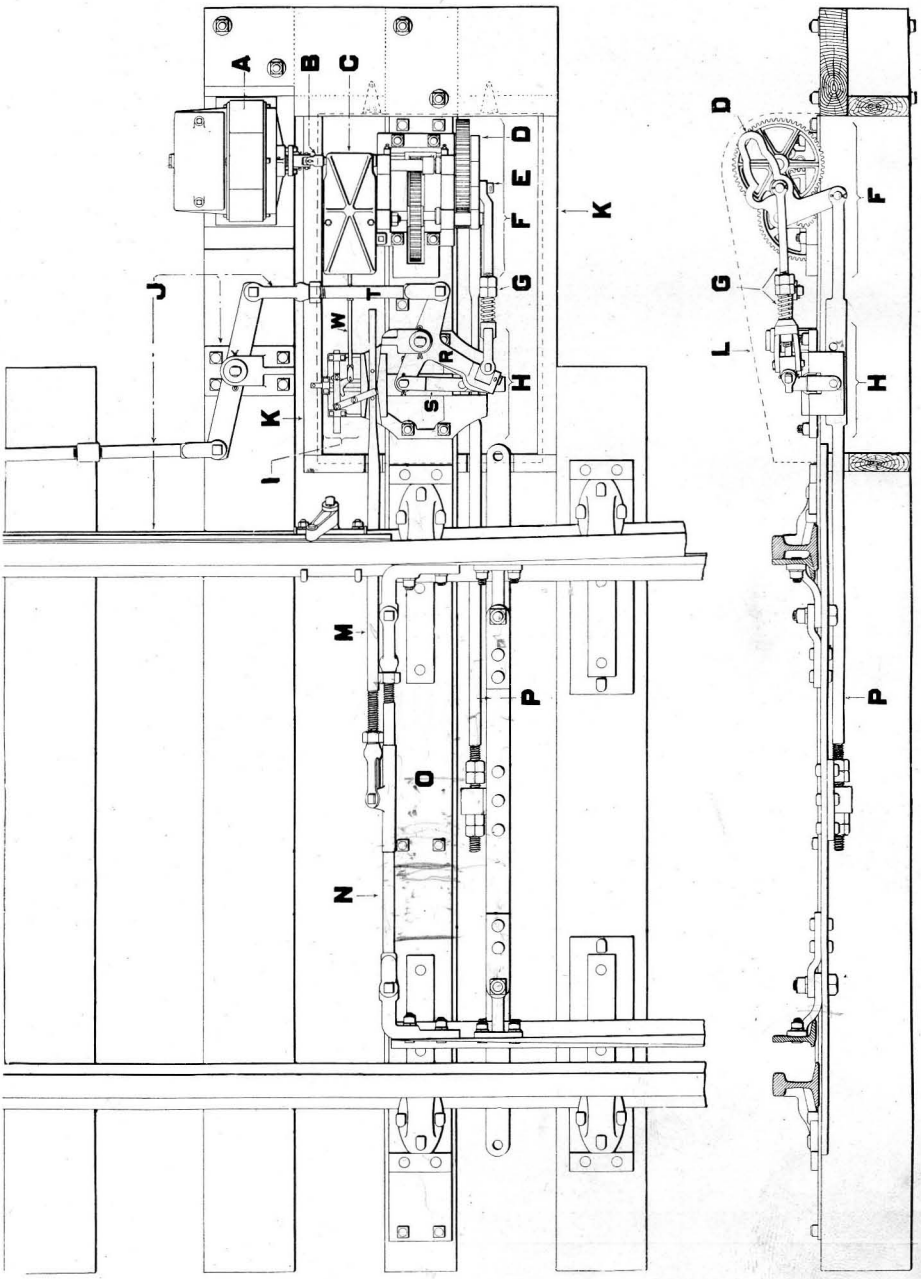
INTERLOCKER

Order No.	TERMINAL AND FUSE BOARD		
506	Washer, used with 2455 or 2456		
528	Nut for 1418, 1891 or 1892		
845	Base for 1892		
846	Thumb Nut for 1892		
847	Lock Nut for 1892		
1407	Terminal, used as required for connections to Binding Posts, etc		
1418	Stud with Nuts, for connections to Bus Bars		
1419	Screw for 1892		
1420	Nut for 1891 or 3105		
1421	Stud for 1891		
1422	Square Washer for 1891		
1507	Piece of Slate, 8½″ x 18″		
1510	Piece of Slate, 8½″ x 20″		
1891	Fuse Post, Complete		
1892	Binding Post, Complete		
1893	Terminal, used as required for connections to Binding Posts, etc		
1899	Wood Strip, guiding incoming wires to Binding Posts		
1977	3Ampere Fuse for Dwarf Signal Lever		
1978	5Ampere Fuse for High Signal Lever, also used formerly on Switch Lever. (See 3106)		
1979	12 Ampere Fuse (short) for Switch Lever, superseded by 2264		
2264	12 Ampere Fuse (long) for Switch Lever, superseding 1979		
2318	Set of Terminals, showing arrangement, for Switch Lever		
2319	Set of Terminals, showing arrangement, for High Signal Lever		
2320	Set of Terminals, showing arrangement, for Dwarf Signal Lever		
2420	Clip for 1891 or 3105		
2421	Piece of Bus Bar, ¼″ x ½″, drilled as required; specify length		
2422	Angle Iron Brace supporting Slates, drilled as required; specify length		
2436	Screw for 3105		
2449	Screw, holding 2422 to Brackets 1393, etc. Sec 4		
2455	Screw, holding Bus Bar 2421 to Slate when required		
2456	Screw, holding Strip 1899 or Slates to 2422		
2571	Terminal, used for connections to Controllers		
2847	Piece of Slate, 8½″ x 16″		
3080	Set of Lead Wires, Complete, connecting from Terminal Board to Dwarf Signal Controller 2673		
3081	Set of Lead Wires, Complete, connecting from Terminal Board to High Signal Controller 2676		
3082	Set of Lead Wires, Complete, connecting from Terminal Board to Switch Controller 2560		
3085	Piece of Slate, 8½″ x 8″		
3105	Fuse Clip, Complete, for direct connection to Bus Bars		
3106	Strip for 2318, superseding Fuse 1978, for Switch Levers		

PAGE 53.

1507	Should read 1510.
1510	Should read 2847.
2264	Superseded by 10 ampere fuse 4867.
2847	Should read 1507.
2318	Superseded by set of terminals 4054, which has only one long fuse.

SWITCH AND LOCK MOVEMENTS



SWITCH AND LOCK MOVEMENTS.

DESCRIPTION

A complete switch and lock movement for a left hand slip switch is shown on the opposite page. It consists in general, of the motor, the switch machine, the detector bar and certain switch connections.

MOTOR

The motor, shown at A and also in Sec. 10, is entirely waterproof in construction, the operating wires entering through holes in a soft rubber plug (1771, Sec. 10), the cover being provided with a soft rubber gasket which is compressed between finished surfaces and the armature shaft passing out through an adjustable stuffing box. The removal of the cover gives free access to the parts requiring inspection. The armature, field coils and brush holders are of the most approved construction. Since some switches require more power to work them than others the motors have been arranged so that by a slight change of the internal connections, easily made on the ground, they can be adapted to the work to be performed in each case. All motors are thoroughly tested before shipment by an electric pressure ten times greater than they will have to stand in practice.

SWITCH MACHINE

The switch machine proper, consists of a connecting shaft (B), gear frame (F), lock movement (H) with its driving rod (G), pole changer movement (I), pole changer (C) and cover (L).

The connecting shaft (C) (shown also at 2056, Sec. 16) is flexible in all directions and renders the maintenance of careful alignment between motor and gear frame unnecessary.

The function of the gear frame mechanism (F) is first; to reduce the speed of the motor and correspondingly increase its power to an amount suitable for the movement of the switch and detector bar and, second; to disengage the motor after the switch machine has entirely completed a stroke. The disengagement of the motor is effected by the combination of a cam (469, Sec. 11), mounted on the shaft with the main gear, a clutch shifter (2526, Sec. 11), a pair of clutches (2308, Sec. 11) and a gear (2309 Sec. 11). Both clutches and gear are mounted on a shaft (2758, Sec. 11) which connects direct with the motor. The clutches are keyed to the shaft but free to move sideways and, when permitted by the shifter, are forced against the gear by the springs (414). The gear is loose on the shaft except when in engagement with one clutch or the other. When the motor operates it drives the gearing by means of one of the clutches. When a stroke has been completed the clutch is moved sideways by the cam (469), acting through the shifter (2526), thus disengaging the motor and leaving it free to continue in rotation by its acquired momentum and to give an indication as explained on page 20. The movement of the switch, detector bar

and lock plunger is effected by the pin (E) on the main gear, which connects direct with the lock movement, by the rod (G), and to the switch, by engagement with the crank cam (D).

It is through the medium of the lock movement (H) that the lock plunger, detector bar and pole changer are operated. Motion is transmitted to the crank (R) by the rod (G), to the lock plunger by link (S), and to the detector bar by link (T). Since both detector bar and plunger are driven by the same crank, if a train, on the track, prevents movement of the detector bar the plunger cannot be withdrawn, much less the switch thrown.

Motion is imparted to the pole changer (C) through the medium of the pole changer movement (I), after the lock plunger, in returning, has passed entirely through the hole in the lock rod (M). By an ingenius arrangement of the pole changer movement mechanism (1882 or 1910, Sec. 13), acting in combination with two pins on the lock rod (M), the pole changer (C) is caused to throw in one direction when the switch has reached its normal position and in the other when it has reached its reverse position. The movement of the pole changer (C), illustrated more fully in Sec. 14,accomplishes three things: First, cuts working current off the motor; second, reverses the armature connections; and third, completes the indicating circuit, all as described on page 20. It is operated mechanically by the rod (W), or electrically by the magnets (M–M, Sec. 14), in the manner and for the reasons explained on page 21. A revolving circuit breaker (V, Sec. 14), is arranged to cut current off the magnets whenever the switch is in its full normal or reverse position. The whole is enclosed in a cast iron case with a gasketted cover.

A boxing (K), in combination with the cover (L), which is both hinged and padlocked, affords suitable protection for the mechanism.

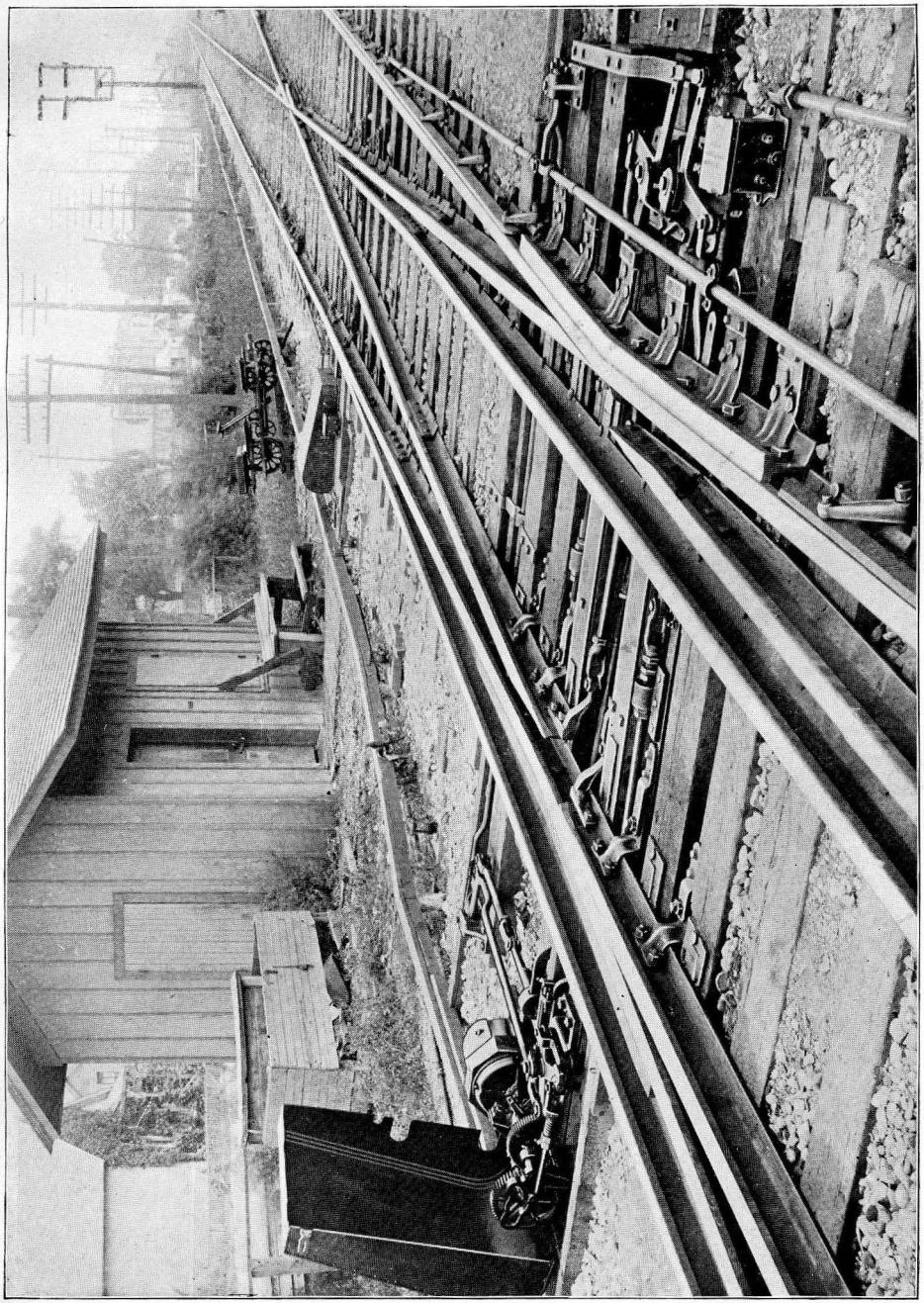
SWITCH CONNECTIONS AND DETECTOR BAR

The gear frame and lock movement, together with the stock rails, are securely bolted and braced to a rigid tie plate (O) which maintains all parts in their proper relation, one to the other. The lock, front and throw rods, are shown at M, N and P respectively. Both lock and throw rods are bolted by the lock plunger. The detector bar is shown at J and also in section 18.

OPERATION

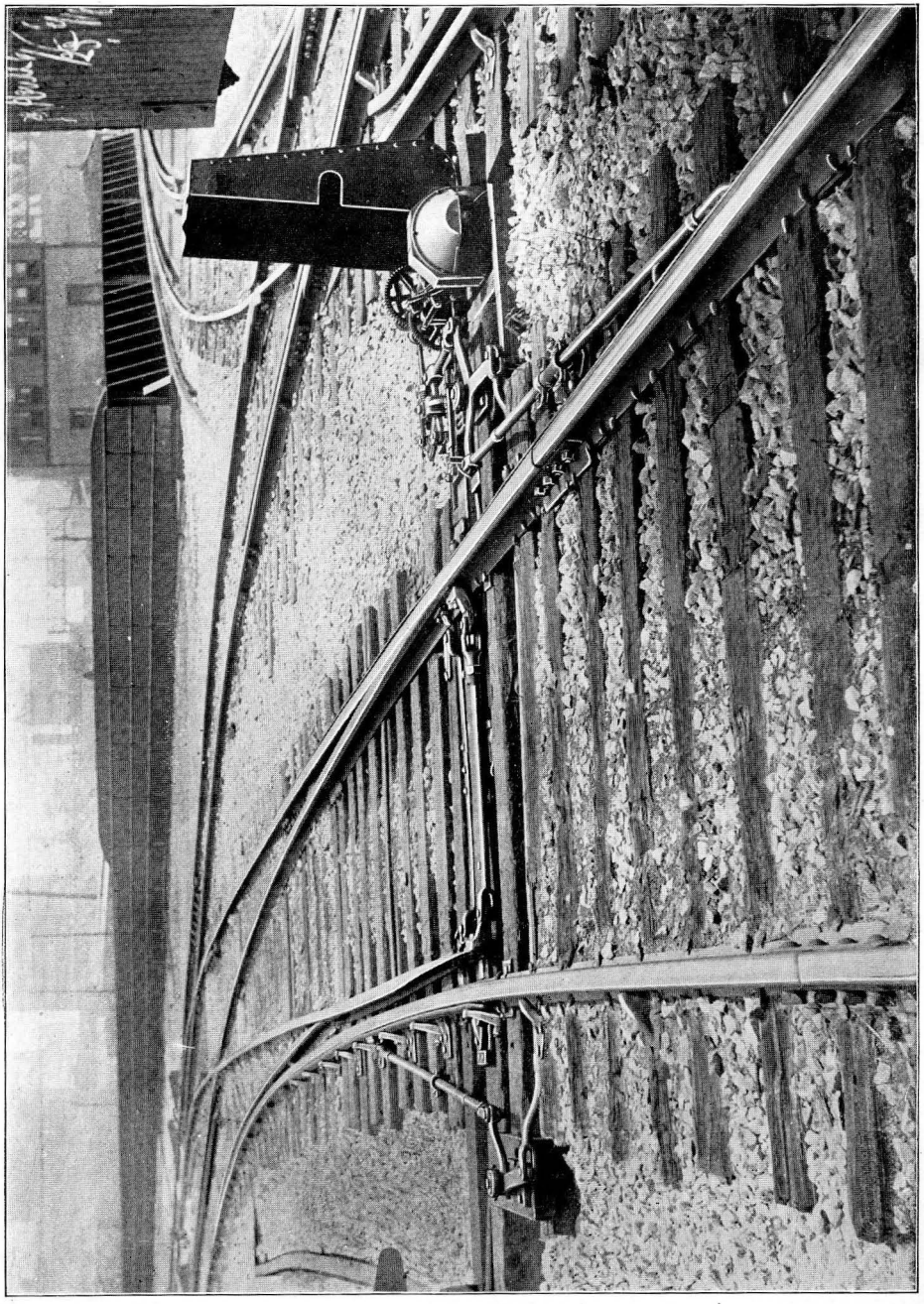
The operation of the switch movement as a whole is as follows: Current having been delivered to the motor, as explained on page 20, it is set in motion and, operating through the train of gearing, carries the main gear, with pin (E), through a complete revolution. During approximately the first one-third of this revolution the lock bolt is withdrawn and the detector bar raised simultaneously. This having been accomplished, the pin (E), coming in contact with the outer end of the crank cam (D), causes the switch to be thrown dur-

SWITCH AND LOCK MOVEMENTS



MOVABLE POINT FROG.

SWITCH AND LOCK MOVEMENTS



SPLIT SWITCH.

ing the next one-third of the revolution. During the final one-third the lock bolt is returned to its place and the detector bar lowered. Just at the instant the lock plunger passes through the lock rod, the pole changer is thrown and at the same time, the motor is disengaged as explained above, resulting in an indication being given as described on page 20.

ILLUSTRATIONS.

The following is a list of illustrations showing machines connected to the various switches, etc., named: Derail, page 11; Wharton Derail, page 73; Split Switch, page 58; Double Slip Switch, page 61; Movable Point Frog, page 57.

SWITCH AND LOCK MOVEMENTS

MOVEMENTS

1—A complete Switch and Lock Movement includes the Motor, Switch Machine, Switch Connections and Detector Bar.

2—The Motors are shown in section 10.

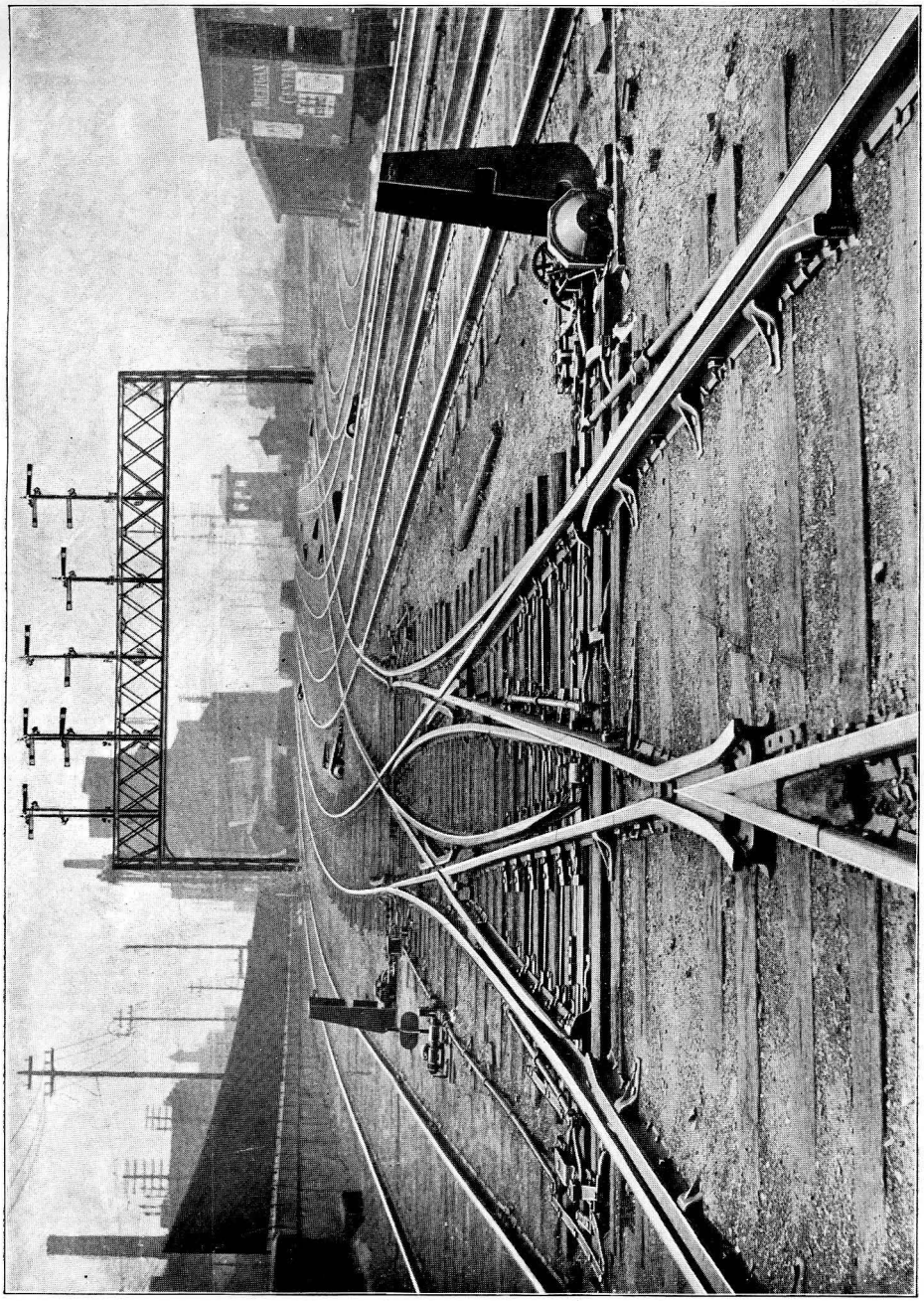
3—The Switch Machine (see section 8) includes the Connecting Shaft (B), Pole Changer (C), Gear Frame (F), Lock Movement (H), Pole Changer Movement (I) and Cover (L). It is made either Right or Left as specified. A Right or Left Hand Switch is one in which the mechanism is respectively to the Right or Left of an observer standing between the rails, facing the switch points. Switch Machines are the same for Derails, Split Switches, Single and Double Slip Switches and Movable Point Frogs. For other devices such as Crossing Bars, Scotch Blocks, etc., they are liable to vary somewhat and are therefore furnished to specification.

4—Switch Connections (see section 8) include the Tie Plate (O), with Rail Braces, Slide Plates, etc., Throw Rod (P), Lock Rod (M), and Front Rod (N), all of which are subject to variation depending upon the kind of device to be operated and the relative location of the switch machine. Below is listed a set of Standard Connections for a derail and one for a split switch; others furnished to specification.

5—Detector Bars will be found listed in section 17.

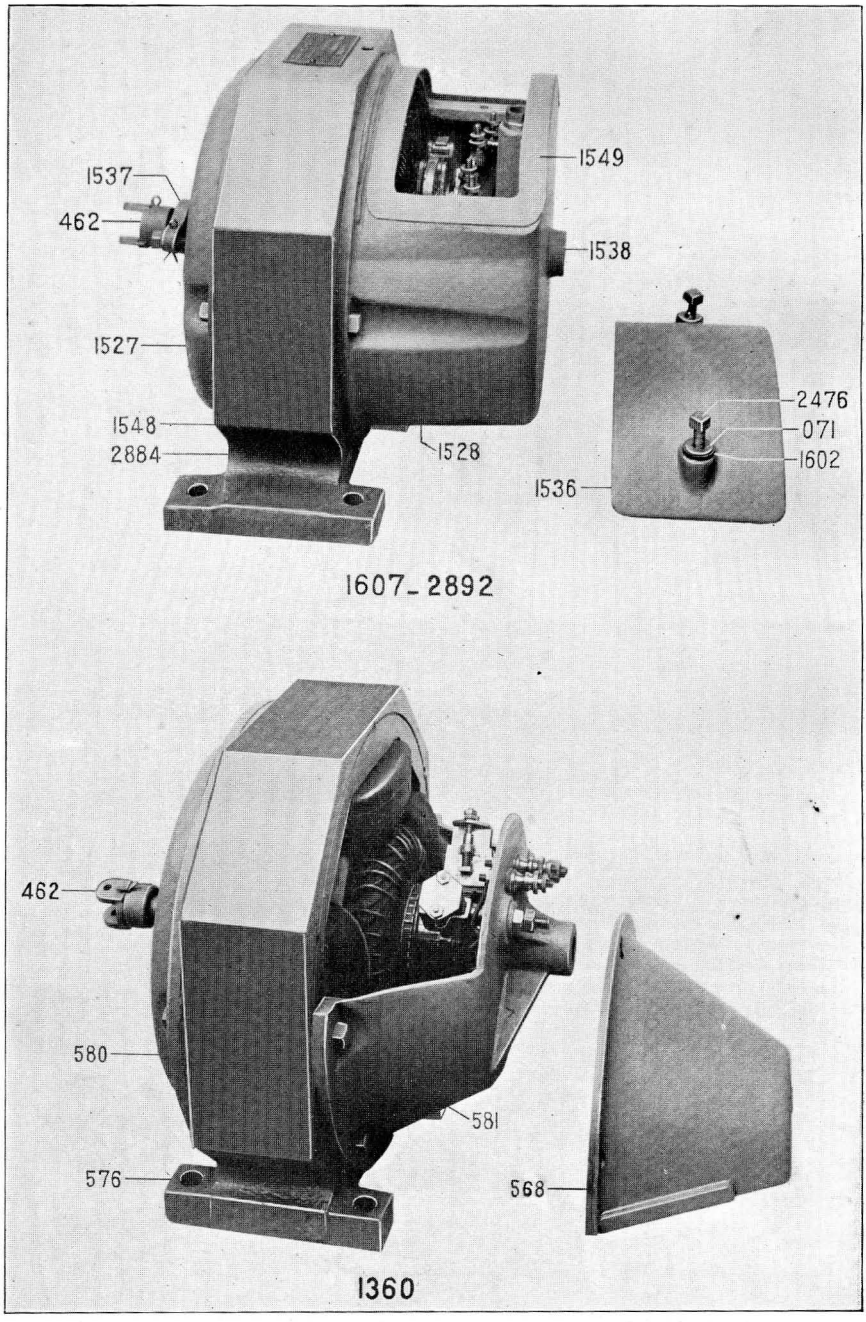
Order No.	LIST OF PARTS		
3146	Right Hand Switch Machine, Complete, (see paragraph 3, above) including Gear Frame 2606 Sec 11, Lock Movement 2607 Sec 12, Pole Changer Movement 1882 Sec 13, Pole Changer 3000 Sec 14, Cover 2920 Sec 16 and Connecting Shaft 2056 Sec 16		
3147	Left Hand Switch Machine, Complete, (see paragraph 3, above) including Gear Frame 2606 Sec 11, Lock Movement 2607 Sec 12, Pole Changer Movement 1910 Sec 13, Pole Changer 3000 Sec 14, Cover 2921 Sec 16 and Connecting Shaft 2056 Sec 16		
3148	Set of Switch Connections for a Split Switch including Throw Rod 2795 Sec 15, Front Rod 962 Sec 15, Lock Rod 2804 Sec 15 and Tie Plate 2919 Sec 16		
3157	Set of Switch Connections for a Derail, including Throw Rod 2795 Sec 15, Front Rod 2799 Sec 15, Front Rod Guides 2791 or 2792 Sec 15, Lock Rod 2804 Sec 15 and Tie Plate 2918 Sec 16. In ordering, specify Front Rod Guide 2791 or 2792 Sec 15, as required		

SWITCH AND LOCK MOVEMENTS



DOUBLE SLIP SWITCH.

SWITCH AND LOCK MOVEMENTS



SWITCH MOTORS.

SWITCH AND LOCK MOVEMENTS

Order No.	SWITCH MOTORS
026	Key for Jaw 462 (see also 427)
045	Cotter Pin for 1539
041	Cotter Pin for 462
052	Graphite Packing for Armature Shaft
066	Lag Screw, Motor to Tie
071	Washer for Cover Screw 2476
427	Key, old style, for Jaw 462 (see also 026)
462	Jaw for 1607 and others
493	Insulating Washer for 2883
506	Washer for 1550 or 2883
528	Nut for 1550 or 2883
562	Bolt for 990
564	Wood Brace holding Coil 1641
566	Brush for 990 or 1550
567	Square Insulating Bushing for 990
568	Cover for Motor 1360
573	Brush Holder for 990
576	Field Casting for 1360
577	Nut for 990
579	Nut for 990
580	Back Bearing Plate for 1360
581	Front Bearing Plate for 1360
582	Plate for 990
586	Spring for 990
607	Insulating Bushing for 2883
688	Insulating Washer for 990
845	Base for Binding Post for 1550 or 2883
846	Thumb Nut for 1550 or 2883
847	Lock Nut for 1550 or 2883
879	Screw for 2883
884	Insulating Washer for 990
990	Brush Holder complete for 1360

PAGE 63.

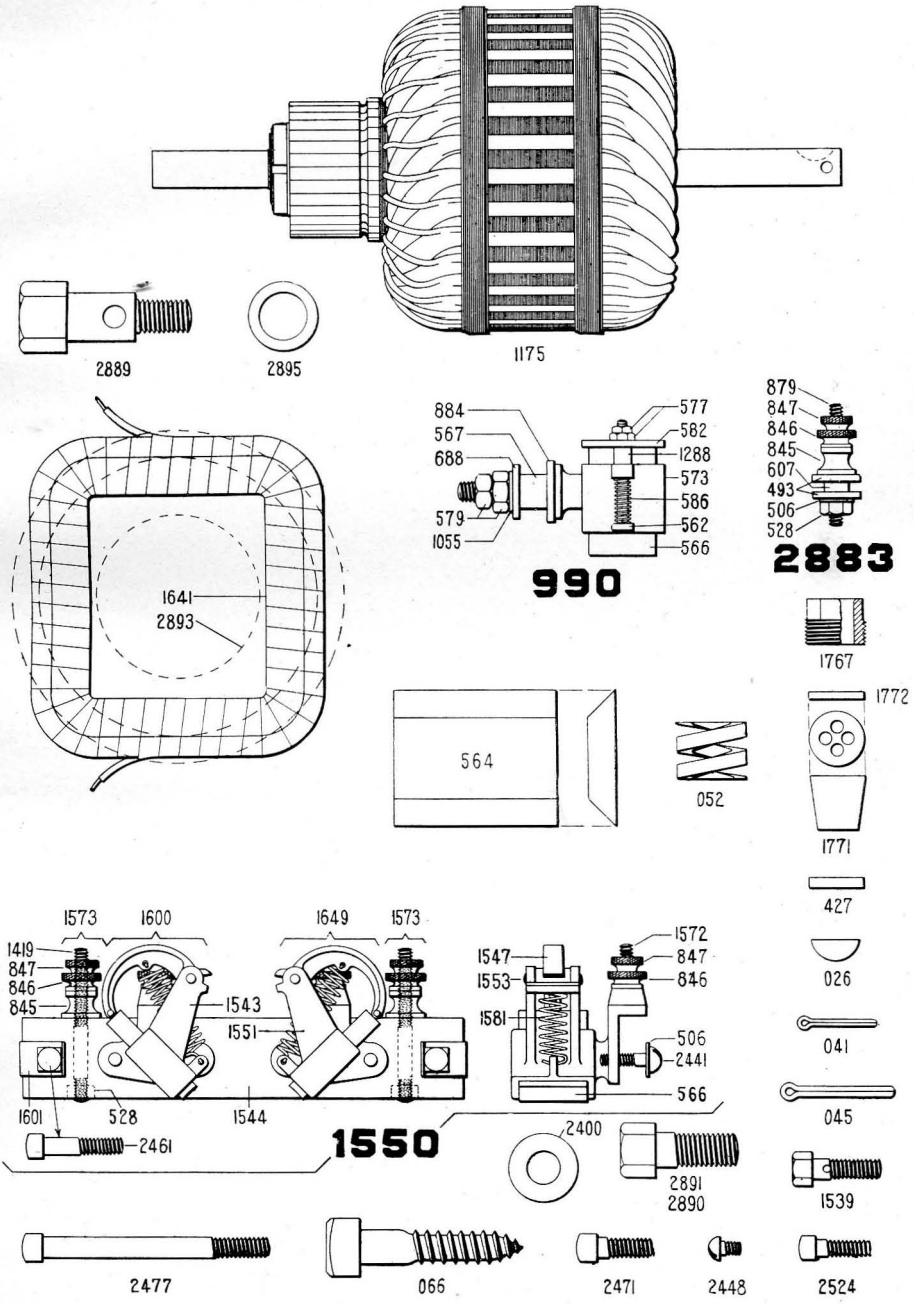
567	Superseded by Bushing 3999.
607	Superseded by Bushing 4001.
688	Superseded by Washer 3998.
884	Superseded by Washer 3998.
1175	Should read 2330.
1419	Superseded by Screw 1389.
1528	Superseded in latest motors by Plate 4617 which has a hinged Cover 4618, and a square Trunking Cap 4619, with an inlet bushing for wires 1768 and other minor parts in accordance.
1550	In later motors has three binding posts instead of two.
041	Should read 045.
045	Should read 041.

SWITCH AND LOCK MOVEMENTS

Order No	SWITCH MOTORS		
1600	Brush Holder, Right Hand, complete for 1550		
1601	Lock Washer for 1550		
1602	Rubber Washer for Screw 2476		
1607	Motor, 110 Volt, Model 3, Complete		
1641	Field Coil, 110 Volt, for 1360 or 1607		
1649	Brush Holder, Left Hand, Complete for 1550		
1767	Compression Screw for 1771		
1771	Rubber Plug for lead wires for 1607 or 2892		
1772	Insulating Washer for 1771		
2400	Washer for 2890		
2441	Screw for 1550		
2448	Screw for Oil Hole in 1527		
2461	Screw for 1550		
2471	Screw, holding Bearing Plates 580, 581, 1527 or 1528		
2476	Cap Screw for Cover 1536		
2477	Cap Screw, holding Bearing Plates 1527 to 1528		
2524	Cap Screw, holding Cover 568		
2703	Wrought Iron Magnet Core for 2892 (not illustrated)		
2883	Binding Post, Complete, for 1360		
2884	Field Casting for 2892		
2889	Cap Screw, special, holding 2703 top		
2890	Cap Screw, 2¼", holding 2703 right and left		
2891	Cap Screw, 1½", holding 2703 bottom		
2892	Motor, 110 Volt, Model 3 Special, Complete		
2893	Field Coil, 110 Volt, for 2802 (shown dotted)		
2895	Washer for 2889		

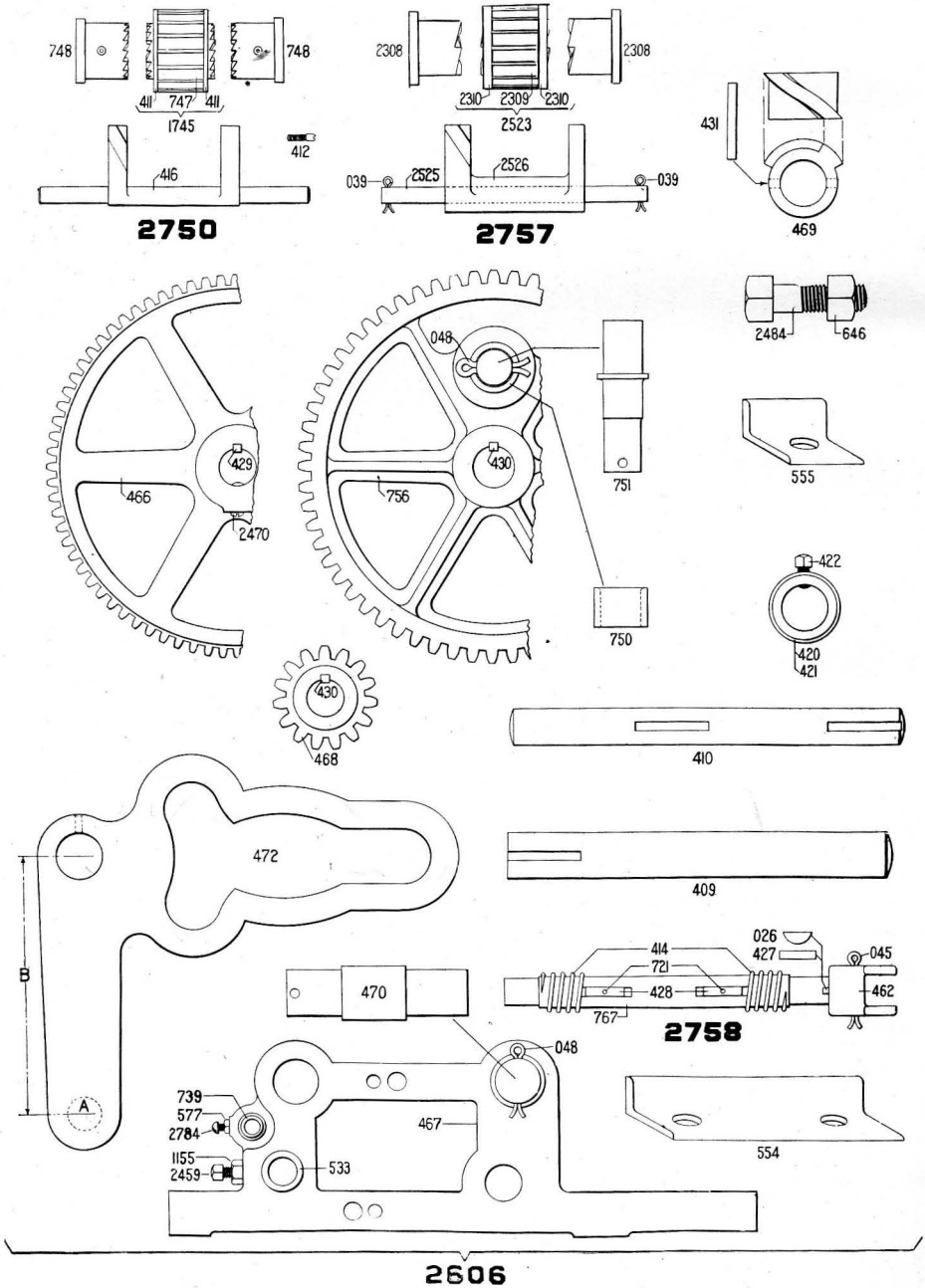
SWITCH AND LOCK MOVEMENTS

SWITCH MOTORS



SWITCH AND LOCK MOVEMENTS

GEAR FRAME



SWITCH AND LOCK MOVEMENTS

Order No.	GEAR FRAME
026	Key for 2758 (see 427)
039	Cotter Pin for 2757
045	Cotter Pin for 2758
048	Cotter Pin for 470 or 751
409	Main Shaft
419	Intermediate Shaft
411	Collar for 2750
412	Screw, Collars to Gear, for 2750
414	Spring for 2758
416	Clutch Shifter for 2750
420	Collar for Shaft 410
421	Collar for Shaft 409
422	Set Screw for Collars 420 and 421
427	Key, old style, for 2758 (see 026)
428	Key for 2758
429	Key for Gear 466
430	Key for Gear 468 or 756
431	Pin, Cam 469 to Shaft 409
462	Jaw for 2758

PAGE 67.

428	Superseded in later machines by semi-circular key 4031.
577	Used only with old style Clutch, etc., 2750.
721	Abandoned in machines using semi-circular key 4031.
739	Used only with old style Clutch, etc. 2750.
2757	Superseded by friction clutch complete 6375.
2484	Used only with ⅜-in. tie plates. For ½-in. tie plates order 4693.
2784	Used only with old style Clutch, etc. 2750.

750	Roller used on 751
751	Stud for Gear 756
756	Main Gear with Stud 751 riveted in
767	Clutch Shaft for 2758
1155	Jamb Nut for Screw 2459
1745	Clutch Gear, Complete, for 2750
2308	Clutch, 4 tooth, used with 2757
2309	Clutch Gear for 2757
2310	Collar for 2757
2459	Set Screw holding Clutch Shaft Bushing
2470	Screw holding Gear 466 to Shaft 410
2484	Cap Screw holding Gear Frame to Tie Plate
2523	Clutch Gear, Complete, for 2757
2525	Shaft for 2757
2526	Clutch Shifter for 2757, slides on 2525
2606	Gear Frame, Complete, with Clutch Shifter 2757, for right or left hand machine as specified, Bolts and Nuts included
2750	Clutch, 16 tooth, with Shifter and Gear, Complete
2757	Clutch, 4 tooth, with Shifter and Gear, Complete
2758	Clutch Shaft with Springs, Jaws, etc., Complete
2784	Set Screw holding Clutch Shifter Bushing

SWITCH AND LOCK MOVEMENTS

Order No.	LOCK MOVEMENT
043	Cotter Pin for 2652 or 2653
046	Cotter Pin for 2652 or 2653
049	Cotter Pin for 724
520	Stud for 2653
522	Nut for 2652
524	Spring for 2652
554	Nut Lock, Double, for 2483 or 2485
555	Nut Lock, Single, for 2483 or 2485
646	Nut for 2483 or 2485
723	Pin for 2652
724	Pin, Pivot, for 768 or 1660
731	Pin for 2653
755	Rod for 2652
760	Block for 2652
763	Plunger for single locking
765	Link for 2653
768	L Crank
773	Jaw for 2652
787	Lock Frame for Left Hand Machine
795	Lock Frame for Right Hand Machine
1000	Pin for 2652
1015	Nut for 2652
1660	T Crank, used with Detector Bar
2030	Bracket, used with 787 or 795 for Locking Throw Rod
2279	Plunger for Double Locking, used with 2030
2483	Cap Screw, 795 or 787 to Tie Plate
2485	Cap Screw, 2030 with 787 or 795 to Tie Plate
2607	Lock Movement, Complete, with Crank 1660, parts for double locking and with bolts. Right or Left as Specified
2652	Driving Rod, Complete
2653	Link, Complete, connecting Crank to Plunger

PAGE 68.

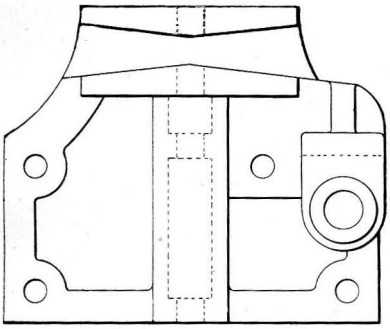
524 Superseded by a heavier Spring 5091, which has convolutions of a rectangular section.

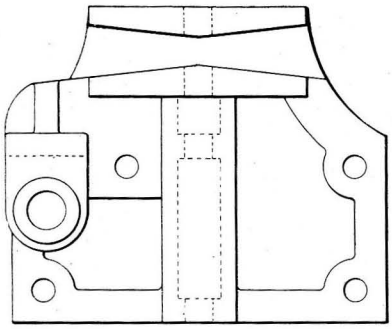
2030 2030 is for a ⅜-in. tie plate. For ½-in. tie plates Bracket 4692 is required.

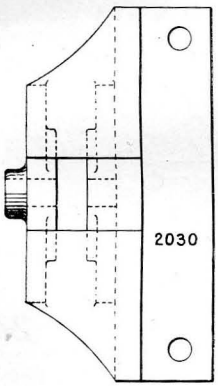
2483 For ⅜-in. tie plates. For ½-in. tie plates order 2484.

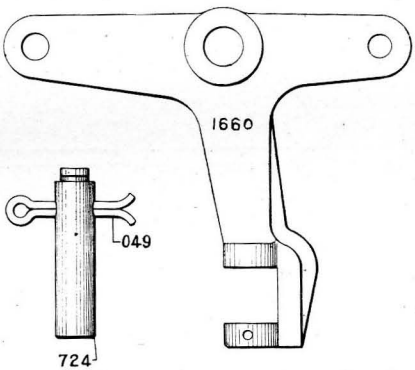
SWITCH AND LOCK MOVEMENTS

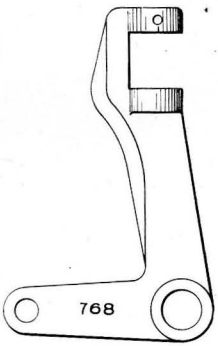
LOCK MOVEMENT

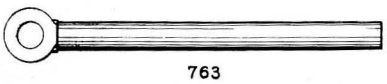


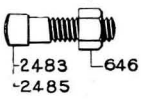


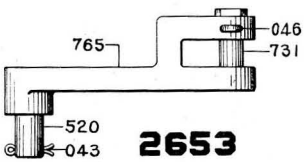


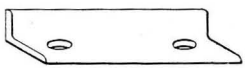


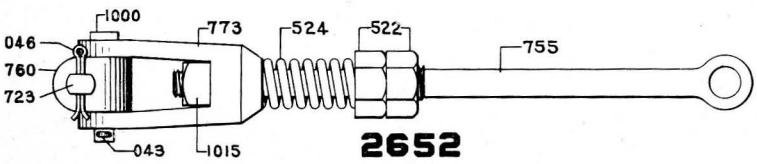






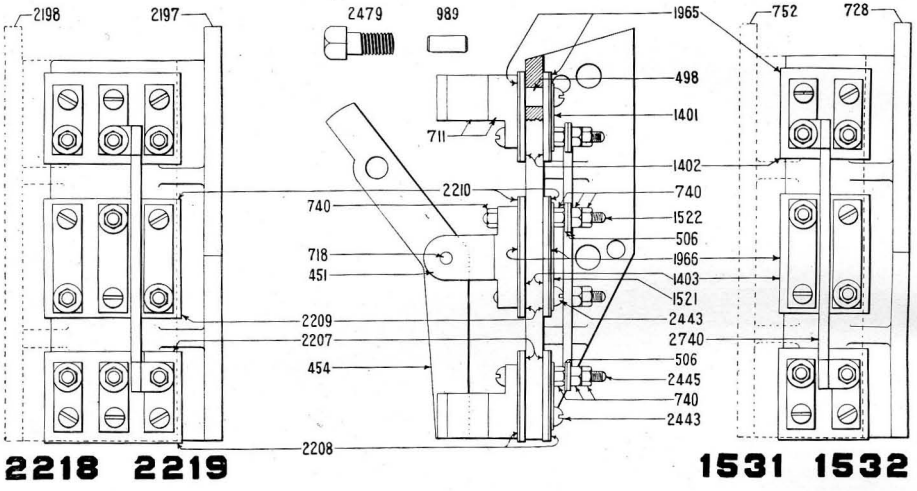


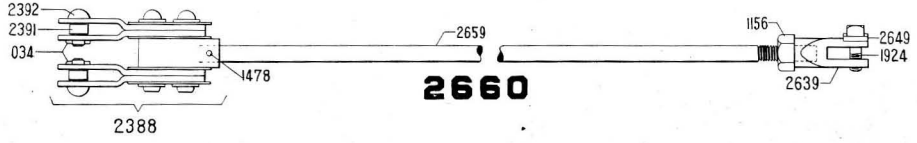


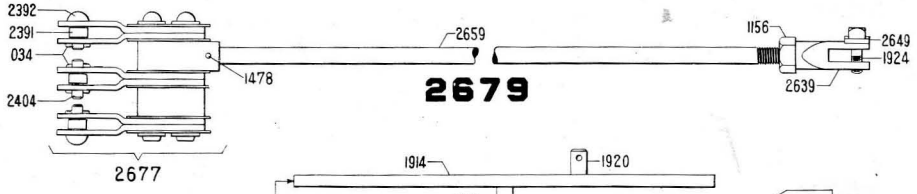


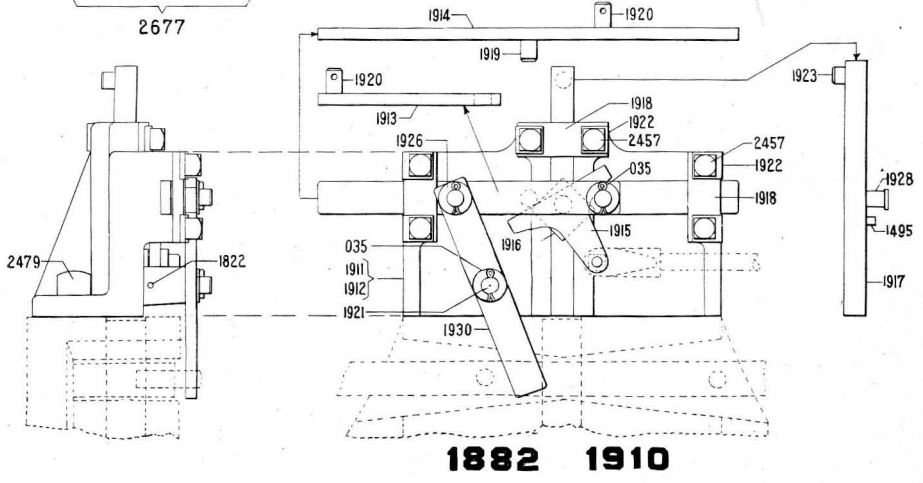
SWITCH AND LOCK MOVEMENTS

POLE CHANGERS AND MOVEMENT









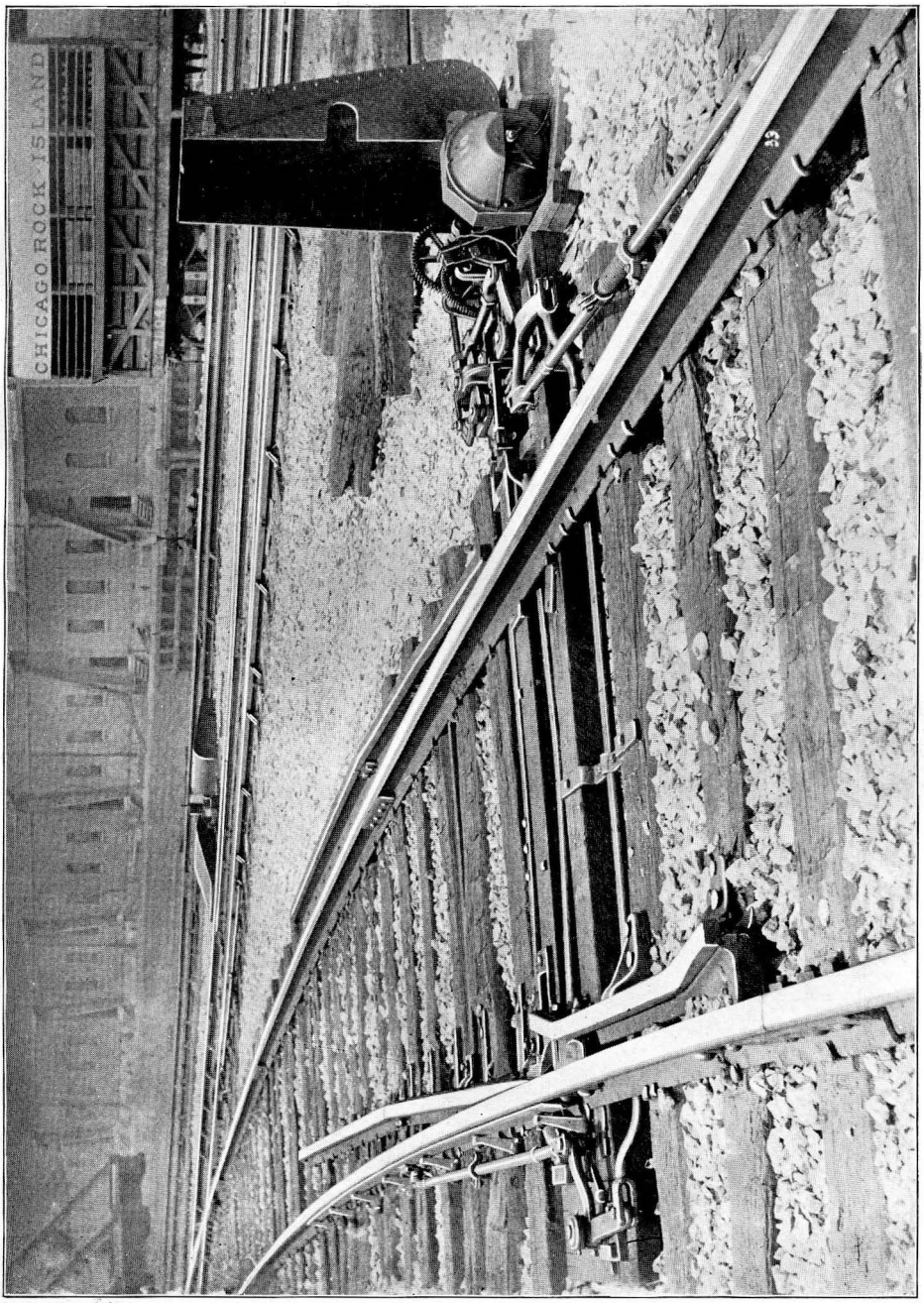
SWITCH AND LOCK MOVEMENTS

Order No.	POLE CHANGERS AND MOVEMENT		
034	Cotter Pin for 2660 or 2679		
035	Cotter Pin for 1882 or 1910		
451	Bracket for 1531, 2218, etc		
454	Contact Bar for 1531, 2218, etc		
498	Insulating Bushing for 1531, 2218, etc		
506	Washer for 1531, 2218, etc		
711	Contact for 1531, 2218, etc		
718	Pin for 1531, 2218, etc		
728	Bracket for 1532		
740	Nut for 1531, 2218, etc		
752	Bracket for 1531		
989	Dowel Pin holding Pole Changers		
1156	Nut for 2660 or 2679		
1401	Contact Plate for 1531, 2218, etc		
1402	Insulator for 1531 or 1532		
1403	Insulator for 1531 or 1532		
1478	Pin for 2660 or 2679		
1495	Pin for 1882 or 1910, holding 1916 to 1917		
1521	Contact Plate for 1531, 2218, etc		
1522	Stud for 1531, 2218, etc		
1531	Two Circuit Pole Changer complete for Right Hand Switch Machine; superseded by Pole Changer 3000, Sec 14		
1532	Ditto for Left Hand Machine; superseded by Pole Changer 3000 Sec 14		
1822	Pin for 1882 or 1910		
1882	Pole Changer Movement complete for Right Hand Switch Machine, with Screws, 2479, (Left Hand shown)		
1910	Pole Changer Movement complete for Left Hand Switch Machine, with Screws, 2479		
1911	Bracket for 1910		
1912	Bracket for 1882		
1913	Link for 1882 or 1910, connecting 1914 and 1930		
1914	Slide Bar for 1882 or 1910		
1915	Crank for 1882 or 1910		
1916	Cam " " " "		
1917	Plunger for 1882 or 1910		
1918	Cap for 1882 or 1910		
1919	Stud for 1882 or 1910, Fulcrum for 1916		
1920	Stud for 1882 or 1910		
1921	Pin for 1882 or 1910		
1922	Lock Washer for 1882 or 1910		
1923	Stud for 1882 or 1910		
1924	Cap Screw for 2660 or 2679		
1926	Washer for 1882 or 1910		
1928	Stud for 1882 or 1910, Pivot for 1915		
1930	Lever for 1882 or 1910		
1965	Insulator for 1531 or 1532		
1966	Insulator for 1531 or 1532		
2197	Bracket for 2219		
2198	Bracket for 2218		
2207	Insulator for 2218 or 2219		
2208	Insulator for 2218 or 2219		
2209	Insulator for 2218 or 2219		
2210	Insulator for 2218 or 2219		
2218	Three Circuit Pole Changer complete for Right Hand Switch Machine		
2219	Ditto for Left Hand Switch Machine		
2388	Jaw, Complete, for 2660		

SWITCH AND LOCK MOVEMENTS

Order No.	POLE CHANGERS AND MOVEMENT		
2391	Bushing for 2660 or 2679		
2392	Pin for 2660 or 2679		
2404	Pin for 2679		
2443	Screw for 1531, 2218, etc		
2445	Screw for 1531, 2218, etc		
2457	Cap Screw for 1882 or 1910		
2479	Cap Screw, holding Pole Changers, also 1882 or 1910		
2639	Jaw for 2660 or 2679		
2649	Lock Washer for 2660 or 2679		
2659	Rod for 2660 or 2679		
2660	Rod, Complete, connecting 1882 with 1531 or 1910 with 1532		
2677	Jaw ,Complete, for 2679		
2679	Rod, Complete, connecting 1882 with 2218		
2740	Connecting Wire with Terminals for 1531, 2218, etc		

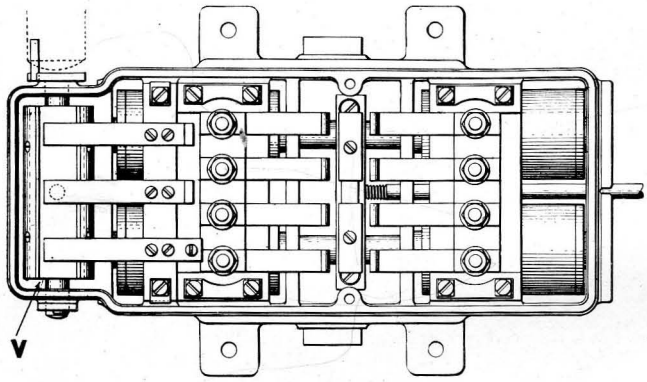
SWITCH AND LOCK MOVEMENTS



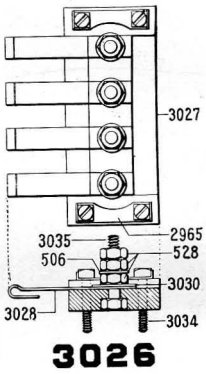
WHARTON DERAIL

SWITCH AND LOCK MOVEMENTS

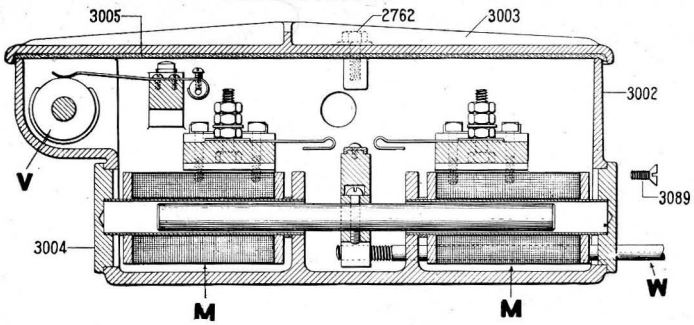
REVERSIBLE POLE CHANGER

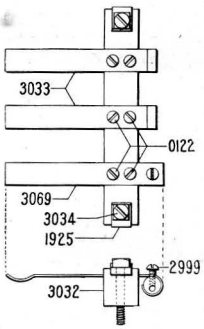


3000

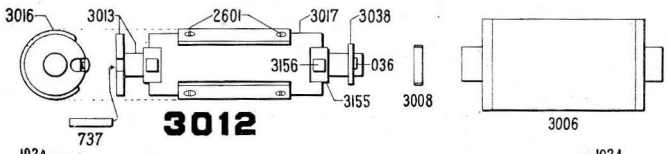


3026

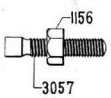


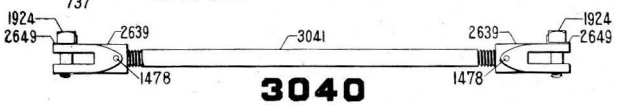


3031



3012





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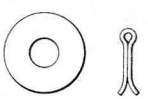

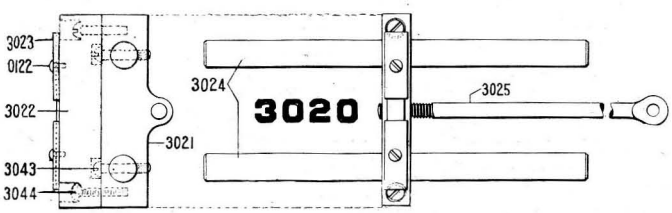

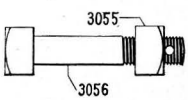

SWITCH AND LOCK MOVEMENTS

Order No.	REVERSIBLE POLE CHANGER		
036	Cotter Pin for 3012		
040	Cotter Pin for 3056		
0122	Screw for 3020 or 3031		
506	Washer for 3026		
528	Nut for 3026		
737	Pin for 3012		
1156	Nut for 3057		
1478	Pin for 3040		
1924	Cap Screw for 3040		
1925	Lock Washer for 3031		
2601	Screw for 3012		
2639	Jaw for 3040		
2649	Lock Washer for 3040		
2762	Cover Screw		
2965	Lock Washer for 3026		
2999	Screw for 3031		
3000	Reversible Pole Changer, Complete, including the necessary Bolts, Nuts, etc., for fastening to Switch Machine and with Rod 3040. Replaces 1531 and 1532, Sec. 13		
3002	Case		
3003	Cover		
3004	Cap		

PAGE 75.

3006	Superseded by Coil 6094 with Tube 6095.
3012	Superseded by Commutator 6439 and Shaft 3013. When ordering this to replace 3012 be sure and specify contact block complete 6489 to go with it. (6439 is equipped with a cam arrangement for bringing the commutator to its centre regardless of where the machine would other. wise stop it.)
3031	Superseded by Block Complete 6489. (This includes the springs and roller for forcing Commutator 6439 to its centre as above.)
3056	3056 with its nut 3055 superseded by Bolt Complete 3264.

3038	Washer for 3012		
3040	Rod, Complete, connecting Pole Changer to Movements 1910 or 1882, Sec. 13		
3041	Rod for 3040		
3043	Screw for 3020		
3044	Screw for 3020		
3055	Nut for 3056		
3056	Cap Screw holding Pole Changer to Gear Frame		
3057	Set Screw for adjusting Pole Changer		
3058	Washer for 3056		
3069	Contact Spring for 3031 for outside connection		
3089	Screw holding Cap 3004		
3155	Collar for 3012		
3156	Screw for 3012		

SWITCH AND LOCK MOVEMENTS

Order No.	FRONT, LOCK AND THROW RODS		
010	Bolt with Nut for 2791		
029	Nut Lock for 1889 and 1890		
044	Cotter Pin for 730 or 1168		
067	Lag Screw 2791 to Tie		
097	Rivet for Brackets 861 or 2811		
0113	Nut Lock for 2792		
529	Pin for 2803 or 2804, located on the ground		
545	Nut for various Rods		
547	Jaw Rod for 2794		
636	Hook Bolt for Rail with 4½″ to 5″ flange		
645	Nut for 2792		
646	Nut for 1889 or 1890		
730	Pin for Jaw 959 and others		
793	Foot, Right Hand, for 963 or 2799		
794	Foot, Left Hand, for 963 or 2799		
809	Foot, Left Hand, for 2803		
810	Foot, Right Hand, for 2803		
826	Lock Rod for 2804		
827	Lock Rod for 2803		
861	Bracket, Throw Rod Adjusting for 2794 or 2795		
876	Jaw Rod for 2793		
959	Screw Jaw, 1¼″, for various Rods		
962	Front Rod, Complete, for Switch		
963	Front Rod, Complete, for Slip Switch		
1168	Pin for Throw Rods		
1775	Foot, Right Hand, for 962		
1776	Foot, Left Hand, for 962		
18			
18			
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21			
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2813	Nut for 2810		
2814	Jaw Rod for 2815		
2815	Throw Rod, Complete, Double Locking, for Switch		
2923	Hook Bolt for Rail with 4½″ flange and under		
2924	Hook Bolt for Rail with 5″ flange and over		
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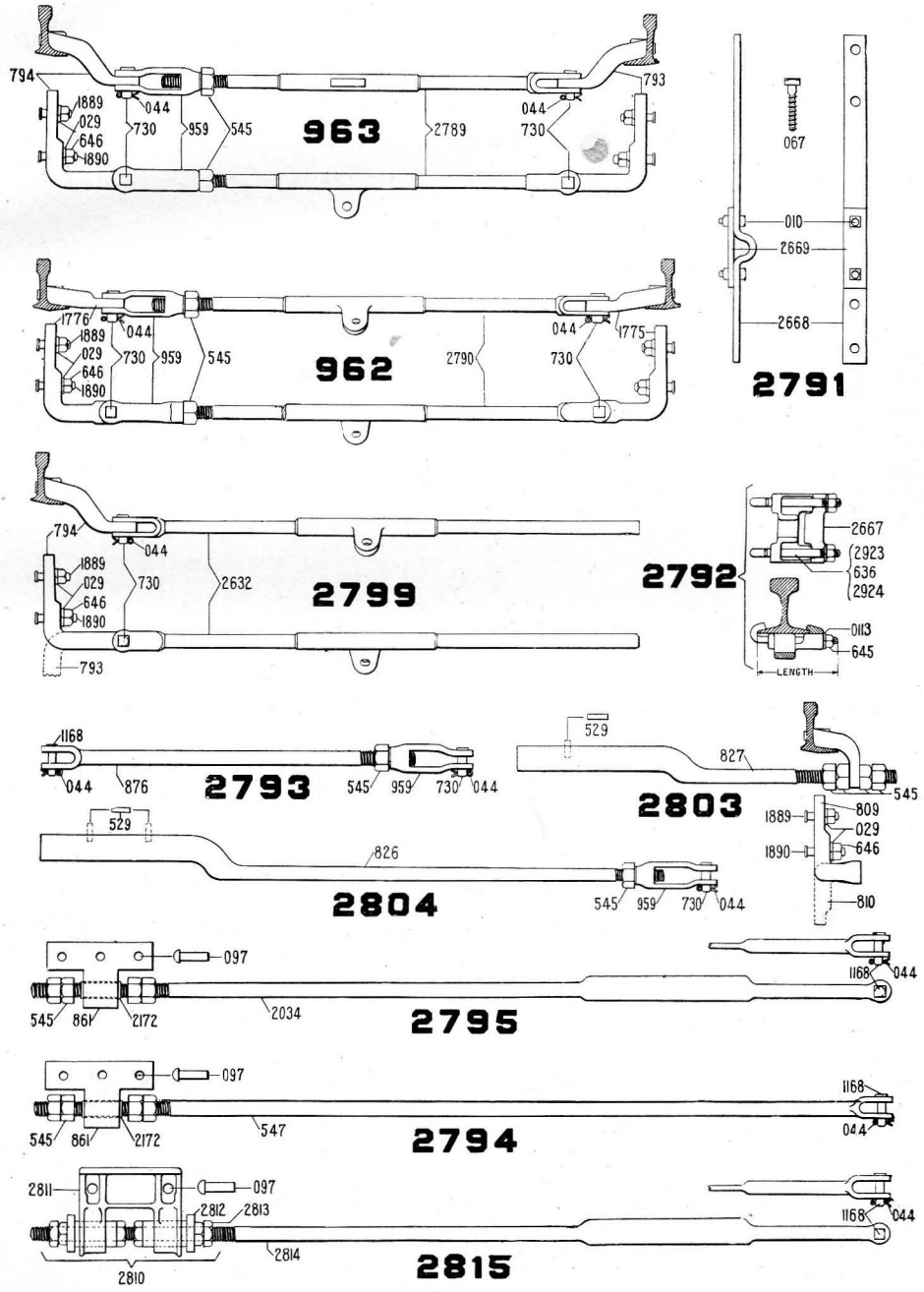
PAGE 76.

529	Superseded by Screw 4459.
545	Superseded by Nut 2813.
793	Superseded by 1775 for Rod 2799 only.
794	Superseded by 1776 for Rod 2799 only.
809	Superseded by Foot 4640.
810	Superseded by Foot 4641.
1889	Superseded by 1890 (3-in.) for ordinary reinforced points, and by 4160 (3½-in.) for extra heavy reinforcements.
1890	Superseded by 4160 (3½-in.) for ordinary reinforced points, and by 4295 (4-in.) for extra heavy reinforcements.
2034	Superseded by 2814.

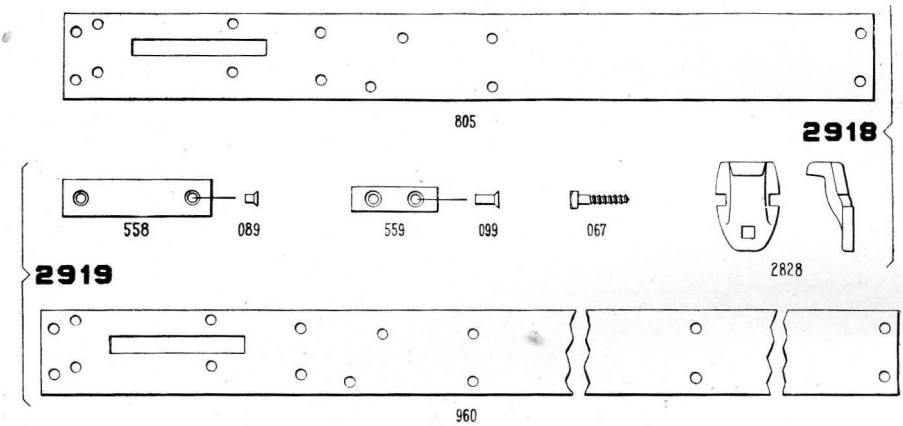
SWITCH AND LOCK MOVEMENTS

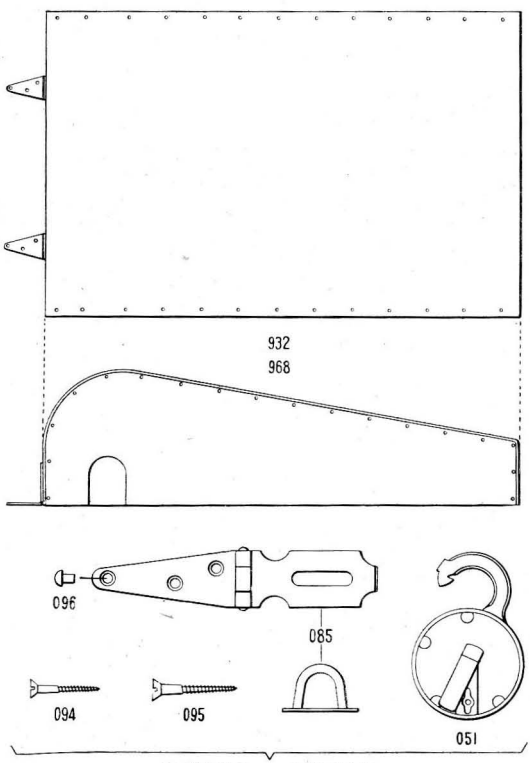
FRONT, LOCK AND THROW RODS

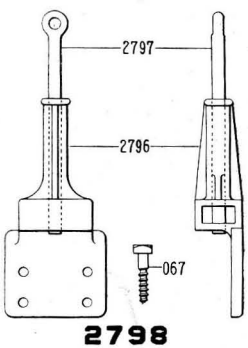


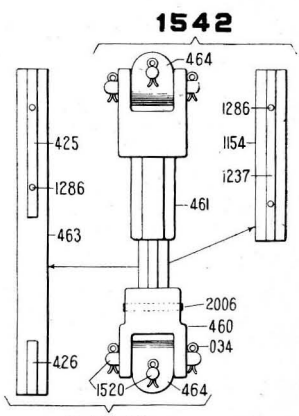
SWITCH AND LOCK MOVEMENTS

TIE PLATES, COVERS, &c.









SWITCH AND LOCK MOVEMENTS

Order No.	TIE PLATES, COVERS, &c.
034	Cotter Pin for 1542 or 2056
051	Pad Lock for 2920 or 2921, with or without key
067	Lag Screw for 2798, 2918 or 2919
085	Hasp with Staple for 2920 or 2921
089	Rivet 558 to Tie Plate
094	Screw for 2920 or 2921
095	Screw for 2920 or 2921
096	Rivet for 2920 or 2921
099	Rivet 559 to Tie Plate
425	Key for 2056
426	Key for 2056
460	Jaw for 1542 or 2056
461	Sliding Jaw for 1542 or 2056
463	Shaft for 2056
464	Block for 1542 or 2056
558	Slide Plate for 2918 or 2919
559	Rail Brace Plate for 2918 or 2919, used back of 2828
805	Tie Plate, 5′6″, for 2918, holes for 558, 559 and 2828, drilled on the ground
932	Cover for 2920
960	Tie Plate, 10′5″, for 2919, holes for 558, 559 and 2828, drilled on the ground
968	Cover for 2921
1154	Shaft for 1542
1237	Key for 1542
1286	Pin for 1542 or 2056
1520	Pin for 1542 or 2056
1542	Short Shaft, Complete, connecting Motor to Switch Machine
2006	Pin for 1542 or 2056
2056	Long Shaft, Complete, connecting Motor to Switch Machine
2796	Guide for 2798
2797	Plunger for 2798
2798	Facing Point Lock, Complete
2828	Rail Brace for 2918 or 2919; specify height of rail
2918	Tie Plate with Braces and Plates, Complete for a derail
2919	Tie Plates with Brace and Plates, Complete for a Switch
2920	Cover with Lock, Hasp, etc., Complete, for right hand Switch Machine
2921	Cover with Lock, Hasp, etc., Complete, for left hand Switch Machine

PAGE 79.

932	Should read 4339.
968	Should read 4340.
089	Is for ⅜-in. tie plates. For ½-in. tie plates order 0225.
096	Superseded by 0203.
099	Is for ⅜-in. tie plates. For ½-in. tie plates order 0226. When plate 559 is not countersunk order round head rivet 093 for ⅜-in. tie plates and 0288 for ½-in. tie plates.

Order No.		

SWITCH AND LOCK MOVEMENTS

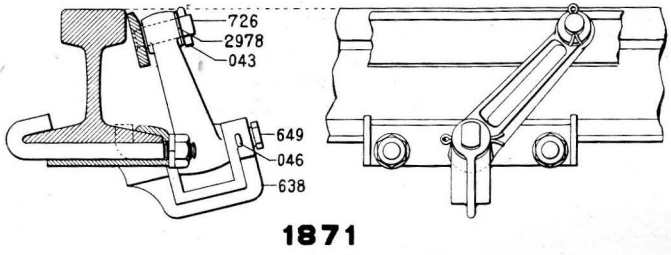
DETECTOR BARS

Detector bars are subject to wide variation in the length, number of clips, connections, etc., to suit local requirements. We have, however, given below two styles which are often used and which will indicate what is included. For bridges or other places, where there is no room under the rail for fastenings, clip 2671, with stop 2977 is used.

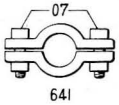
Order No.	LIST OF PARTS		
1884	50 foot Detector Bar, Complete, for use on same side of track with switch machine, including 15 clips 1871 Sec 18, 4 stops 1872, Bar 2687 (50 ft.) made in three pieces with 2 bolts (0128) at each joint, Driving Bracket 2685, Eye Rod 2698, Pipe 653 with couplings, plugs and rivets as required. Guide 886, Spring 786 with Clamp 641, Crank Stand 1875 with Compensators or Cranks as required, and Link 1874.		
	In ordering specify length of pipe, style of Crank or Compensator, and send drawing of rail section.		
3145	50 foot Detector Bar, Complete, for use on opposite side of track from switch machine, including 15 clips 1871 Sec 18, 4 stops 1872, Bar 2687 (50 ft.) made in three pieces with 2 bolts (0128) at each joint, Driving Bracket 2685, Eye Rod 2698, Pipe 653, with couplings, plugs and rivets as required, Guide 886, Spring 786 with Clamp 641, Screw Jaw 2697, Guide 2930, Crank Stand 1875 with L crank, and two Jaws 2699.		
	In ordering specify length of pipe, style of L crank and send drawing of rail section.		

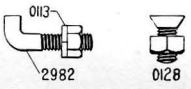
SWITCH AND LOCK MOVEMENTS

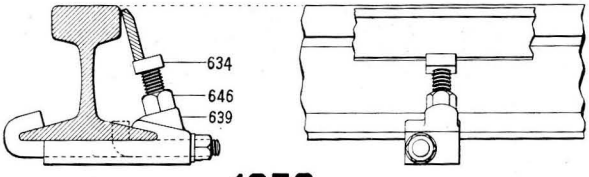
DETECTOR BAR PARTS



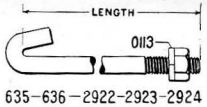
1871

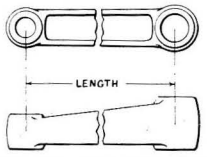


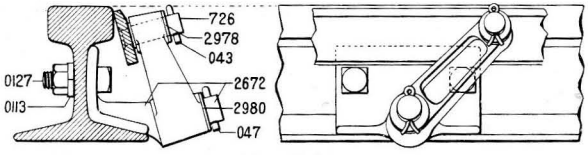




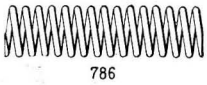
1872

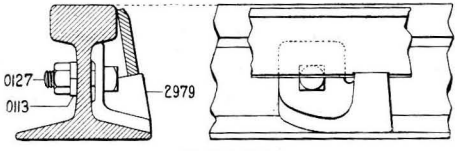




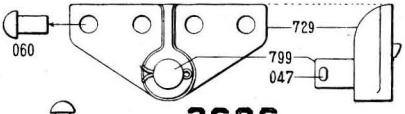


2671

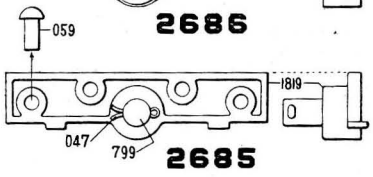




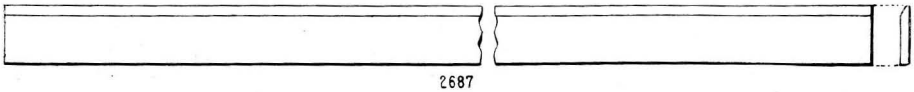
2977



2686



2685



2687

SWITCH AND LOCK MOVEMENTS

Order No.	DETECTOR BAR PARTS
07	Bolt with Nut for 641 and 886
011	Bolt with Nut for 2930
022	Bolt, holding 1875 to Tie
042	Cotter Pin for 2693 or 2927
043	Cotter Pin for 1871 or 2671
044	Cotter Pin for Pin 730
046	Cotter Pin for 1871
047	Cotter Pin for 2671, 2685 or 2686
050	Cotter Pin for 1875
059	Rivet for 2685
060	Rivet for 2686
064	Lag Screw, holding Pipe Carriers to Tie
067	Lag Screw, holding 1875 to tie
073	Washer for 022
0113	Nut Lock for 2671, 2977 or Hook Bolts
0114	Rivet connecting Pipe 653 to Plug 2933
0127	Bolt with Hex. Nut for 2671 or 2977
0128	Bolt with countersunk head and square nut for joining bars 2687
446	Pin for 1875
545	Nut for 1874 or 2697
634	Bolt for 1872
635	6¼″ Hook Bolt with Nut and Lock Nut for 1871
636	7¼″ Hook Bolt with Nut and Lock Nut for 1871 or 1872
637	L Crank, 9″ x 9″
638	Clip for 1871, fits all sizes of rails
639	Clip for 1872, fits all sizes of rails
640	1″ reinforced Coupling for Pipe Connections
641	Clamp, Complete, used on operating rod, for compressing 786
642	5¾″ Link for 1871
646	Nut for 1872
649	Pin for 1871

PAGE 83.

646 Superseded by thin nut 4364.

2978 Not used.

022 Should read 0131 for 10-in. ties.

043 Not used.

059 If countersunk head bolts are required, order Bolt 0261 with Washer 091.

060 If countersunk head bolts are required, order Bolt 0260 with Washer 0113.

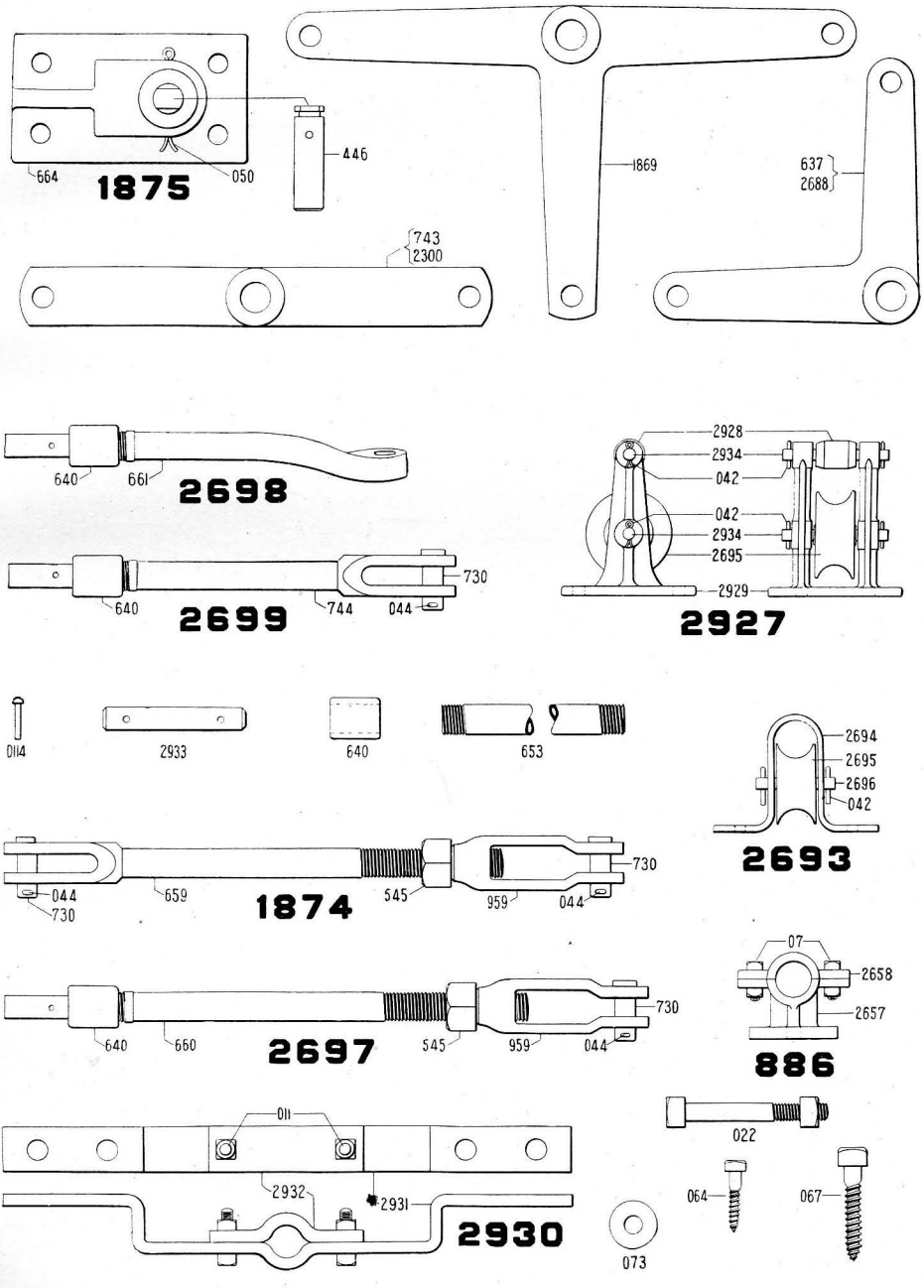
1819	Bracket for 2685
1869	T Crank, 11″ x 11″ x 11″
1871	Rail Clip, Complete. In ordering specify width and height of Rail.
	The following table will assist when ordering Links or Hook Bolts separately for this Clip.
	Height of Rail, 4⅛ to 4½″, use Link 2976
	Height of Rail, 4⅝ to 5″, use Link 642
	Height of Rail, 5⅛ to 5½″, use Link 1230
	Width of Rail, 4 to 4½″, use Hook Bolt 2922
	Width of Rail, 4½ to 5″, use Hook Bolt 635
	Width of Rail, 5 to 5½″, use Hook Bolt 2923

SWITCH AND LOCK MOVEMENTS

Order No.	DETECTOR BAR PARTS		
	Width of Rail, $5\frac{1}{2}$ to 6″, use Hook Bolt 636		
1872	Detector Bar Stop, Complete, used with 1871. In ordering specify width of rail. The following table will assist when ordering Hook Bolts separately for this Stop		
	Width of Rail, 4 to $4\frac{1}{2}$″, use Hook Bolt 2923		
	Width of Rail, $4\frac{1}{2}$ to 5″, use Hook Bolt 636		
	Width of Rail, 5 to $5\frac{1}{2}$″, use Hook Bolt 2924		
	Width of Rail, $5\frac{1}{2}$ to 6″, use Hook Bolt 3090		
1874	Adjustable Link (Throw Rod), Complete, connecting Switch Machine with Compensator or Crank		
1875	One Way Horizontal Crank Stand with Pin and Cotter		
2300	Compensator, $11\frac{3}{4}$″ x $11\frac{3}{4}$″		
2657	Base for 886		
2658	Cap for 886		
2671	Special Rail Clip, Complete, used where 1871 cannot be employed. In ordering send drawing of rail section. The following table will assist when ordering Links separately for this Clip		
	Height of Rail, $4\frac{1}{4}$ to $4\frac{5}{8}$″, use Link 2974		
	Height of Rail, $4\frac{3}{4}$ to 5″, use Link 2975		
	Height of Rail, $5\frac{1}{8}$ to $5\frac{1}{2}$″, use Link 2976		
2672	Clip for 2671		
2685	Driving Bracket, Complete, superseding No. 2686		
2686	Driving Bracket, Complete, superseded by 2685		
2687	Detector Bar, furnished in 17-foot lengths		
2688	L Crank, $11\frac{3}{4}$″ x $11\frac{3}{4}$″		
2693	Pipe Carrier, single roller, Complete		
2694	Stand for 2693		
2695	Bottom Roller for 2693 or 2927		
2696	Pin for 2693		
2697	Adjustable Jaw Rod with Tang End, Complete		
2698	Eye Rod with Tang End connecting to 2685 or 2686		
2699	$1\frac{1}{4}$″ Jaw with Tang End, Complete		
2922	$5\frac{3}{4}$″ Hook Bolt with Nut and Lock Nut for 1871		
2923	$6\frac{3}{4}$″ Hook Bolt with Nut and Lock Nut for 1871or 1872		
2924	$7\frac{3}{4}$″ Hook Bolt with Nut and Lock Nut for 1872		
2927	Pipe Carrier, double roller, Complete		
2928	Top Roller for 2927		
2929	Stand for 2927		
2930	Guide complete for pipe connections passing under tracks		
2931	Guide for 2930		
2932	Cap for 2930		
2933	Plug for 1″ pipe connections		
2934	Pin for 2927		
2974	$3\frac{3}{4}$″ Link for 2671		
2975	$4\frac{1}{4}$″ Link for 2671		
2976	5″ Link for 1871 or 2671		
2977	Detector Bar Stop, Complete, used with 2671. In ordering send drawing of rail section		
2978	Washer for 1871 or 2671		
2979	Clip for 2977. In ordering send drawing of rail section		
2980	Washer for 2671		
2982	Short Hook Bolt with Nut and Nut Lock, used for 1871 or 1872, as shown by dotted lines, when the long bolts cannot be used		
3090	$8\frac{1}{4}$″ Hook Bolt with Nut and Lock Nut for 1872		

SWITCH AND LOCK MOVEMENTS

DETECTOR BAR PARTS



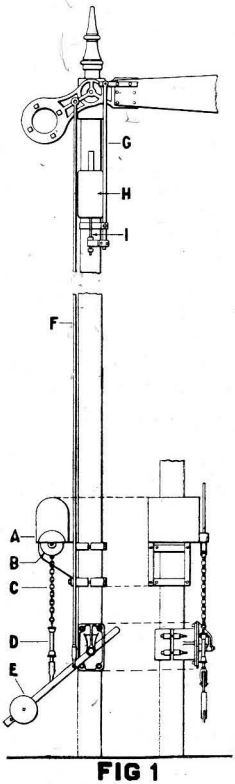


FIG 1

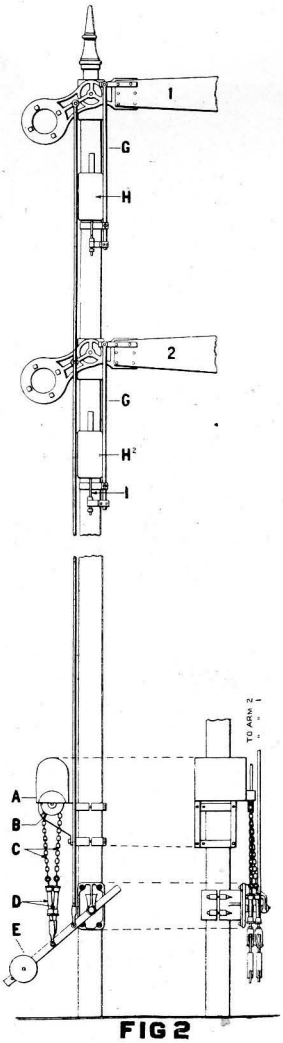


FIG 2

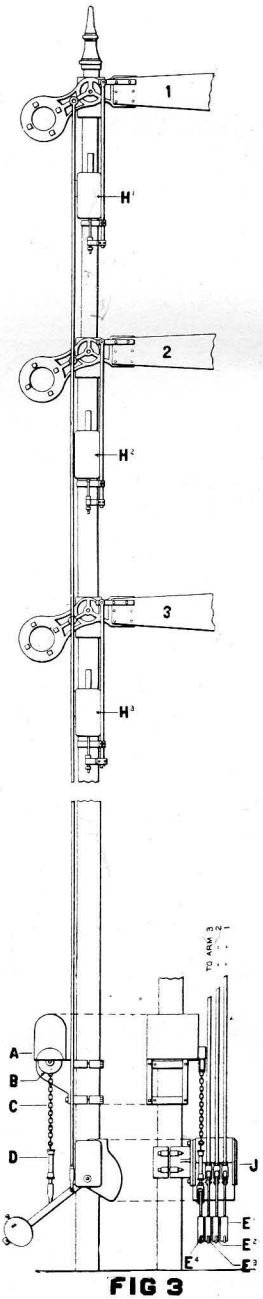


FIG 3

HIGH SIGNALS

SINGLE ARM SIGNALS

Figure 1, on the opposite page, shows a standard Single Arm High Signal. Aside from the pole, with its fittings (see section 20), the signal includes the signal movement (A) and circuit breaker (H).

The signal movement is fully shown in section 25, and includes the cover (1652), the machine proper and whatever pole fastenings are required. The machine consists in general of an electric motor, a train of gears and a magnetic brake. The motor armature, with its brake disc and pinion, is shown at 1438 (section 25), the gearing in the cut (1255 section 25) and the parts constituting the brake at 1112, 1113 and 1714 (section 25).

The circuit breaker (H) is shown at 819 (section 26). Its essential parts consist of a frame (843) with its cover (842) and suitable pole fastenings, a set of fixed contacts and a sliding contact with its operating mechanism. The frame supports two vertical and parallel strips upon which are mounted the fixed contacts with their binding posts, as shown at 2573 (section 26). Its operating mechanism is shown at 2643 (section 26) in which 834 is the operating rod, shown also at I (figure 1); 839 and 840, two collars pinned to the rod; 859, a spring which operates contact 821; and 825, a dog which keeps the contact in its normal position until the signal has reached the clear position. The operation of the circuit breaker is as follows: When the signal arm descends, it moves rod 834 downward through the medium of rod G (figure 1). In so doing, collar 839 compresses spring 859 against contact 821. When the arm has reached its clear position, collar 840, coming in contact with the projection shown on dog 825, throws the dog out and releases the contact 821, which is then forced down by the spring 859. In so doing it moves off the upper, and onto the lower contacts. The upper contacts control the motor and brake, the lower ones being used only when a circuit to a distant signal is to be completed. In case it is desired to break the circuit to a switch, governed by the signal, circuit breaker 2492 (section 26) is used. It is provided with an independent set of fixed and sliding contacts which opens the switch circuit as soon as the arm starts to clear.

The operation of the signal as a whole is as follows: Current having been delivered to the motor, by the reversal of the lever on the interlocker, the armature is set in motion and acting through the train of gears revolves the chain sheave (B), winds up chain C, which, acting through the flexible connection (D), lifts the counterweight lever and clears the signal through the medium of rod F in the usual manner. When the arm has reached its clear position, the circuit breaker operates as explained and sets the brake which stops the motor and holds the signal clear. When it is desired to restore the signal to danger, the lever on the interlocker is put normal and in so doing the current is cut off from the brake magnets and motor and a circuit through the motor

and indication magnets is set up but which is open at the signal circuit breaker.

The motor being free, the counterweight falls, turning the motor backwards and at the same time bringing the arm to danger. Just as the arm reaches the danger position, the circuit breaker completes the indication circuit and the motor, acting as a generator, sends in the indication and releases the lever. The connections between the battery, controller, motor and circuit breaker are clearly shown in connection with signal No. 1 in the diagram insert B.

The flexible connection (D), shown more fully at 530 (section 24), prevents injury to the mechanism in case the arm should come against its stop before the brake had set.

It is to be noted that the failure of the current or of any electrical or mechanical connection will only result in the signal going to danger.

On pages 93 and 94 are illustrated signals of the type just described.

TWO-ARM SIGNAL

Figure 2 shows a standard Two-Arm High Signal. Aside from the pole with its fittings (section 20) the signal includes one signal movement (A) and two circuit breakers (H and H^2).

The signal movement (A) is the same as that for the single arm signal except that the chain sheave (B) is provided with sprockets for gripping the chain (C), which passes over it. When the motor armature revolves in one direction, it clears the upper arm and in the other direction clears the lower arm. The reversal of the armature is caused by a ground selector moved by the switch points. The manner in which this is accomplished is fully explained on page 23. The ground selector referred to is shown at 2850, (section 29).

The circuit breakers are the same as in the case of the single arm signal.

All connections between the battery, controller, motor, ground selector and circuit breakers are fully shown in connection with signal No. 2 in the diagram, insert B. On page 92 is illustrated a signal of the two-arm type.

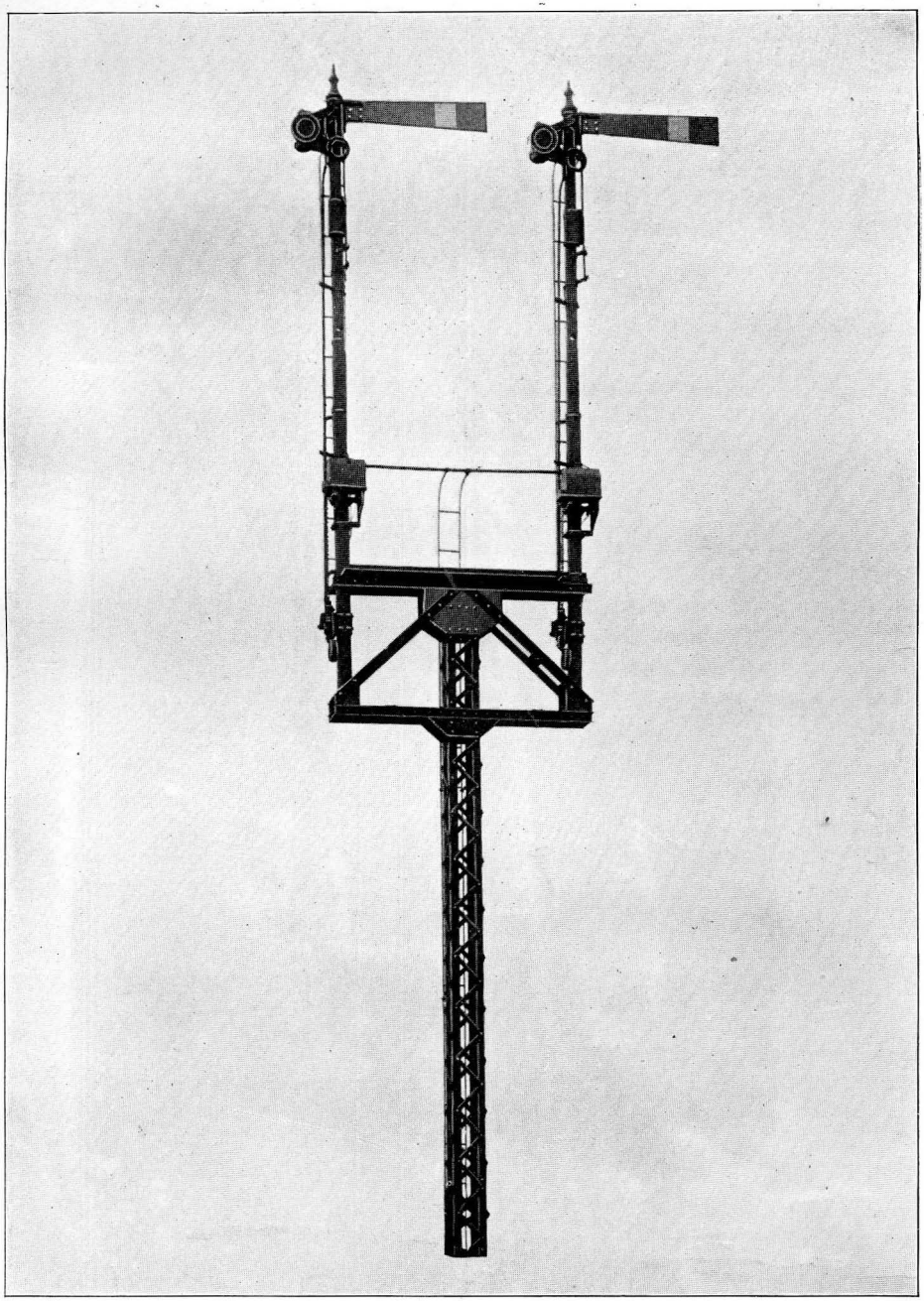
THREE-ARM SIGNAL

Figure 3 shows a standard Three-Arm High Signal. Aside from the pole and fittings (section 20) the signal includes one signal movement (A), a three-arm hook selector (J) and three circuit breakers (H^1, H^2 and H^3).

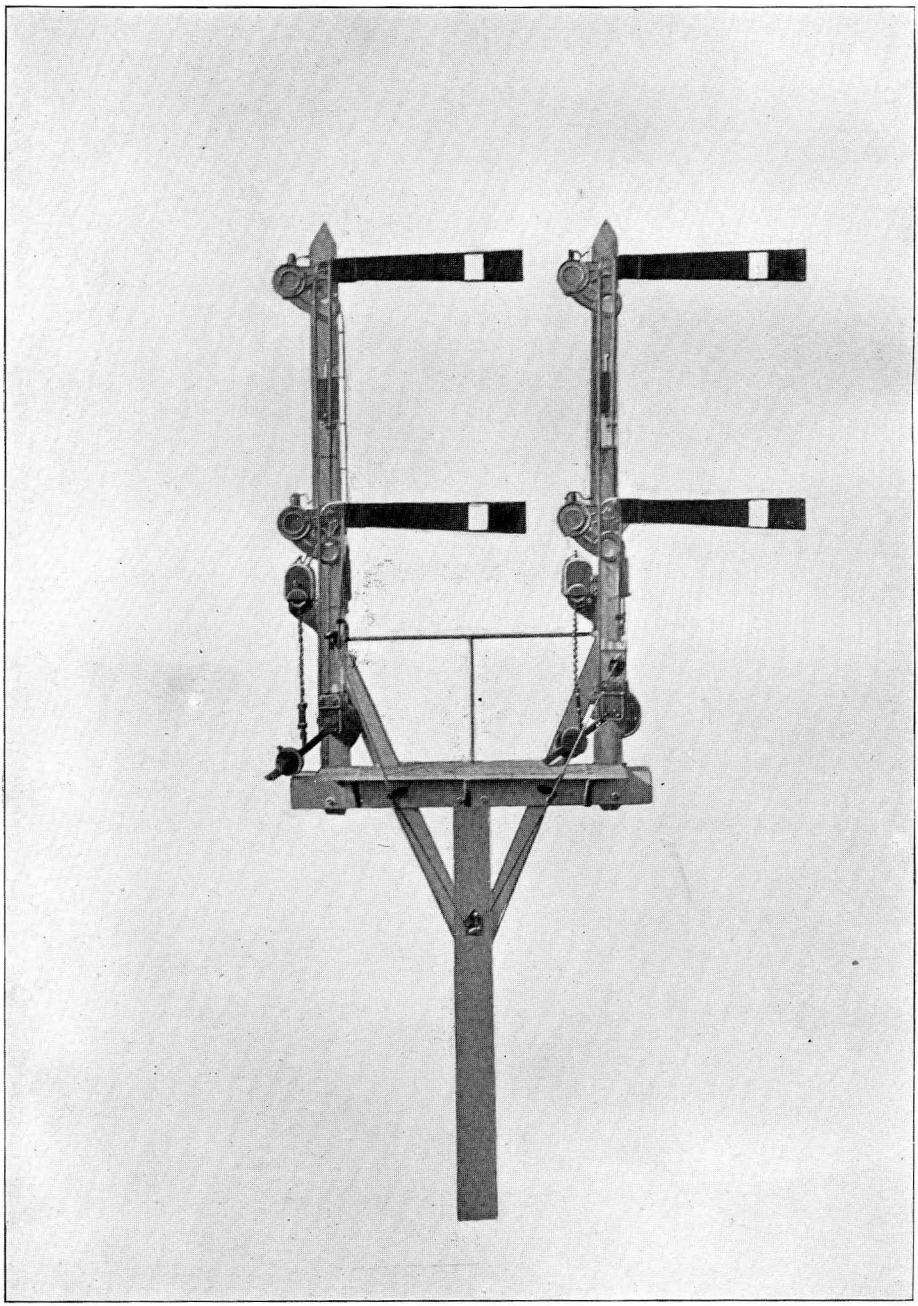
The signal movement and circuit breakers are the same as in the case of the single arm signal. The circuit breakers are connected in series with each other and with the motor as in the case of the two arm signal.

The hook selector is fully illustrated in section 24. It consists essentially of the frame work, the various levers with their hooks, and the magnets. The frame work is shown in outside view on page 105 and in section on page 106. It is fastened to the pole in the same manner as the counterweight brackets. The signal movement connects with one of the levers (E^4, figure 3)

HIGH SIGNALS



IRON BRACKET POLE.



WOOD BRACKET POLE.

by means of the regular chain and spring connections (C and D, figure 3). The inner end of arm E^4 is provided with a bar (1373 section 24) that extends across the selector where it is joined to a short lever (1370 section 24). Both long and short levers are forced to move together by being keyed to the same shaft. Whenever current is supplied to the motor, the lever E^4 lifts and causes bar 1373 to move downward. Between these two levers and mounted on the same shaft, but not keyed to it, are the three levers (E^1, E^2 and E^3) which connect direct to their respective arms 1, 2 and 3. Each of these levers is provided at its inner end with a hook (2597 section 24) which is caused to engage with bar 1373 whenever current is sent through the proper magnet. Directly above each hook are the magnets which are shown in place on pages 105 and 106. One terminal of each magnet is connected to a separate controller at the interlocker. The other terminals are joined together and connected to the signal motor. The operation of the selector is as follows: When a lever on the interlocker is reversed, current flows through the corresponding magnet in the selector, through the motor and circuit breakers and back to battery. This causes the proper hook to engage with the cross bar (1373) which, as it descends, due to the operation of the motor, pulls the corresponding lever after it and thus clears the proper signal where it is held by the brake in the regular manner. The indication is given as in the case of the single arm signal.

Hook selectors are made for two, three, four, or five arms.

Instead of a separate lever on the interlocker for each signal arm, they may all be worked from the same lever through the medium of ground selectors properly located.

BRACKET SIGNALS

The one, two or three-arm dolls on bracket poles are equipped and operated in the same manner as the one, two or three-arm signals just described.

We have made no attempt to cover, in detail, the various forms of bracket signals which might be ordered, since the requirements as to the exact construction of the post and the combination of arms, are so varied. We are, however, prepared to furnish any bracket signal required.

The cut on page 90, illustrates a four-arm, two-doll signal with a wood pole which fairly represents the practice in such cases.

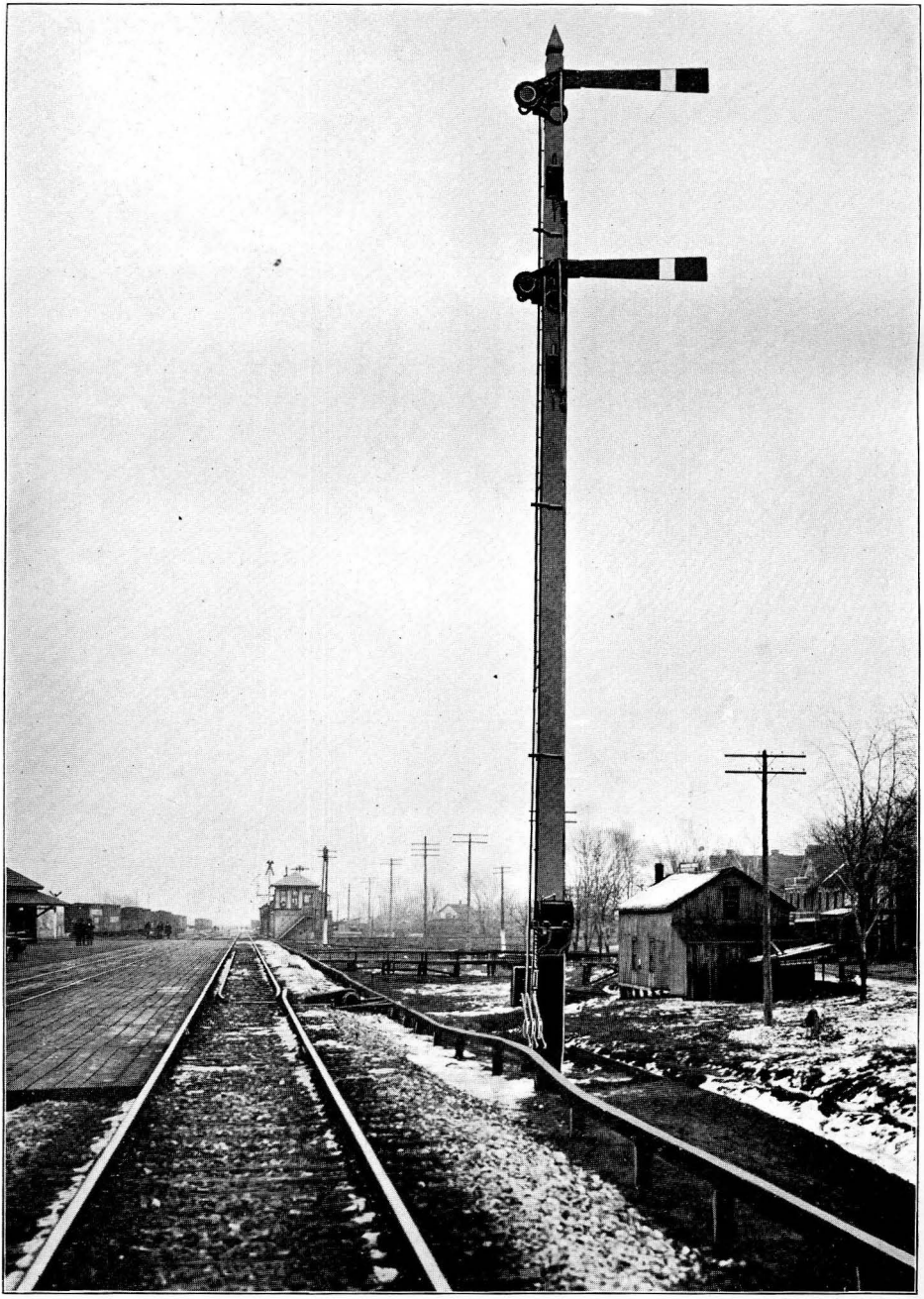
On page 89 is illustrated a two-arm, two-doll bracket pole of iron construction.

BRIDGES AND BRIDGE POLES

Bridge poles are equipped in the same manner as the one, two and three-arm signals outlined above. The various bridges are covered in section 27.

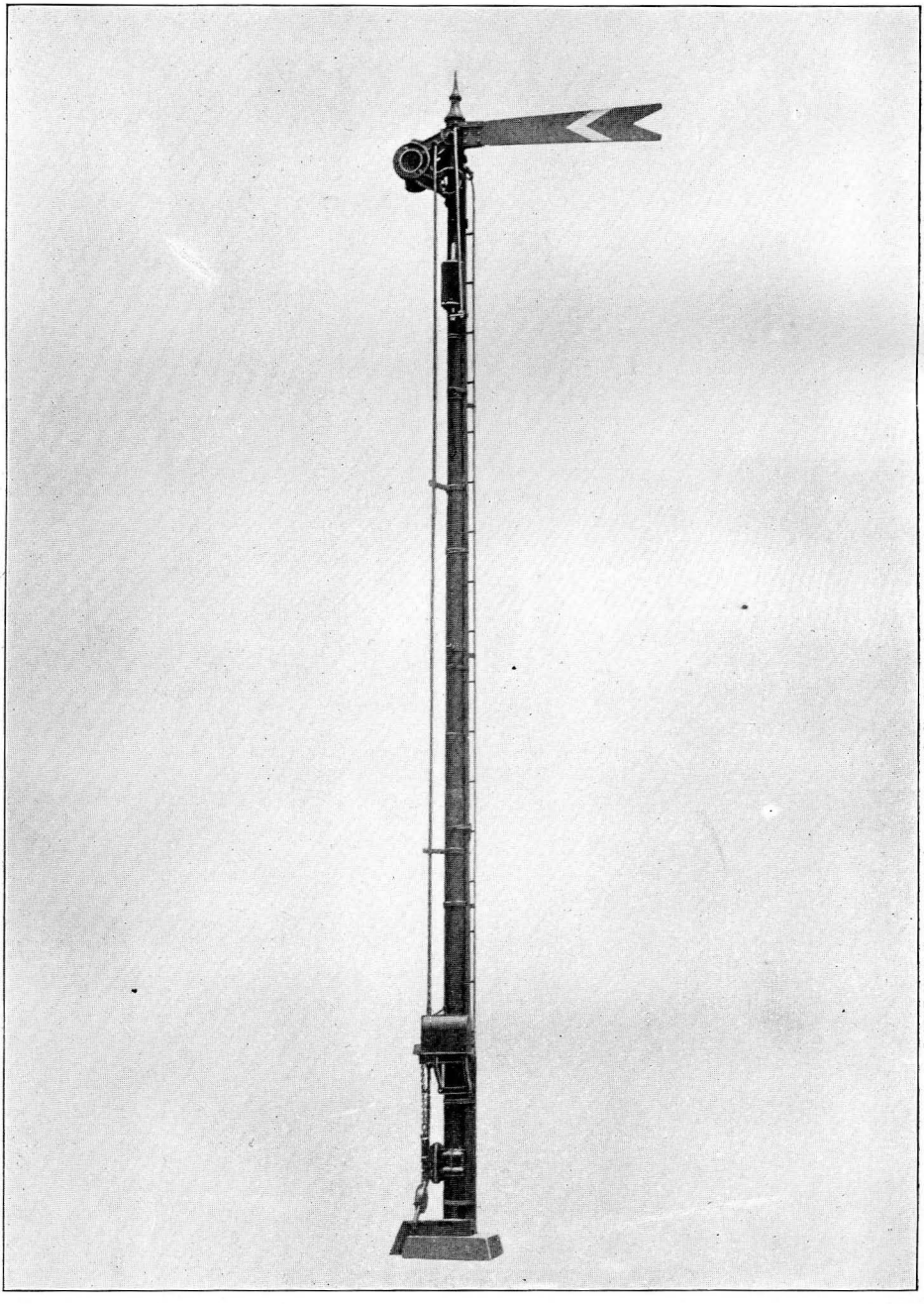
The cut, page 118, illustrates a "Two-Track" bridge equipped with two and three-arm signals.

HIGH SIGNALS



TWO-ARM WOOD POLE.

SINGLE-ARM WOOD POLE.



SINGLE-ARM IRON POLE.

HIGH SIGNALS

POLES AND FITTINGS

PARTS INCLUDED

1—Pole (Sec 21) ; Wood ground Poles include bottom cross pieces and braces;—All Iron Poles include the Cap and Base.

2—Ladder with Brackets and Braces (Sec 21).

3—Semaphore Parts, (Sec 22) including Front and Back Light Castings with Rings, Bolts, Stud and Glasses; Home or Distant Ash Blade with bolts; Semaphore Shaft and Bearing and (with Iron Poles) Clamp 1664 (with bolts) or a similar one; Lamp bracket 2369 for Iron Poles or 836 for Wood Poles.

4—Semaphore Operating Rods (Sec 23), including Screw Jaw 2948, Eye Rod 2947 and Pipe 054 with the necessary Plugs, Couplings, Rivets and Guides.

5—Counterweight Parts (Sec 24) as follows: For One-arm Iron Poles, counterweight 2985 with Clamp 797 or 798 and Bolts; For One-arm Wood Poles, Counterweight 2985 only; For Two-Arm Iron Poles, Counterweight 2986 with clamp 797 or 798 and Bolts; For Two-Arm Wood Poles, Counterweight 2986 only; For Three-Arm Iron Poles, Clamp 797 or 798 with Bolts (selector separate); For Three-Arm Wood Poles, nothing (selector separate).

PARTS NOT INCLUDED.

The following parts are not included with "poles and fittings" and only furnished when ordered.

1—Signal Machine (Sec 25) with pole fastenings.

2—Circuit Breakers (Sec 26)with pole fastenings.

3—Hook Selectors (Sec 24).

4—Case and Spring (530 Sec 24) connecting to Signal Machine.

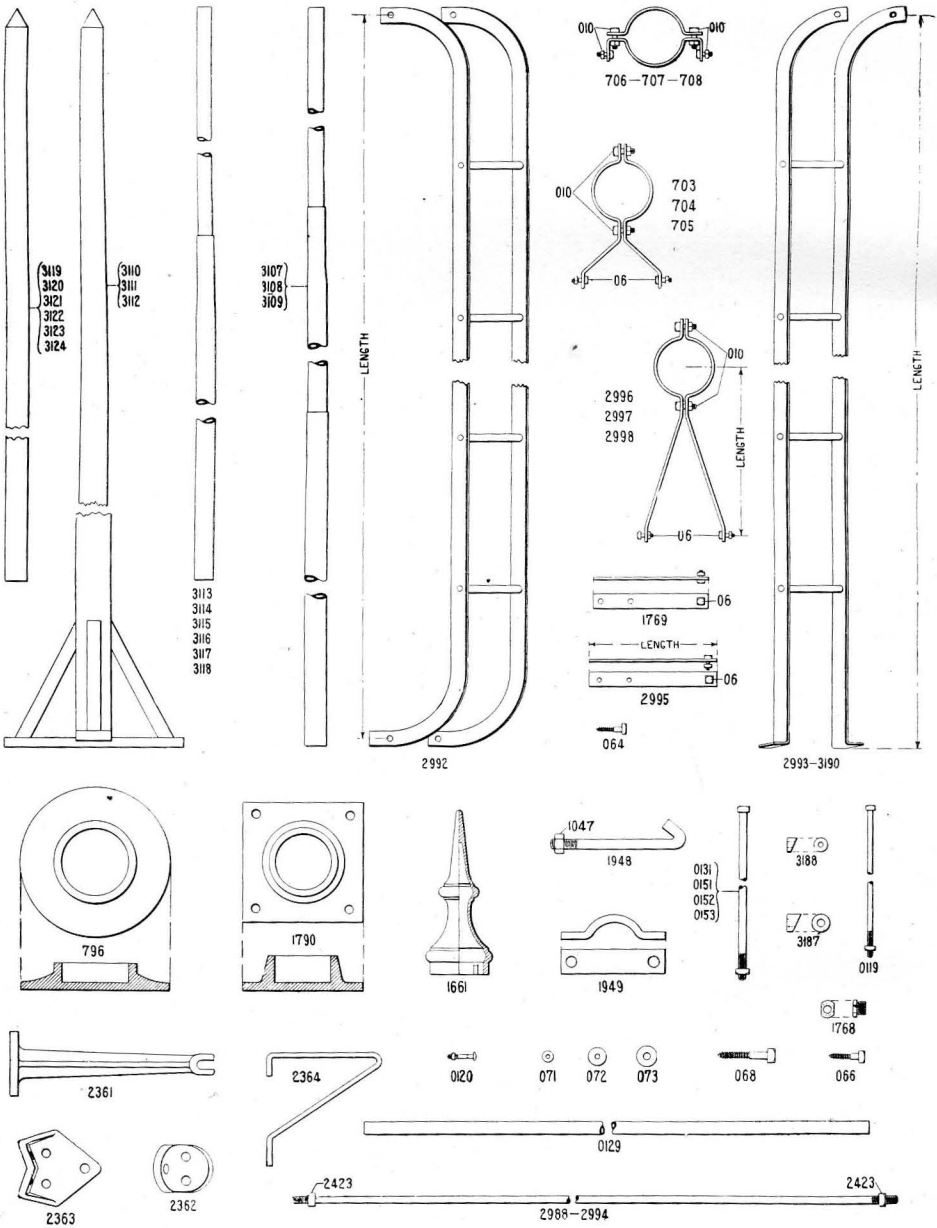
5—Lamp (Sec 22).

6—Lag Screws and Bolts, except where specified under "Parts Included."

Order No.	LIST OF POLES WITH FITTINGS			
3125	1 Arm Iron Ground Pole (32′8″).	Specify style of Ladder and Front Light Casting		
3126	2 Arm Iron Ground Pole (38′8″).	Specify as in 3125		
3127	3 " " " " (44′8″)	" " " "		
3128	1 Arm Wood Ground Pole (33′8″)	" " " "		
3129	2 " " " " (39′8″)	" " " "		
3130	3 " " " " (45′8″)	" " " "		
3131	1 Arm Iron Bridge Pole (14′8″)	For 6′ Bridge Truss; specify as in 3125		
3132	2 " " " " (20′8″)			
3133	3 " " " " (26′8″)			
3134	1 " " " " (16′8″)	For 8′ Bridge Truss; specify asin 3125		
3135	2 " " " " (22′8″)			
3136	3 " " " " (28′8″)			
3137	1 Arm Wood Bridge Pole (14′8″)	For 6′ Bridge Truss; specify as in 3125		
3138	2 " " " " (20′8″)			
3139	3 " " " " (26′8″)			
3140	1 " " " " (16′8″)	For 8′ Bridge Truss; specify as in 3125		
3141	2 " " " " (22′8″)			
3142	3 " " " " (28′8″)			

HIGH SIGNALS

POLES AND LADDERS



HIGH SIGNALS

Order No.	POLES AND LADDERS.		
06	Bolt with Nut, Ladders to Braces		
010	Bolt with Nut, for Ladder Brackets and Braces		
064	Lag Screw, $\frac{1}{2}$″ x 2$\frac{1}{2}$″, holding 1769 or 2995 to Wood Pole		
066	Lag Screw, $\frac{5}{8}$″ x 3″, Brackets 2364 to Post		
068	Lag Screw, $\frac{3}{4}$″ x 5″ for 2363		
071	$\frac{3}{8}$″ Washer		
072	$\frac{1}{2}$″ Washer		
073	$\frac{3}{4}$″ Washer		
0119	Bolt with Nut, $\frac{1}{2}$″ x 14″, Slanting Braces to Dolls, Bracket Poles		
0120	Carriage Bolt holding Platform to 2364		
0129	Hand Rail, for Wood Bracket Pole; specify length		
0131	Bolt with Nut, $\frac{3}{4}$″ x 13″, Main Post and Dolls to cross Timbers, Bracket Poles		
0151	Bolt with Nut, $\frac{3}{4}$″ x 10″, for 2362		
0152	Bolt with Nut, $\frac{3}{4}$″ x 20″, Slanting Braces to Main Post, Bracket Poles		
0153	Bolt with Nut, $\frac{3}{4}$″ x 14$\frac{1}{2}$″, for 2361 or 2363		
703	Brace with Bolts, holding 2992 or 3190 to iron Pole 4$\frac{1}{2}$″ O. D		
704	Brace with Bolts, holding 2992 or 3190 to Iron Pole 5$\frac{1}{2}$″ O. D		
705	Brace with Bolts, holding 2992 or 3190 to Iron Pole 6$\frac{5}{8}$″ O. D		
706	Bracket with Bolts, holding upper ends of 2992, 2993 or 3190 to Iron Pole 4$\frac{1}{2}$″ O. D		
707	Bracket with Bolts, holding lower end of 2992 to Iron Pole, 5$\frac{1}{2}$″ O. D		
708	Bracket with Bolts, holding lower end of 2992 to Iron Pole, 6$\frac{5}{8}$″ O. D		
796	Cast Iron Base for Poles 3107, 3108 or 3109		
1047	Nut for 1948		
1661	Ornamental Cap for all Iron Poles		
1768	Insulating Bushing, inlet for wires running inside of Iron Poles		
1769	Brace with Bolt, holding 2992 or 3190 to Wood Pole		
1790	Cast Iron Base for Poles 3113 to 3118 inclusive		
1948	Hook Bolt with Nut, holding 1949		
1949	Clamp, holding Iron Bridge Poles		
2361	Strut for 2994		
2362	Bracket, holding upper end of 2994		
2363	Bracket, holding lower end of 2994		
2364	Bracket, supporting Platform, Wood Bracket Pole		

PAGE 97.

Ladders, braces and clamps, superseded by a line of new design.

2995	Brace with Bolt, holding 2995 to Wood Pole		
2996	Brace with Bolts, holding 2993 to Iron Pole 4$\frac{1}{2}$″ O. D.; specify length, 11″ or 11$\frac{3}{8}$″		
2997	Brace with Bolts, holding 2993 to Iron Pole 5$\frac{1}{2}$″ O. D., specify length, 11$\frac{1}{2}$″, 16$\frac{1}{4}$″, 16$\frac{5}{8}$″, or 17″		
2998	Brace with Bolts, holding 2993 to Iron Pole 6$\frac{5}{8}$″ O. D., specify length, 21$\frac{1}{8}$″, 21$\frac{3}{4}$″, 23$\frac{1}{4}$″, 26$\frac{1}{8}$″ or 29$\frac{1}{2}$″		
3107	1 Arm Iron Ground Pole, 32′8″		
3108	2 " " " " 38′8″		
3109	3 " " " " 44′8″		
3110	1 Arm Wood Ground Pole, 33′8″		
3111	2 " " " " 39′8″		
3112	3 " " " " 45′8″		
3113	1 Arm Iron Bridge Pole, 14′8″		
3114	2 " " " " 20′8″ For Bridges with Truss 6 feet deep		
3115	3 " " " " 26′8″		

HIGH SIGNALS

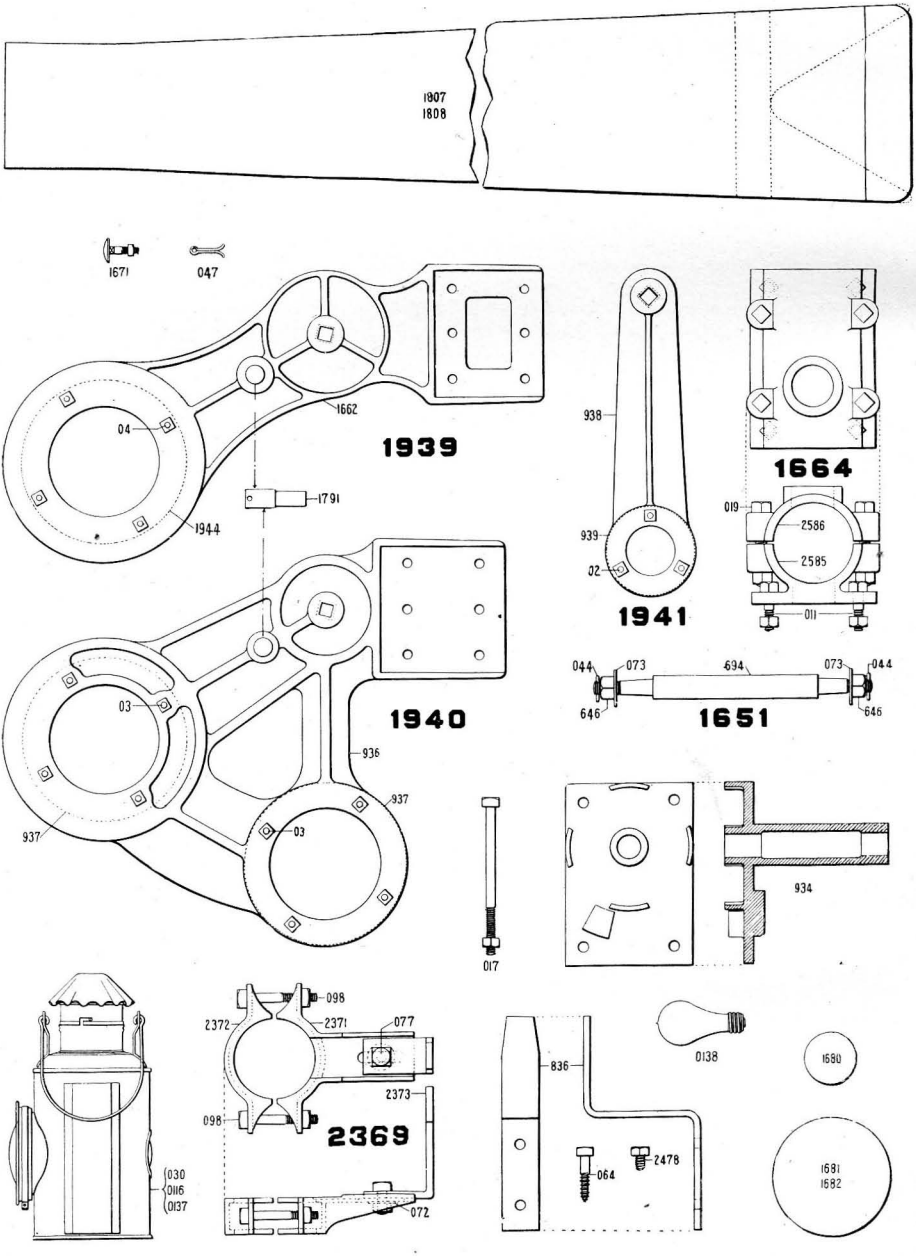
Order No.	POLES AND LADDERS		
3116	1 Arm Iron Bridge Pole, 16′8″		
3117	2 " " " " 22′8″ } For Bridges with Truss 8 feet deep		
3118	3 " " " " 28′8″		
3119	1 Arm Wood Bridge Pole, 14′8″		
3120	2 " " " " 20′8″ } For Bridges with Truss 6 feet deep		
3121	3 " " " " 26′8″		
3122	1 " " " " 16′8″		
3123	2 " " " " 22′8″ } For Bridges with Truss 8 feet deep		
3124	3 " " " " 28′8″		
3187	¾″ Wedge Washer for 0152		
3188	½″ Wedge Washer for 0119		
3190	Vertical Ladder for Wood or Iron Poles, straight bottom; specify length		

HIGH SIGNALS

Order No.			

HIGH SIGNALS

SIGNAL FITTINGS



HIGH SIGNALS

Order No.	SIGNAL FITTINGS. SEMAPHORE CASTINGS, BLADES, LAMPS, ETC.		
02	Bolt with Nut for 1941		
03	Bolt with Nut for 1940		
04	Bolt with Nut for 1939		
011	Bolt with Nut for 1664, holding 934		
017	Bolt with Nut, holding 934 to 7″ Wood Pole		
019	Bolt with Nut for 1664		
030	No. 8 Dressel Lamp, arranged for oil		
044	Cotter Pin for 1651		
047	Cotter Pin for Stud 1791		
064	Lag Screw, holding 836 to Wood Pole		
072	Washer for 2369		
073	Washer for 1651		
077	Bolt with Nut for 2369		
098	Bolt with Nut for 2369		
0116	No. 8 Dressel Lamp, arranged for electric light		
0137	No. 8 Dressel Lamp, arranged for both oil and electric light		
0138	110 Volt Incandescent Lamp, Edison Base, for 0116 or 0137; 4, 6 or 8 Candle Power, as specified		
646	Nut for 1651		
694	Shaft for 1651		
836	Lamp Bracket for 030, 0116 or 0137 with Cap Screws or Lag Screws, when specified		
934	Semaphore Bearing. In ordering, state which front light casting it is to fit		
936	Arm for 1940		
937	Ring for 1940		
938	Arm for 1941		
939	Ring for 1941		
1651	Semaphore Shaft Complete		
1662	Arm for 1939		
1664	Clamp, Complete, holding 934 to Iron Pole, 4½″ O. D		
1671	Mushroom Head Bolt, holding Blades to Castings		
1680	Blue Glass, 2⅞″, for 1941		
1681	Ruby Glass, 6½″, for 1939 or 1940		
1682	Green Glass, 6½″, for 1939 or 1940		
1791	Stud for 1939 or 1940		
1807	5 ft. Ash Blade for Home Signal (shown in full lines)		
1808	5 ft. Ash Blade for Distant Signal (shown dotted)		
1939	Single Front Light Casting, 14″ centres, with Stud and Ring, Comp.		
1940	Double Front Light Casting, 14″ centres, with Stud and Rings,Comp		
1941	Back Light Casting with Ring, Complete, used with 1939 or 1940		
1944	Ring for 1939		
2369	Adjustable Lamp Bracket, Complete		
2371	Base for 2369		
2372	Cap for 2369		
2373	Bracket for 2369		
2478	Cap Screw, holding 836 to Iron Pole		
2585	Cap for 1664		
2586	Base for 1664		
.....	.....		

PAGE 101.

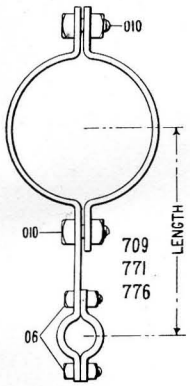
2585 Should read 2586.
2586 Should read 2585.

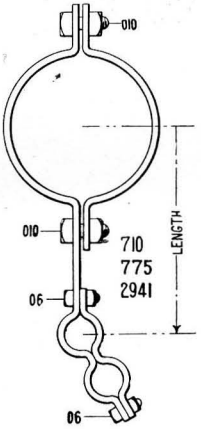
HIGH SIGNALS

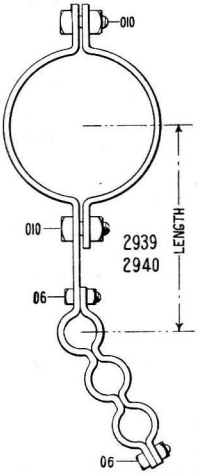
Order No.	SIGNAL FITTINGS. SEMAPHORE OPELATING RODS WITH CRANKS AND GUIDES		
02	Bolt with Nut for Guides 2938, etc		
06	Bolt with Nut for Guides 709, etc		
010	Bolt with Nut for Guides 709, etc		
025	Pipe Coupling, $\frac{3}{4}$″ reinforced, for 2947, 2948 or 054		
041	Cotter Pin for 2945 or 2948		
049	Cotter Pin for 2949 or 2951		
054	$\frac{3}{4}$″ Pipe, specify length		
064	Lag Screw, Guides to Wood Pole		
067	Lag Screw, Crank Stands to Wood Pole		
0115	Rivet, fastening Pipe 054 to Plug 2943		
446	Pin for 2951		
670	Pin for 2949		
709	One Way Guide, length 8″ for Iron Pole, $4\frac{1}{2}$″ O. D.		
710	Two Way Guide, length 8″ for Iron Pole, $5\frac{1}{2}$″ O. D.		
712	Jaw for 2945 or 2948		
771	One Way Guide, length $10\frac{1}{2}$″, for Iron Pole, $4\frac{1}{2}$″ O. D.		
775	Two Way Guide, length 8″, for Iron Pole, $6\frac{5}{8}$″ O. D.		
776	One Way Guide, length 8″, for Iron Pole, $5\frac{1}{2}$″ O. D.		
890	One Way Guide for Wood Pole		
891	Two Way Guide for Wood Pole		
1047	Nut for 2945 or 2948		
1296	Crank Stand for 2951		
1663	Crank Stand for 2949		
1788	Eye Rod for 2947		
1789	Rod for 2948		
2148	6″ x 6″ Crank for 2949 or 2951		
2181	Pin for 2945 or 2948		
2938	Three Way Guide for Wood Pole		
2939	Three Way Guide, length 8″, for Iron Pole, $5\frac{1}{2}$″ O. D.		
2940	Three Way Guide, length 8″, for Iron Pole, $6\frac{5}{8}$″ O. D.		
2941	Two Way Guide, length $10\frac{1}{2}$″, for Iron Pole, $4\frac{1}{2}$″ O. D.		
2943	Plug for $\frac{3}{4}$″ Pipe Connections		
2945	Adjustable Link, Complete, for connection between Cranks		
2946	Rod for 2945, specify length		
2947	Eye Rod with Tang End, Complete, connecting 054 to Signal Arm		
2948	$\frac{3}{4}$″ Screw Jaw, Complete, with Tang End		
2949	Two Way Crank Stand, Complete		
2950	Spacing Collar for 2949		
2951	One Way Crank Stand, Complete		

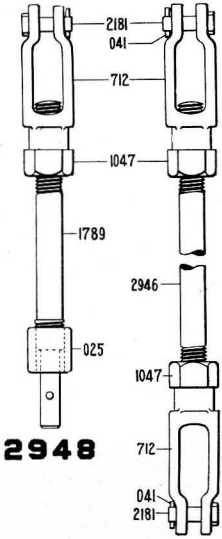
HIGH SIGNALS

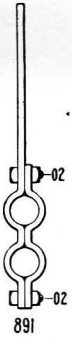
SIGNAL FITTINGS

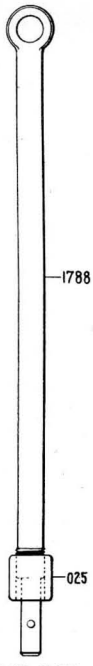


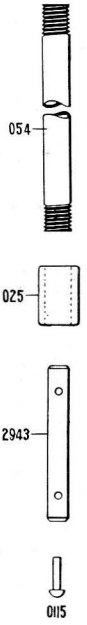


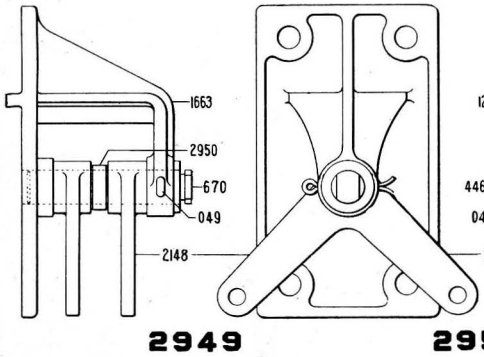


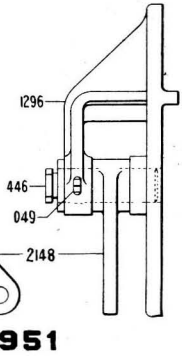








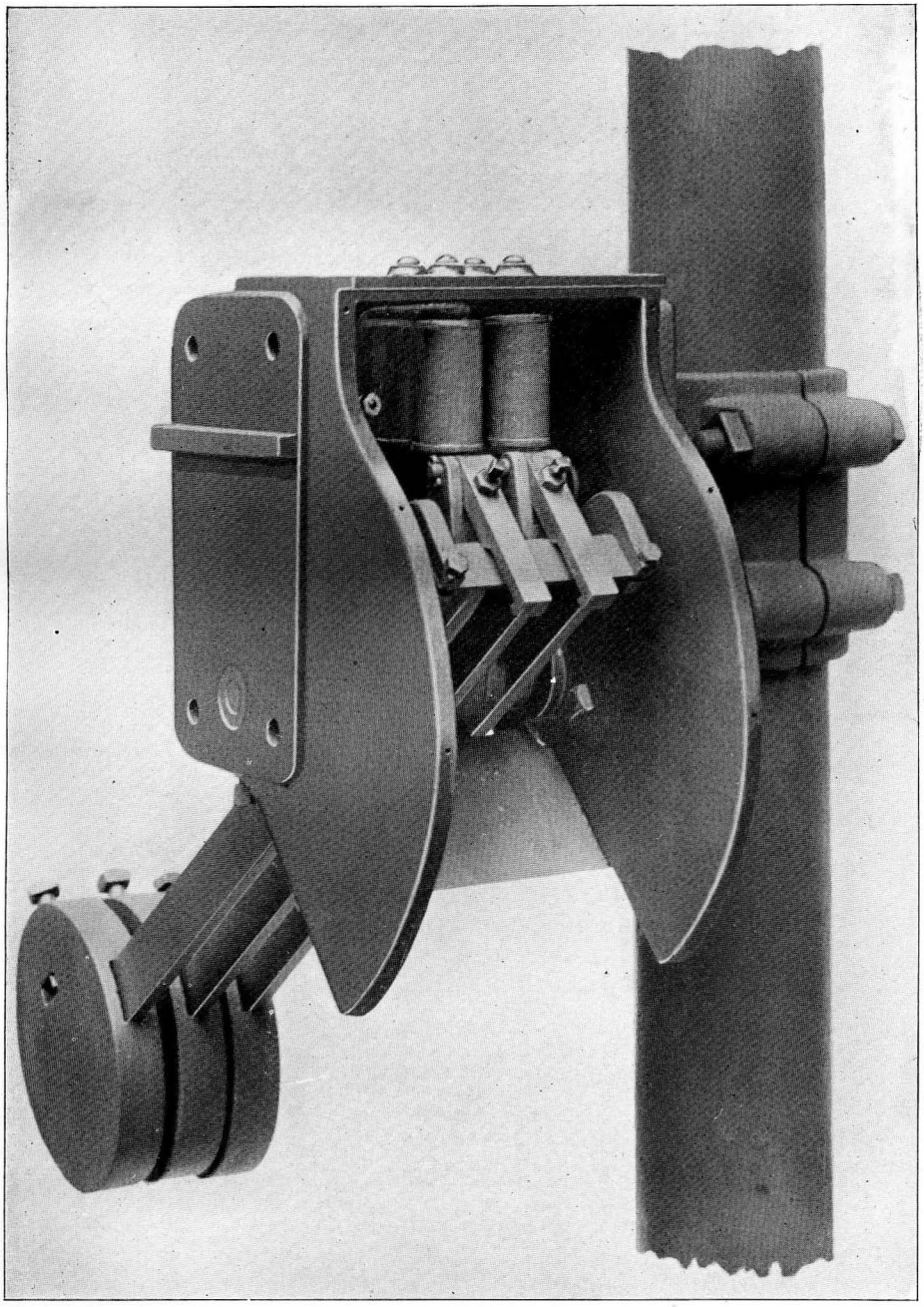




Order No.			

HIGH SIGNALS

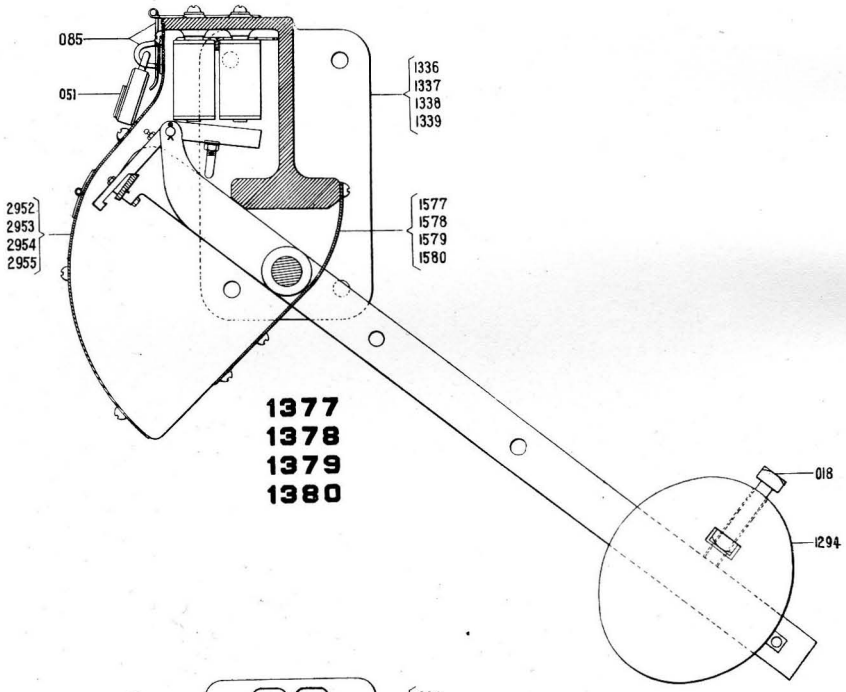
SELECTORS.



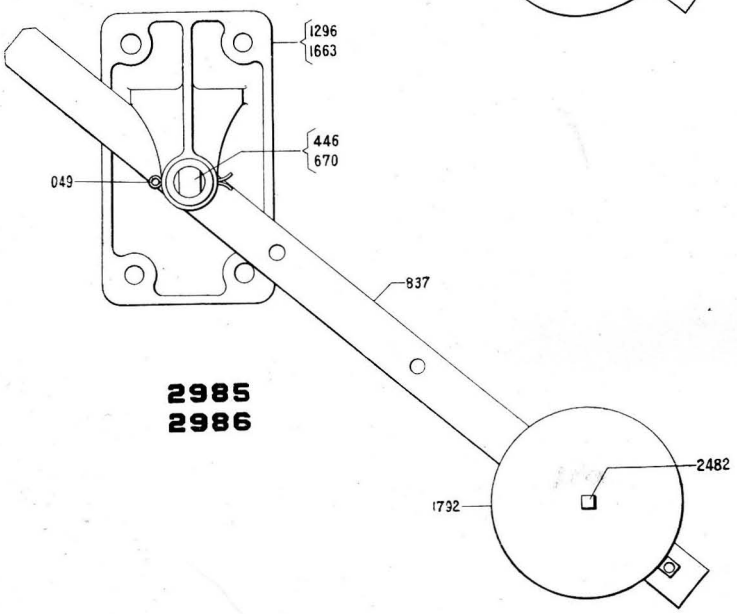
TWO-ARM HOOK SELECTOR

HIGH SIGNALS

SELECTORS AND COUNTERWEIGHTS



1377
1378
1379
1380



2985
2986

HIGH SIGNALS

Order No	SELECTORS AND COUNTERWEIGHTS		
06	Bolt with Nut. Counterweight Stop used in ends of Levers		
018	Bolt with Nut for 1294		
023	Bolt with Nut for 797 or 798		
024	Bolt with Nut for 797 or 798, holding Counterweight or Selector Brackets		
034	Cotter Pin for 1702		
038	Cotter Pin for 2597		
040	Cotter Pin for 530 or 3079		
049	Cotter Pin for 2985 or 2986		
051	Padlock		
067	Lag Screw holding 2985 or 2986 to Wood Pole		
070	Washer for 2187		
085	Hasp with Staple		
086	Bolt with Nut holding Hook Selectors or Counterweight Brackets to 10″ Wood Pole. (See 0135)		
087	Washer for 086 or 0135		
0135	Bolt with Nut holding Hook Selectors or Counterweight Brackets to 7″ Wood Pole		
446	Pin for 2985		
506	Washer for 1576		

PAGE 107.

530	Superseded by inverted case and spring 3978.		
797	Clamp, Complete, holding Selectors or Counterweight to Iron Pole $6\frac{5}{8}$″ O. D.		
798	Clamp, Complete, holding Selectors or Counterweight to Iron Pole $5\frac{1}{2}$″ O. D.		
837	Lever for 2985 or 2986		
996	Spring for 530		
1041	Rod for 530		
1044	Eye Rod for 530		
1046	Washer for 530		
1047	Nut for 530		
1048	Nut for 530		
1049	Case for 530		
1155	Nut for 2597		
1156	Nut for 2597		
1294	Weight, 19 lbs., for Selectors or Counterweights		
1296	Bracket, Single Lever, for 2985		
1336	Bracket for 1377		
1337	Bracket for 1378		
1338	Bracket for 1379		
1339	Bracket for 1380		
1350	Shaft for 1377		
1351	Shaft for 1378		
1352	Shaft for 1379		
1353	Shaft for 1380		
1368	Counterweight Lever for Hook Selectors		
1369	Long Operating Lever for Hook Selectors		
1370	Short Operating Lever for Hook Selectors		
1371	Latch for 2597		
1372	Latch Bar for 1377		
1373	Latch Bar for 1378		
1374	Latch Bar for 1379		

HIGH SIGNALS

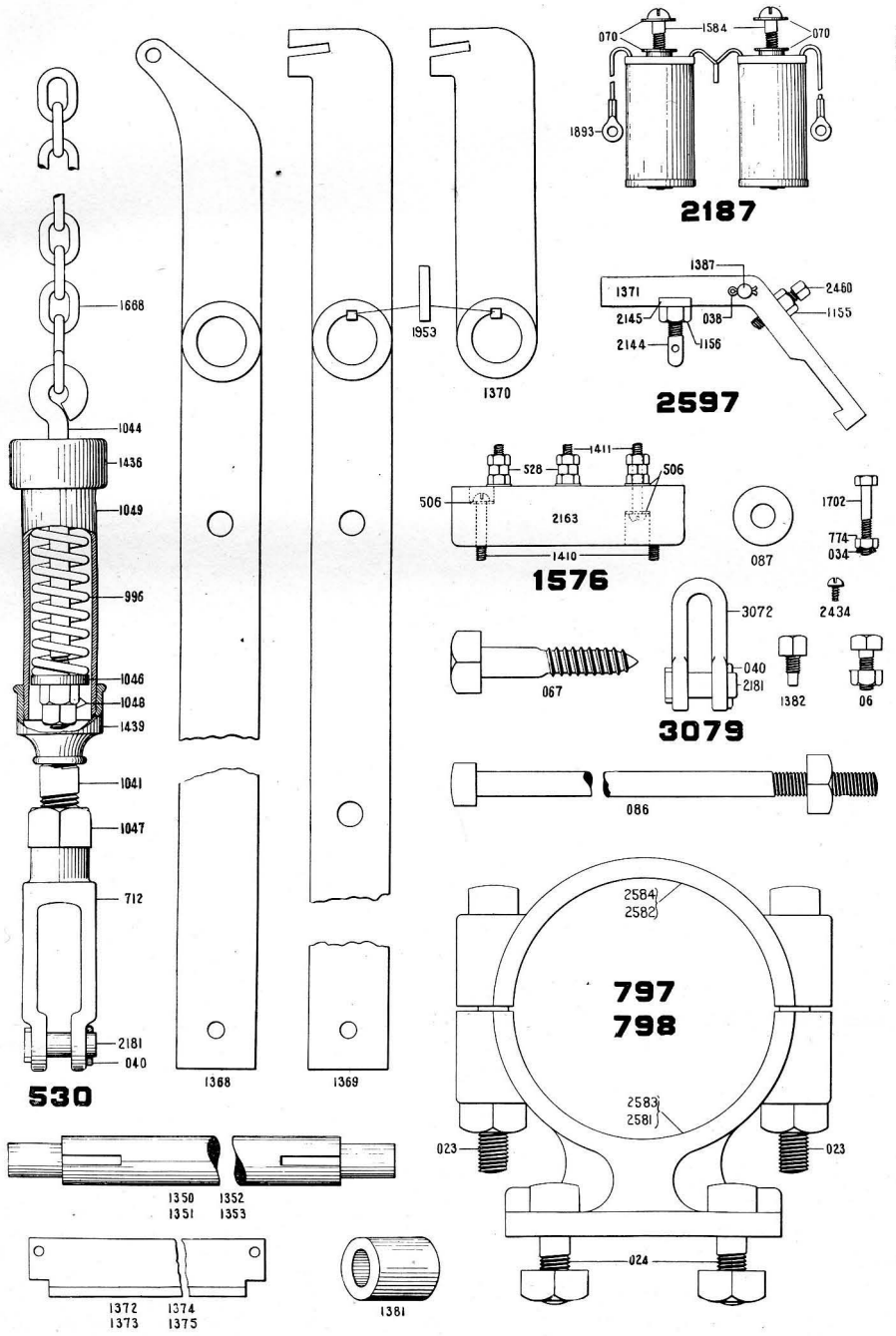
Order No.	SELECTORS AND COUNTERWEIGHTS		
1375	Latch Bar for 1380		
1377	5 Arm Hook Selector, Complete		
1378	4 Arm Hook Selector, Complete		
1379	3 Arm Hook Selector, Complete		
1380	2 Arm Hook Selector, Complete		
1381	Bushing used with Shafts 1350, etc		
1382	Screw holding 1381 to Brackets 1336, etc		
1387	Pin for 2597		
1410	Screw holding 1576 to Bracket		
1411	Screw for 1576		
1436	Cap for 530		
1439	Pipe Reducer for 530		
1576	Terminal Block, Complete, for Hook Selectors 2, 3, 4, or 5 Arm as specified		
1577	Cover, Bottom, for 1377		
1578	Cover, Bottom, for 1378		
1579	Cover, Bottom, for 1379		
1580	Cover, Bottom, for 1380		
1584	Screw for 2187		
1663	Bracket, Double, for 2986		
1668	Chain for 530 or for connecting 3079 to Signal Machine; specify length		
1702	Bolt holding Latch Bars 1372, etc. to 1369 or 1370		
1792	Weight, 24 lbs., for 2985 or 2986		
1893	Terminal for 2187		
1953	Key for 1369 or 1370		
2144	Screw for 2597		
2145	Nut Lock for 2597		
2163	Insulating Block for 1576		
2181	Pin for 530 or 3079		
2187	Magnets, Complete, for Hook Selectors		
2434	Screw for Hook Selector Covers		
2460	Screw for 2597		
2482	Set Screw for 1792		
2581	Base for 798		
2582	Cap for 798		
2583	Base for 797		
2584	Cap for 797		
2597	Latch, Complete, for Hook Selectors		
2952	Hinged Cover, Complete, for 1380		
2953	Hinged Cover, Complete, for 1379		
2954	Hinged Cover, Complete, for 1378		
2955	Hinged Cover, Complete, for 1377		
2985	Counterweight, Single Lever, Complete		
2986	Counterweight, Double Lever, Complete		
3072	Shackle for 3079		
3079	Shackle with Pin, Complete, used when required for connecting [illegible] to Hook Selectors		

PAGE 108.

1668 Superseded by 4 feet of 0183 chain, for reversible signal machines.

HIGH SIGNALS

SELECTORS AND COUNTERWEIGHTS



HIGH SIGNALS

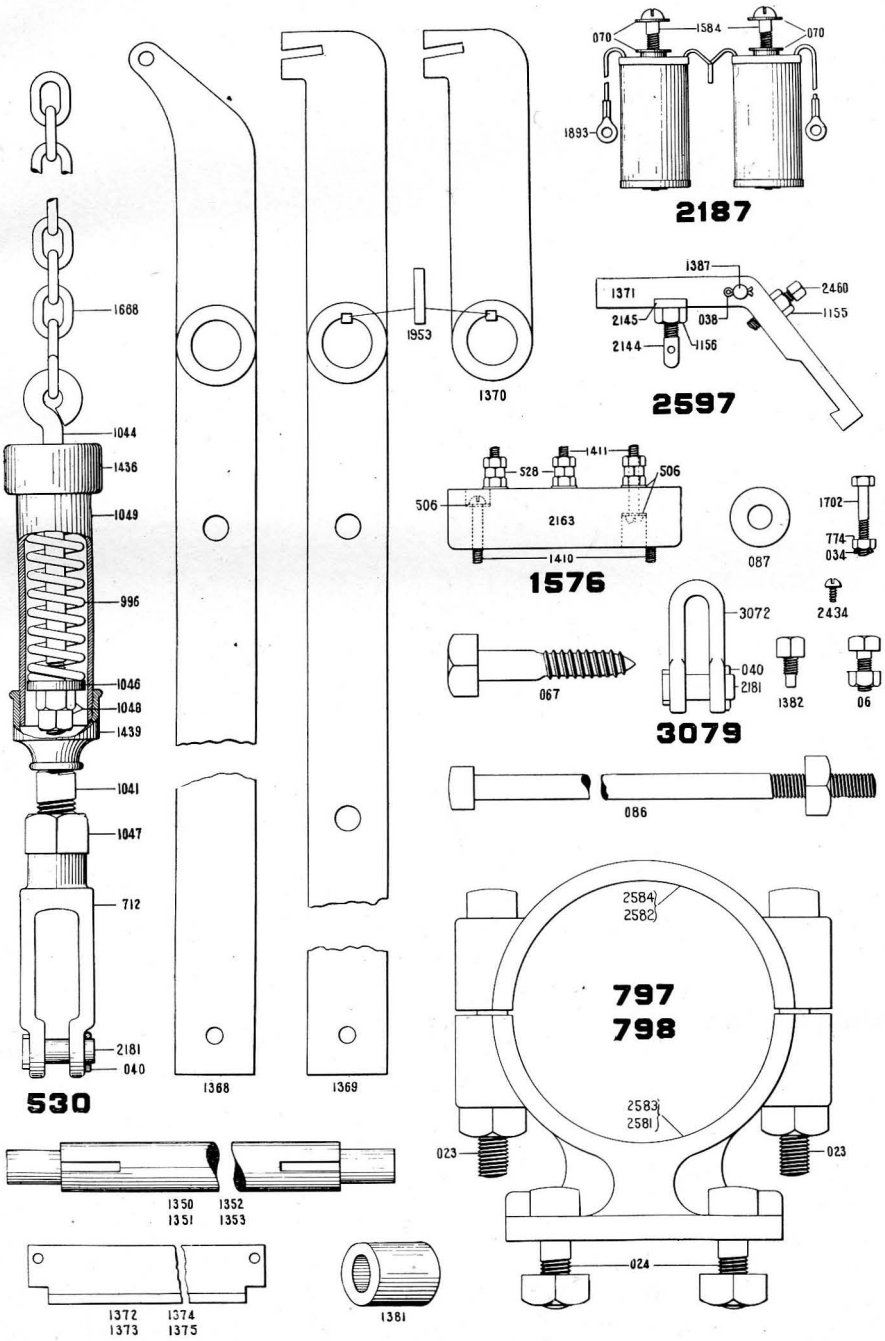
Order No.	SELECTORS AND COUNTERWEIGHTS		
1375	Latch Bar for 1380		
1377	5 Arm Hook Selector, Complete		
1378	4 Arm Hook Selector, Complete		
1379	3 Arm Hook Selector, Complete		
1380	2 Arm Hook Selector, Complete		
1381	Bushing used with Shafts 1350, etc		
1382	Screw holding 1381 to Brackets 1336, etc		
1387	Pin for 2597		
1410	Screw holding 1576 to Bracket		
1411	Screw for 1576		
1436	Cap for 530		
1439	Pipe Reducer for 530		
1576	Terminal Block, Complete, for Hook Selectors 2, 3, 4, or 5 Arm as specified		
1577	Cover, Bottom, for 1377		
1578	Cover, Bottom, for 1378		
1579	Cover, Bottom, for 1379		
1580	Cover, Bottom, for 1380		
1584	Screw for 2187		
1663	Bracket, Double, for 2986		
1668	Chain for 530 or for connecting 3079 to Signal Machine; specify length		
1702	Bolt holding Latch Bars 1372, etc. to 1369 or 1370		
1792	Weight, 24 lbs., for 2985 or 2986		
1893	Terminal for 2187		
1953	Key for 1369 or 1370		
2144	Screw for 2597		
2145	Nut Lock for 2597		
2163	Insulating Block for 1576		
2181	Pin for 530 or 3079		
2187	Magnets, Complete, for Hook Selectors		
2434	Screw for Hook Selector Covers		
2460	Screw for 2597		
2482	Set Screw for 1792		
2581	Base for 798		
2582	Cap for 798		
2583	Base for 797		
2584	Cap for 797		
2597	Latch, Complete, for Hook Selectors		
2952	Hinged Cover, Complete, for 1380		
2953	Hinged Cover, Complete, for 1379		
2954	Hinged Cover, Complete, for 1378		
2955	Hinged Cover, Complete, for 1377		
2985	Counterweight, Single Lever, Complete		
2986	Counterweight, Double Lever, Complete		
3072	Shackle for 3079		
3079	Shackle with Pin, Complete, used when required for connecting [illegible] Hook Selectors		

PAGE 108.

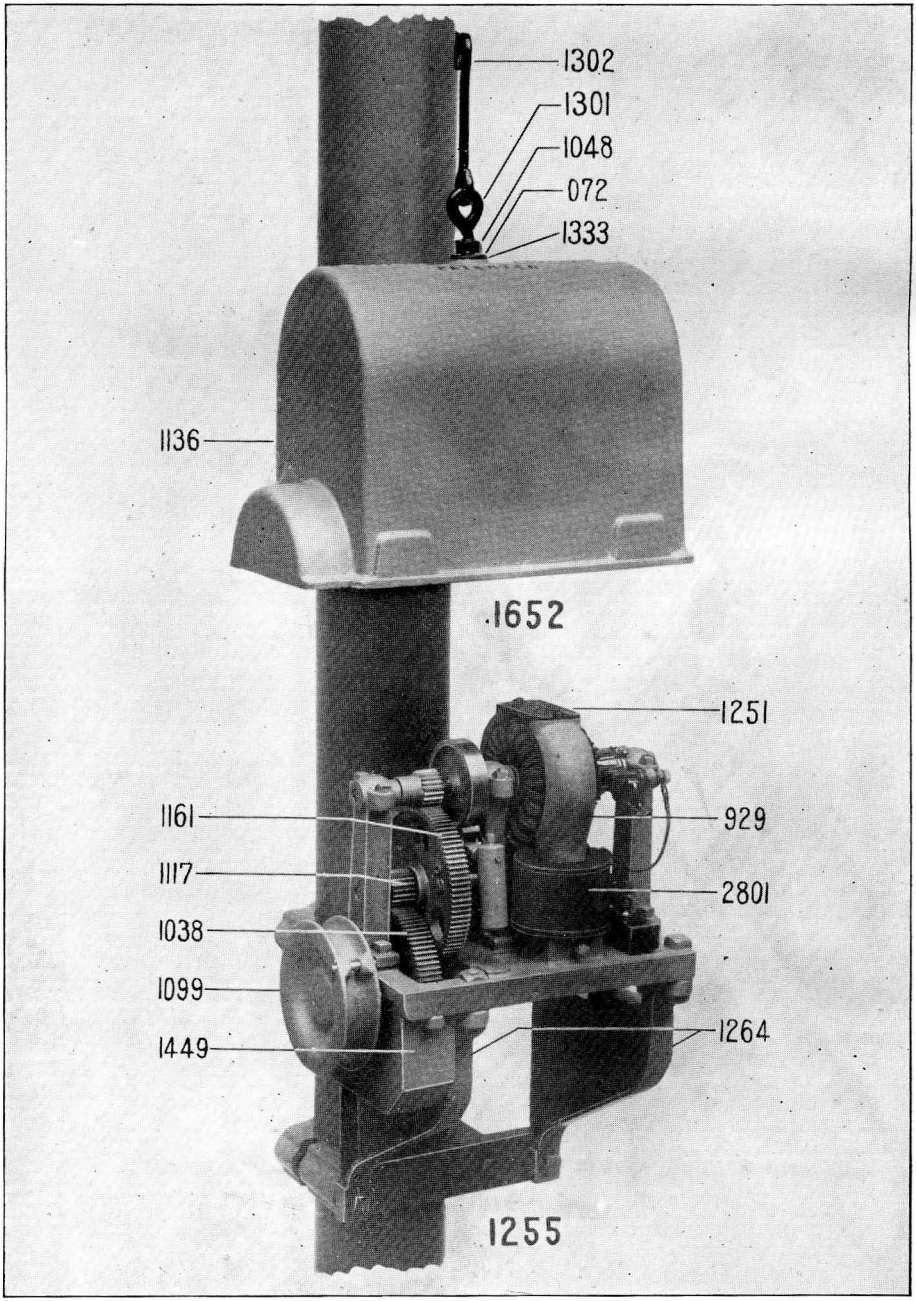
1668 Superseded by 4 feet of 0183 chain, for reversible signal machines.

HIGH SIGNALS

SELECTORS AND COUNTERWEIGHTS



SIGNAL MACHINE



HIGH SIGNALS

Order No.	SIGNAL MACHINE
011	Bolt with Nut for 777 or 789, also holding 1471 to 1264
012	Bolt with Nut holding 1471 to 1264
013	Bolt with Nut for 789
014	Bolt with Nut for 777
015	Bolt with Nut for 789
016	Bolt with Nut for 777
034	Cotter Pin for 1118 or 1714
065	Lag Screw holding 2956 to Wood Pole.
072	Washer for 1652 or 0117 and others
084	Cap Screw for 2557
0117	Bolt with Nut holding 1264 to 7″ Wood Pole
0118	Bolt with Nut holding 1264 to 10″ Wood Pole
0119	Bolt with Nut holding 1264 to 12″ Wood Pole
499	Insulating Bushing for 2557
506	Washer for 1687 or 2557
528	Nut for 1113, 1687 or 2557
774	Nut for 1714
777	Clamp holding Motor to Iron Pole, 6⅝″ O. D
789	Clamp holding Motor to Iron Pole, 5½″ O. D
845	Base, Binding Post, for 1713 or 2557
846	Thumb Nut, Binding Post, for 1713 or 2557
847	Lock Nut, Binding Post, for 1713 or 2557
879	Screw for 2557
929	Magnet Core for 1255
1038	Main Gear for1255
1048	Nut for 1652
1095	Brake Shoe for 1714
1099	Chain Sheave for 1255
1110	Bar for 2557

PAGE 111.

1095 Superseded by raw hide brake shoe 3952.

1099 Superseded by Sheave 2917 for reversible machines 3871.

011 Superseded by 012.

013 Superseded by 014.

014 Superseded by 016.

015 Superseded by 016.

016 Superseded by 017.

1139	Brake Lever for 1714
1140	Screw for 1714
1141	Pin for 1714
1142	Stud for 1714 supporting lever 1139
1147	Pin for 1714 holding 1142 to Centre Upright of 1471
1148	Washer for 1113
1150	Brush for 1687 or 2558
1152	Key for Shaft 1137
1153	Key for Shafts 1137 or 1138
1155	Nut for 2558
1156	Nut for 1471
1157	Insulating Washer for 2558
1158	Insulating Washer for 1687 or 2558
1159	Insulating Bushing, square hole, for 1687 or 2558

HIGH SIGNALS

Order No.	SIGNAL MACHINE		
1160	Clamp for 2558		
1161	Gear, Large Intermediate, for 1255		
1251	Plate for 1255		
1255	Signal Machine complete with cover, Binding Posts 1713 and Brush Holders 1687. In ordering specify voltage, 60 or 110, also style of Iron Pole Fastenings, Clamps 777 or 789, when required		
1264	Bracket for 1255		
1301	Eye Bolt for 1652		
1302	Hook for 1652		
1333	Rubber Washer for 1652		
1391	Counter Weight for 1714		
1411	Screw for 1713		
1438	Armature with Gear and Brake Disc, Complete, 60 or 110 volts as specified. This armature is interchangeable with and replaces those having clutch and spring		
1449	Gear Cover for 1255		
1471	Frame, Complete		
1523	Spring for 1687		
1595	Brush Holder, Right Hand, for 1687		
1596	Brush Holder, Left Hand, for 1687		
1597	Arm, Right Hand, for 1687		
1598	Arm, Left Hand, for 1687		
1616	Insulator for 2557		
1639	Pin holding plate 1251 to 929		

PAGE 112.

1255 Always includes the machine proper with its Cover (1652) and 2 brackets 1264. There is also furnished:—

For iron poles 2 Clamps 777, 789 or 4107, as specified, or

For wood poles 2 Strips 2956, 2 Bolts 0117, 0118 or 0119 as specified, 2 lag screws 065, 2 Washers 072 and 2 Bolts 011.

For 2 arm signals order reversible machine 3871 with cover, brackets, etc., as above.

1713 Superseded by binding post complete 3874, for reversible machine 3871.

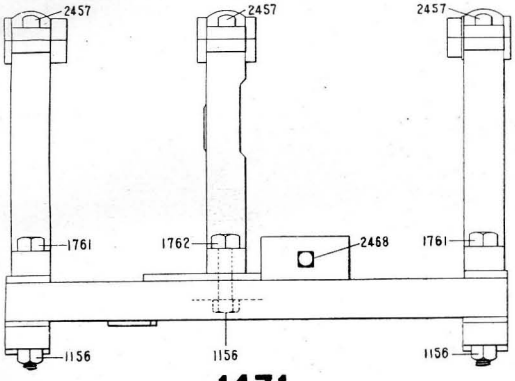
2465 Superseded by Screw 3954.

2801 Superseded by Coil 4027 for reversible machines 3871.

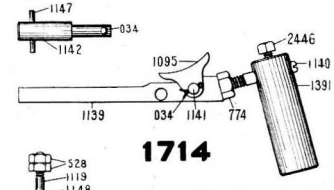
2542	Base for 777		
2543	Cap for 777		
2544	Base for 789		
2545	Cap for 789		
2552	Screw for 2558		
2556	Screw for 2558		
2557	Binding Posts, Mounted, superseded by 1713		
2558	Brush Holder, Complete, superseded by 1595 and 1596		
2801	Field Coil, Complete, connected in series for 110 Volts and in multiple for 60 Volts		
2956	Strip Holding Machine to Wood Pole		

HIGH SIGNALS

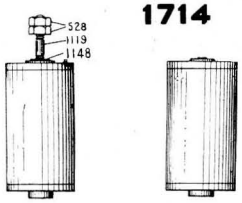
SIGNAL MACHINE



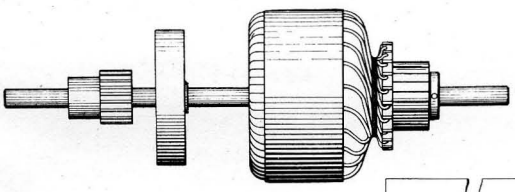
1471



1714



1113 1112



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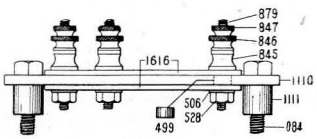

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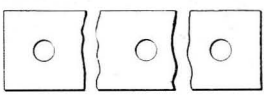

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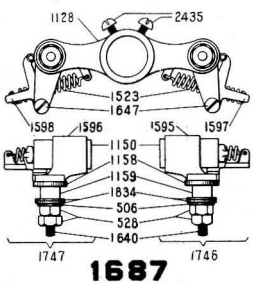
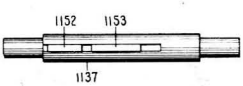
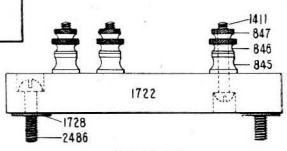
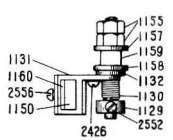


1687





1713



2558

012

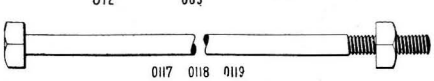
065

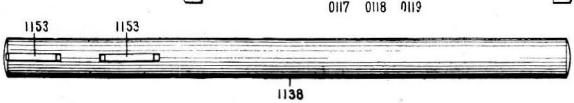
072

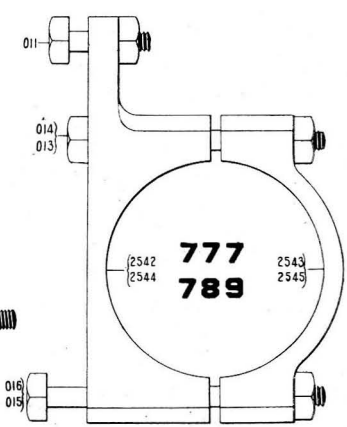
1118

1639

2465

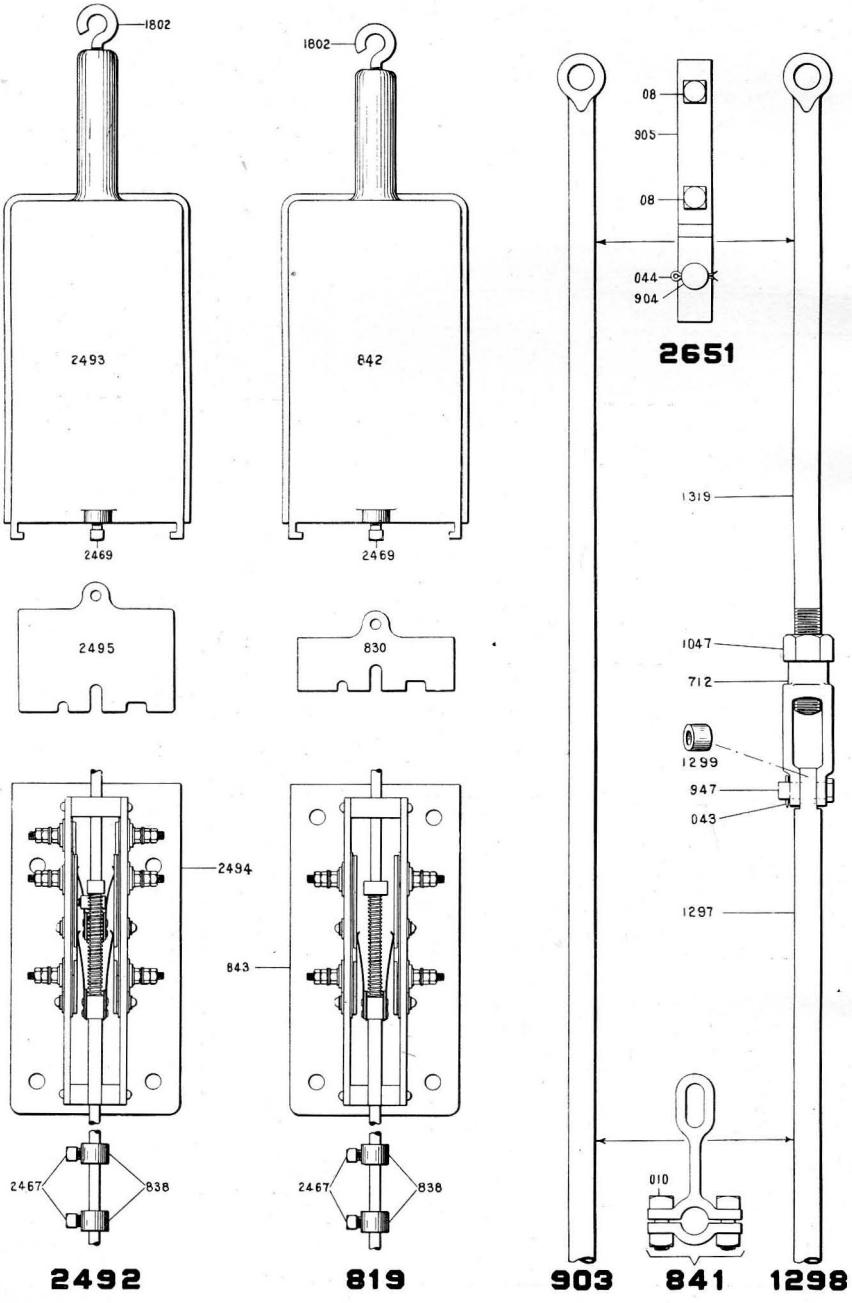






HIGH SIGNALS

CIRCUIT BREAKERS



HIGH SIGNALS

Order No.	CIRCUIT BREAKERS
02	Bolt with Nut for 890
06	Bolt with Nut for 709 or 776
08	Bolt with Nut fastening 2651 to Signal Arm
010	Bolt with Nut for 709, 776 or 841
043	Cotter Pin for 1298
044	Cotter Pin for 2651
064	Lag Screw for 890, also holding Circuit Breakers to Wood Pole
072	Washer for 972 or 1657
493	Washer, Insulating, for 2573 or 2574
506	Washer for 2573 or 2574
528	Nut for 2573 or 2574

PAGE 115.

819 For iron poles a complete circuit breaker includes:
The circuit breaker proper, with
1 operating rod 903 (1298 abandoned.)
1 Bracket 2651 or 5498 (90°) as specified.
1 Clamp 841.
2 Clamps 972, 1657 or 3585 (6½-in. pole) as specified.
1 Guide 709 or 776 or 3966 (6½-in. pole) as specified.
For wood poles a complete circuit breaker includes:
The circuit breaker proper.
1 operating rod 903 (1298 abandoned.)
1 Bracket 2651 or 5498 (90°) as specified.
1 Clamp 841.
1 Guide 890.
6 Lag screws 064.

1298 Superseded by 903.

903	Circuit Breaker Operating Rod, Complete, for 60° to 75° Signals including Guides 709, 776 or 890 as specified
904	Stud for 2651
905	Bracket for 2651
947	Pin for 1298
972	Clamp, Complete, for holding Circuit Breaker to Iron Pole 4½" O. D
975	Washers for 2573
983	U Bolt for 972
984	Clamp for 972
1047	Nut for 1298
1048	Nut for 972 or 1657
1144	Pin for 2642
1205	Rivet for 2574
1297	Eye Rod, Lower, for 1298
1298	Circuit Breaker Operating Rod, Complete, for 90° Signals including Guides 709, 776 or 890 as specified
1299	Bushing for 1298
1319	Eye Rod, Upper, for 1298
1356	Insulator for 2573
1357	Insulator for 2573

HIGH SIGNALS

Order No.	CIRCUIT BREAKERS
1358	Insulator for 2573
1494	Pin for 2643
1495	Pin for 2642 or 2643
1650	Pin for 2642
1653	Clamp for 1657
1654	U Bolt for 1657
1657	Clamp, Complete, for holding Circuit Breakers to Iron Pole 5½″ O. D
1802	Hook for 819 or 2492
1831	Insulator for 2573
1833	Washer, Insulating for 2573 or 2574
1834	Washer, Insulating for 2573
1835	Bushing for 2573, also 2574
1836	Bushing for 2573
1934	Rod, 31″, for 2643 used with 90° Signals
2365	Pin for 2642 or 2643
2430	Screw for 2573 or 2574
2431	Screw for 2573
2467	Screw for 819 or 2492
2469	Screw for 819 or 2492
2487	Screw for 2642
2492	Circuit Breaker, Complete, with attachment for opening Switch Circuit when Signal starts to clear and including Rods 903 or 1298, also Pole Fastenings 972 or 1657, all as specified
2493	Cover for 2492
2494	Frame for 2492
2495	Bottom Plate for 2492
2498	Contact Spring, Complete, used on 2642
2501	Block, Dog Tripping for 2642
2502	Block, Spring Compressing for 2642
2503	Dog for 2642
2504	Insulator for 2574
2505	Insulator for 2574
2507	Rod for 2642
2508	Rod for 2642. Specify 60°, 75° or 90° Throw
2509	Rod for 2642
2510	Pin for 2642
2515	Contact Plate for 2574
2516	Side Plate for 2574
2573	Side Plate with Contacts, etc., Complete, for 819 or 2492
2574	Side Plate with Contacts, etc., Complete, for 2492 only
2642	Miscellaneous Parts for 2492
2643	Miscellaneous Parts for 819
2651	Bracket, Complete, for 903 or 1298, used for fastening Rods to Signal Arm

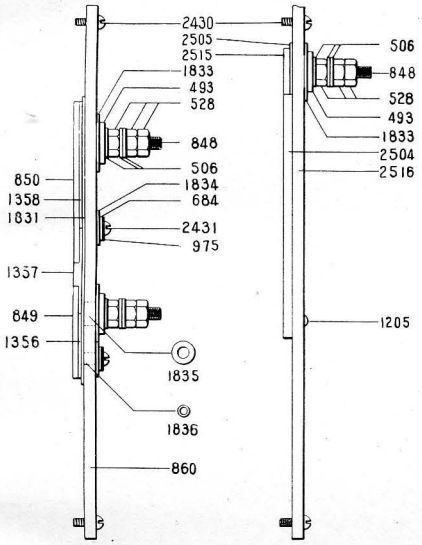
PAGE 116.

2492 Circuit breaker complete includes the same parts as 819.

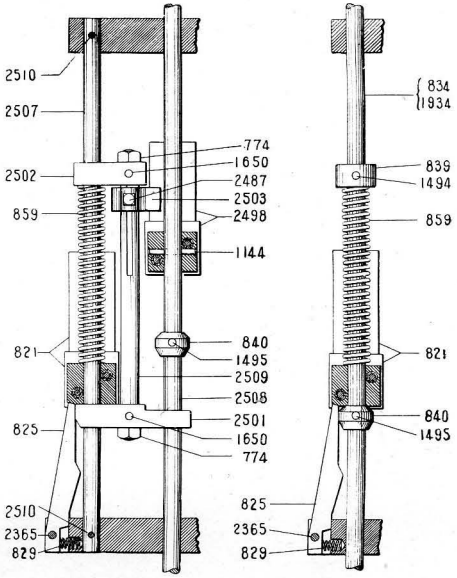
2651 Bracket 2651 is for 60° arn. For 90° arms order 5498, when there is no operating stud in the arm itself.

HIGH SIGNALS

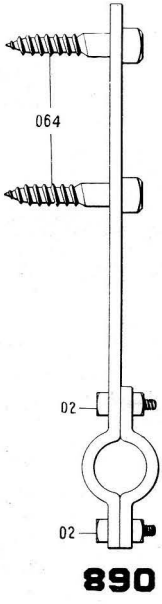
CIRCUIT BREAKERS



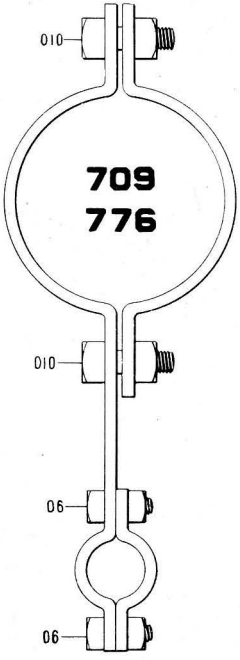
2573 2574



2642 2643



890



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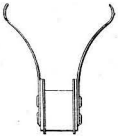
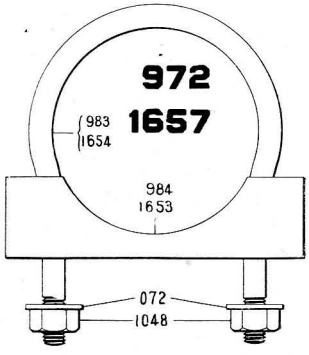
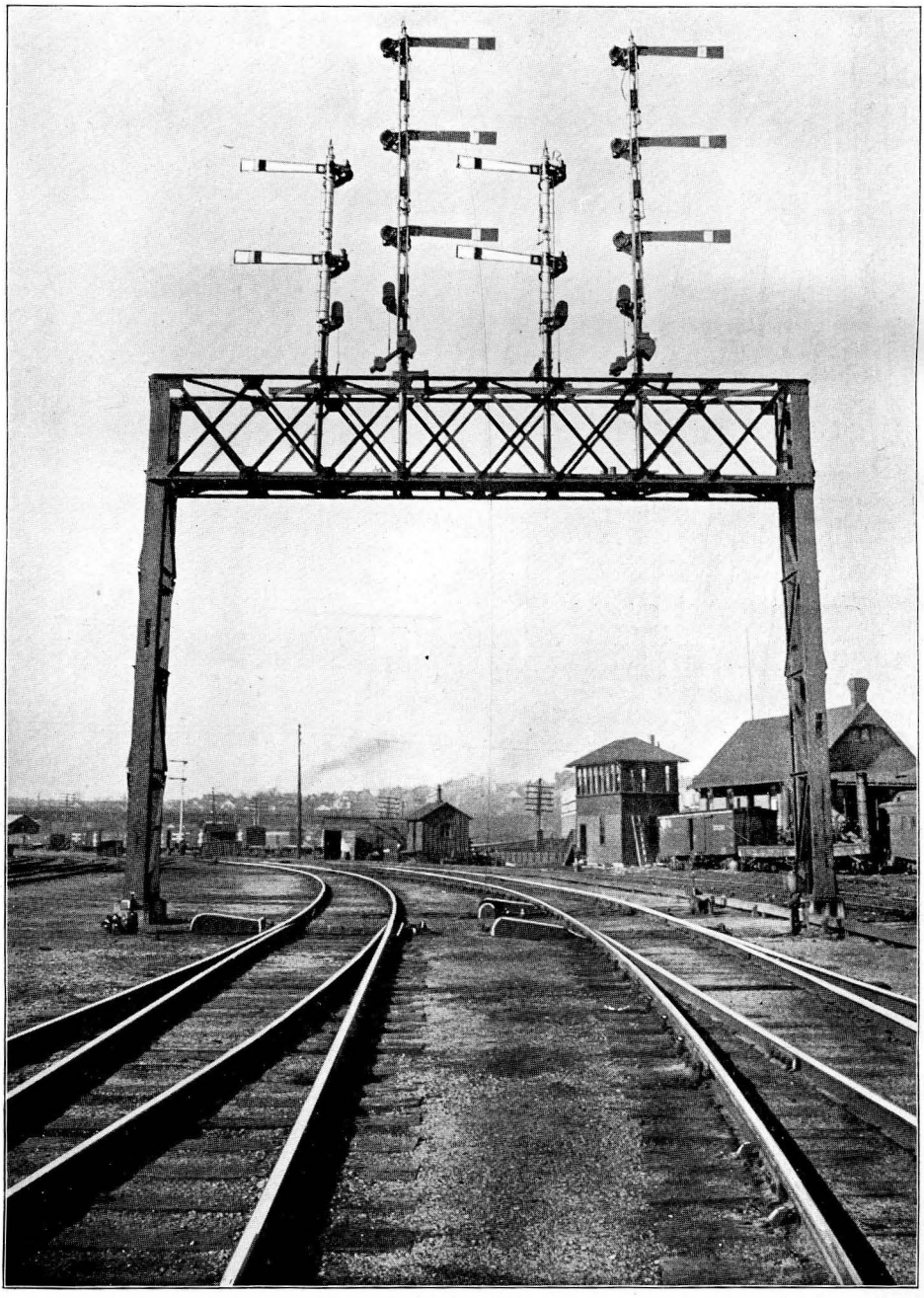


2498



HIGH SIGNALS



TWO-TRACK SIGNAL BRIDGE

HIGH SIGNALS

BRIDGES

Signal Bridges of the type indicated on the opposite page, also on pages 14 and 61, are furnished as required. Below is a list of standard sizes.

Order No.	BRIDGES		
3192	2 Track Signal Bridge, Complete		
3193	3 " " " "		
3194	4 " " " "		
3195	5 " " " "		

DWARF SIGNALS

A Single Arm Dwarf Signal is illustrated in front and side view on the opposite page.

The double solenoid, and the circuit breakers, referred to in the description on page 25, are located in the base, as shown, and are held in place by the solenoid frame (1689 Sec 28) which is suspended from the top of the base. The working coil of the solenoid, when energized by current, exerts a magnetic pull of sufficient strength to clear the signal and, in addition, compress a powerful spring which assists in forcing the arm back to danger when the current is cut off. This spring encircles the operating rod as shown at 1692 or 2591, Sec 28.

Motion is transmitted, from the solenoid cores (1556), to the signal arm through the medium of the yoke (1317), the sliding rod (971), the operating rod (985) and the crank (2603). Connection is made between rods 971 and 985 through the medium of two springs (1021 and 1022) which act as cushions. The springs referred to are held in a cylinder (973) by cap 977 which screws on. Rod 971 screws up into the bottom of said cylinder and rod 985 passes down through a hole in cap 977 and is screwed into a nut (1023) which is held between the springs and is free to slide up or down in the cylinder except as limited by the springs.

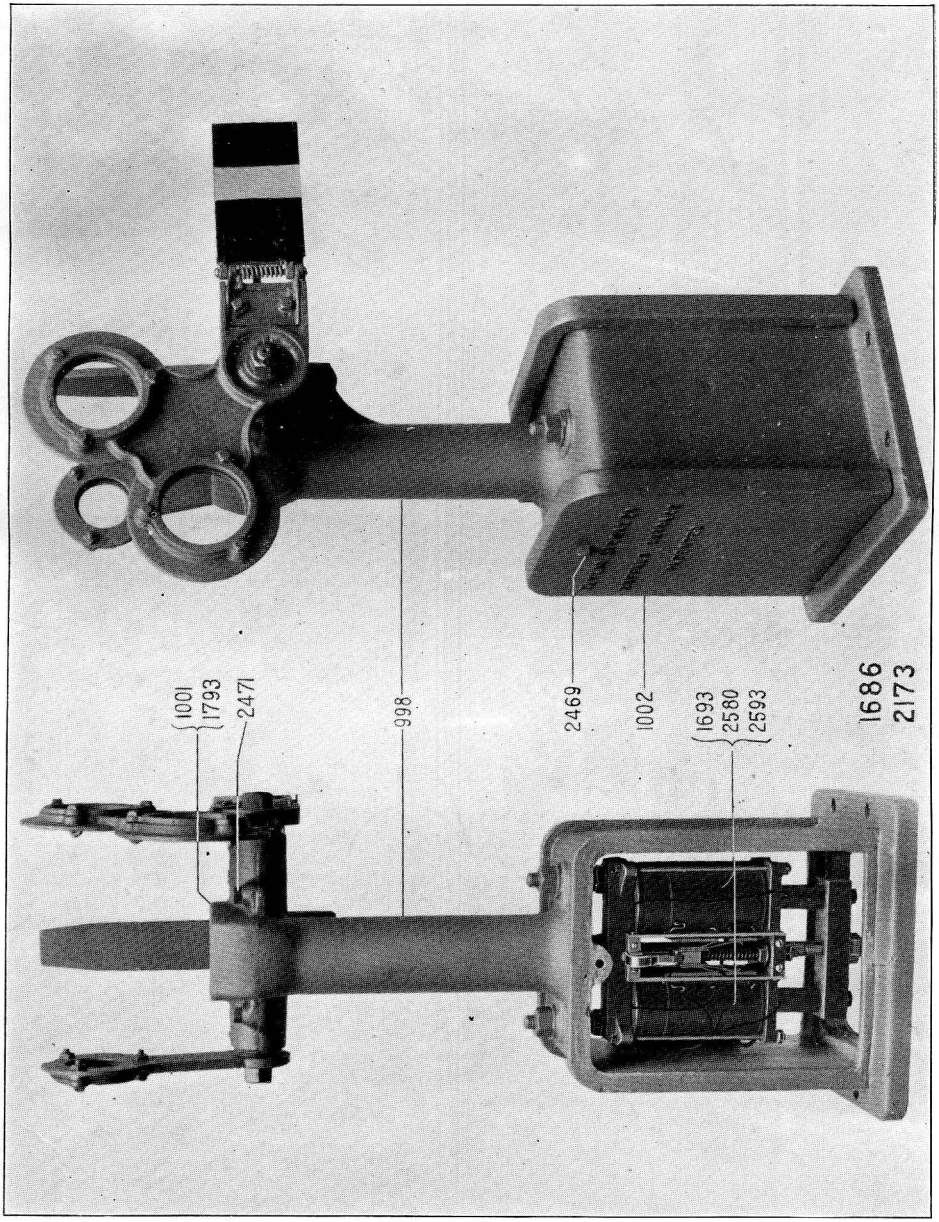
The circuit breakers are shown in detail on page 122.

1071 is the style formerly used and combines in one, the circuit breaker D and G[4], insert B. It however lacked independent adjustment and has been superseded by 2405 and 2410, represented by G[4] and D respectively. Circuit breaker 2405 controls the working and retaining coils and is quick break in its action. It is operated, just before the signal arm reaches its clear position, by a collar (2416) fastened to rod 971. Circuit breaker 2410 controls the indication circuit and is closed, when the signal arm reaches danger, by contact 2413 which is also fastened to and worked by rod 971.

Dwarf signals are made for either 60° or 90° throw and will be provided with any required form of lamp or front light arm.

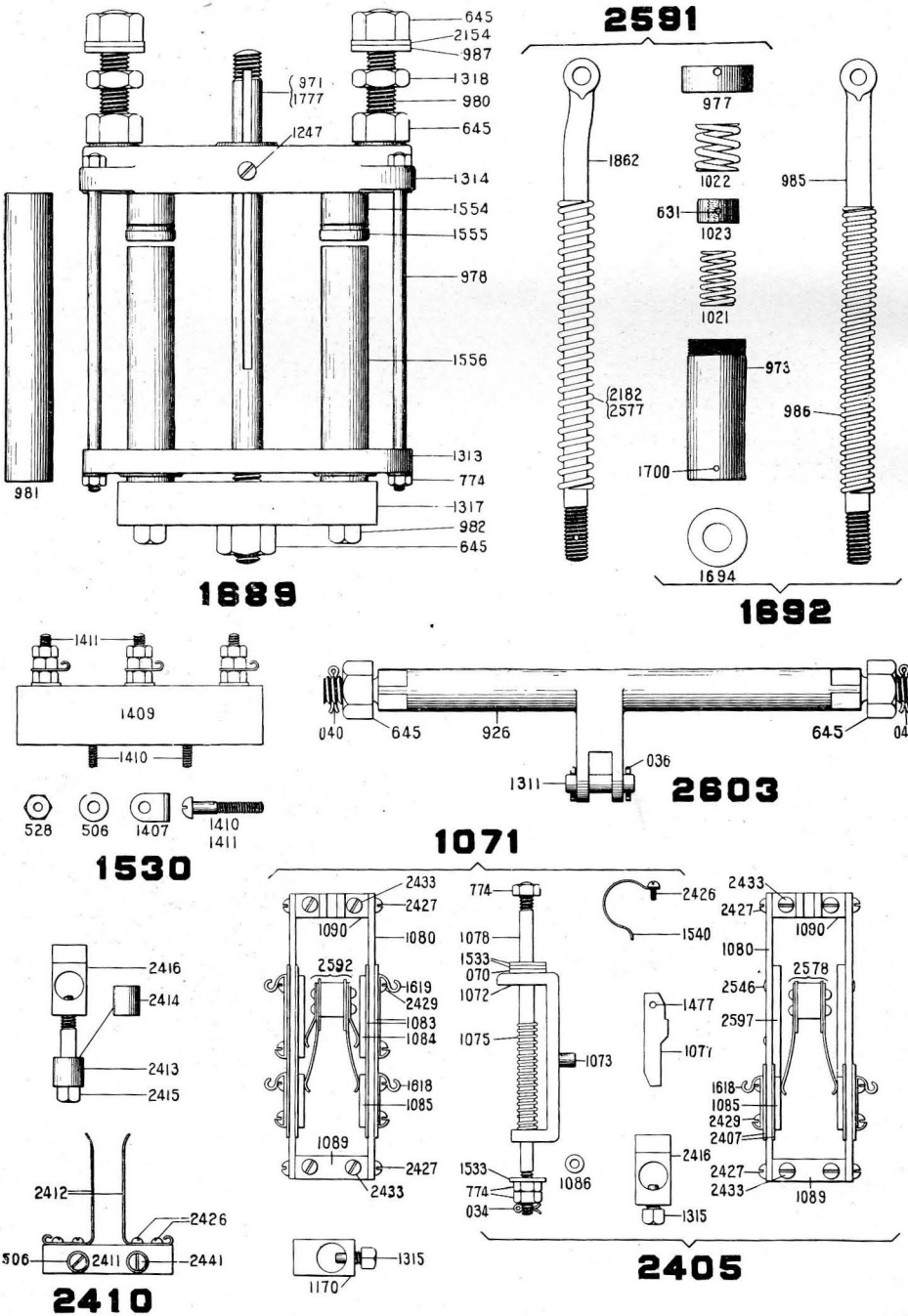
Order No.	LIST OF PARTS		
02	Bolt with Nut, Rings to Arms		
034	Cotter Pin for 1071, 1524 or 2405		
036	Cotter Pin for 2603		
040	Cotter Pin for 2603		
058	Rivet for 1524		
070	Washer for 1071 or 2405		
0134	Bolt with Nut for 1524		
506	Washer for 1530 or 2410		
528	Nut for 1530		

DWARF SIGNALS



DWARF SIGNALS

PARTS



DWARF SIGNALS

Order No.	LIST OF PARTS
631	Pin for 1690

PAGE 123.

744 Should read 774.

	1690 or 1701.
924	Glass, 3½", for 1690 or 1701. (Specify color.)
926	Crank Shaft for 2603
927	Lamp Bracket for 1686.
940	Arm for 1701
941	Ring for 1690 or 1701, superseded by 3088
942	Arm for 1688
971	Guide Rod, 10⅞", for 1689 (60° throw)
973	Cylinder for 1692 or 2591
977	Cylinder Cap for 1692 or 2591
978	Rod for 1689
980	Stud for 1689
981	Core for 1689, used only with Solenoids 2593
982	Cap Screw for 1689
985	Rod for 1692
986	Spring, 8¼", 42 turns, for 1692
987	Rubber Washer for 1689
998	Post for 1686 or 2173
1001	Cap for 1686
1002	Door for 1686 or 2173
1021	Spring, Lower, for 1692
1022	Spring, Upper, for 1692 or 2591 and Lower for 2591
1023	Nut for 1692 or 2591
1071	Circuit Breaker, Complete, for 1686
1072	Clutch for 1071 or 2405
1073	Stud for 1071 or 2405
1075	Clutch Spring for 1071 or 2405
1077	Dog for 1071 or 2405
1078	Guide Bar for 1071 or 2405
1080	Side Plate for 1071 or 2405
1083	Insulator for 1071
1084	Contact Plate for 1071
1085	Contact Plate for 1071 or 2405
1086	Bushing, Insulating, for Screw 2429 in 1071 or 2405
1089	Block, Bottom, for 1071 or 2405
1090	Block, Top, for 1071 or 2405
1170	Trip Collar used only with 1071 on 971
1247	Screw for 1689
1311	Crank Pin for 2603
1313	Cap, Bottom, for 1689
1314	Yoke, Top, for 1689
1315	Set Screw for 1071 or 2405
1317	Yoke, Bottom, for 1689
1318	Lock Nut for 1689
1322	Ring for 1688 or 2903
1396	Spring for 1524
1397	Pin for 1524
1398	Stationary Hinge for 1524
1399	Swinging Hinge for 1524
1407	Terminal for 1530
1409	Block for 1530
1410	Screw for 1530

DWARF SIGNALS

Order No.	LIST OF PARTS
1411	Screw for 1530
1423	Blade for 1524
1424	Back Plate for 1524
1477	Rivet for 1071 or 2405
1524	Blade with Hinge, Complete
1530	Terminal Block, Complete
1533	Washer, Leather, for 1071 or 2405
1540	Dog Spring for 1071 or 2405
1554	Core, Top, for 1689
1555	Cap, Copper, for 1689
1556	Core, Bottom, for 1689
1618	Terminal, Short, for 1071 or 2405
1619	Terminal, Long, for 1071
1686	Dwarf Signal, Complete, 60° throw, with Front Light Arms and Lamp a sspecified
1688	Arm Back Light, Complete, used with 1690 or 1701
1689	Solenoid Frame, Complete, for 1686 or 2173. (Cores as specified.)
1690	Arm, Complete, Single Front Light, 60° throw
1692	Connecting Rod, Complete, for 1686
1693	Solenoids for 1686, used only with Cores 1554 and 1556
1694	Washer for 1692 or 2591
1700	Pin for 1692 or 2591
1701	Arm, Complete, Double Front Light, 60° throw, $6\frac{1}{2}''$ centres, $3\frac{1}{2}''$ glass and with Ring 3088
1777	Guide Rod, $11\frac{7}{8}''$, for 1689, (90° throw)
1793	Cap for 2173
1862	Rod for 2591
1973	Lamp Bracket for 2173
2154	Washer for 1689
2173	Dwarf Signal, Complete, 90° throw with Front Light Arms and Lamp as specified
2182	Spring, $6\frac{1}{2}''$, 22 turns, for 2591
2254	Ring for 2902
2405	Circuit Breaker, Complete, used with 1686 or 2173
2407	Insulator for 2405
2410	Indication Circuit Closer, Complete, used with 2405
2411	Block, Insulating, for 2410

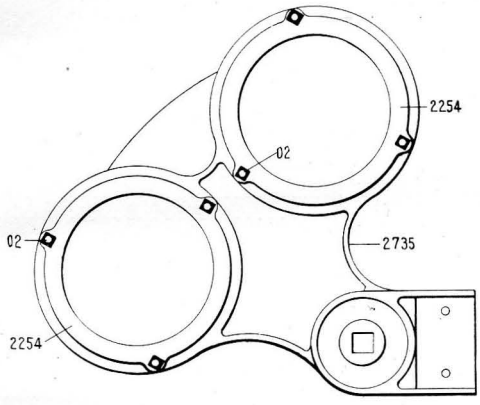
PAGE 124.

2254	Superseded by 3408.
2426	Superseded by 3913.

2433	Screw for 1071 or 2405
2441	Screw for 2410
2469	Screw for door 1002
2471	Screw for 1686 or 2173
2480	Screw for Lamp Brackets
2546	Rivet for 2405
2577	Spring, $8\frac{1}{4}''$, 28 turns, for 2591
2578	Contact Springs, Complete, for 2405
2580	Solenoids, Complete, for 2173, used only with Cores 1554 and 1556
2591	Connecting Rod, Complete, for 2173
2592	Contact Springs, Complete, for 1071
2593	Solenoids, for 1686, used only with Cores 981

DWARF SIGNALS

PARTS



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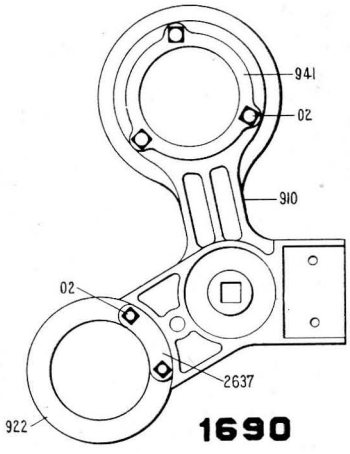

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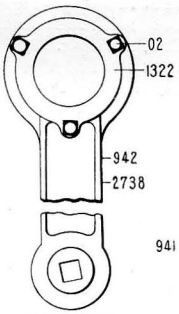

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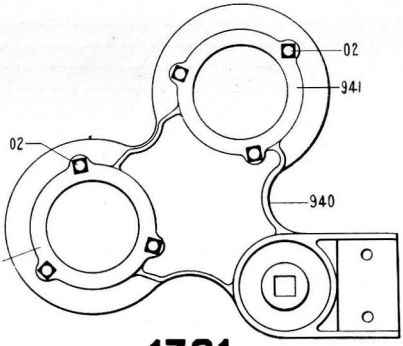

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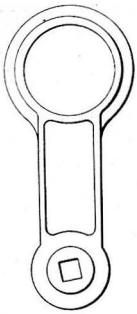

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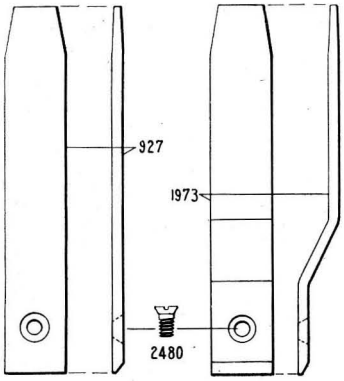
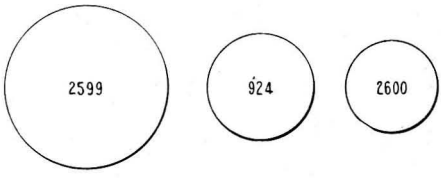
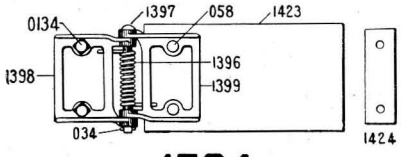






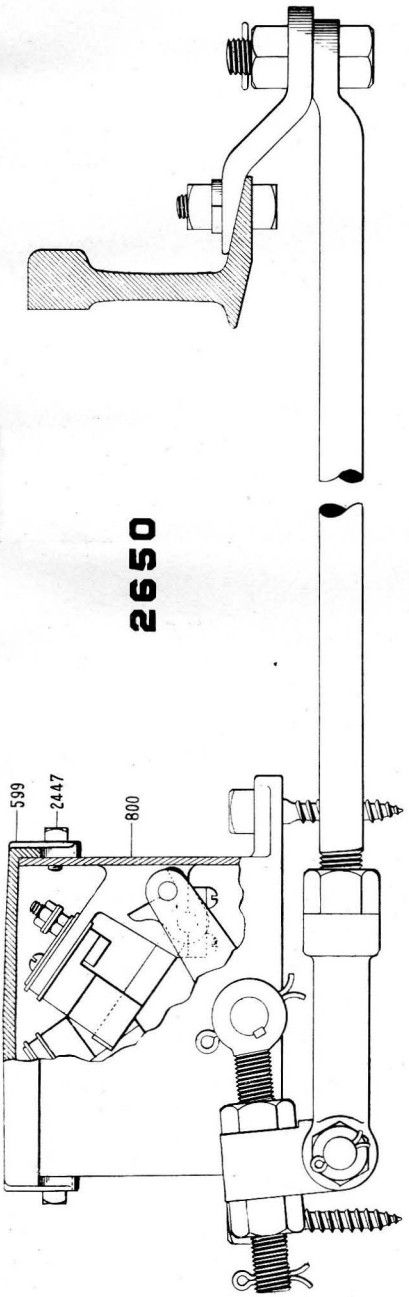
1524

DWARF SIGNALS

Order No.	LIST OF PARTS		
2597	Insulator for 2405		
2599	Glass, $5\frac{3}{8}$", for 2902. (Specify color.)		
2600	Glass, 3" for 1688 or 2903. (Specify color.)		
2603	Crank Shaft, Complete, for 1686 or 2173		
2637	Plate for 1690		
2735	Arm for 2902		
2738	Arm for 2903		
2902	Arm, Complete, Double Front Light, 60° throw, $7\frac{3}{4}$" centres, $5\frac{3}{8}$" Glasses		
2903	Arm, Back Light, Complete, used with 2902		
3088	Ring for 1701 (not shown) $6\frac{3}{4}$" O. D. superseding 941		

PAGE 126.

2597 Should read 2579.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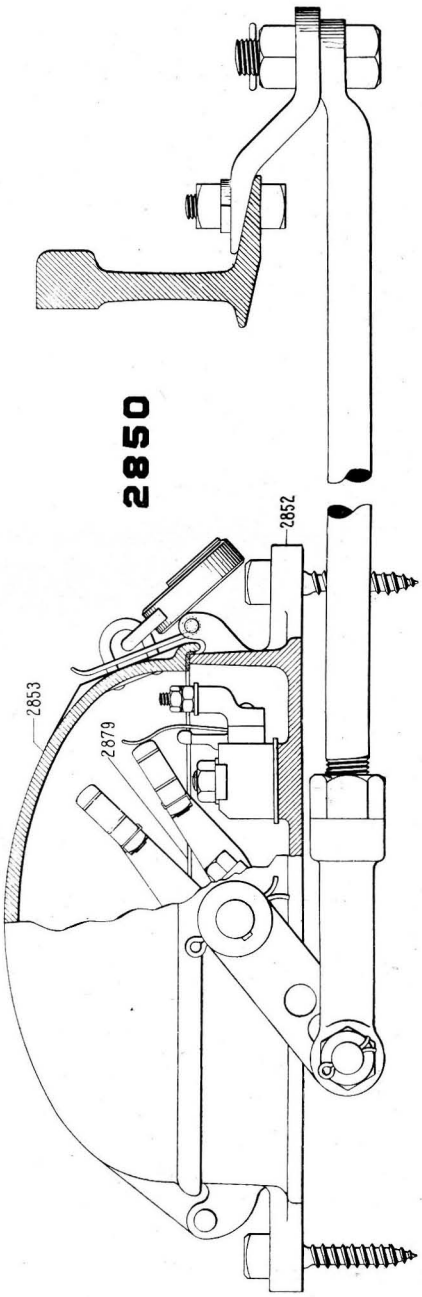
599
2447
800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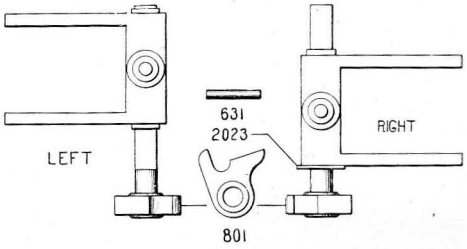
2852
2853
2879

SWITCH BOXES AND GROUND SELECTORS

PARTS



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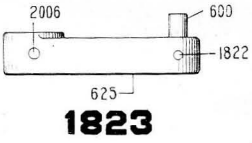

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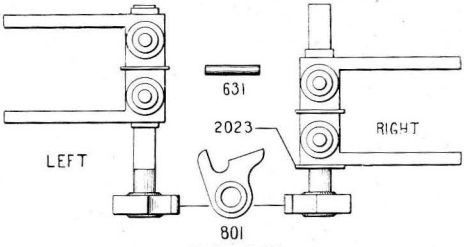
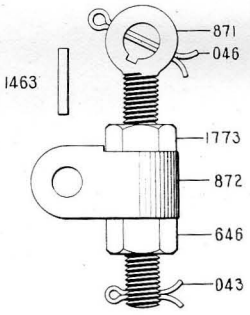


2020



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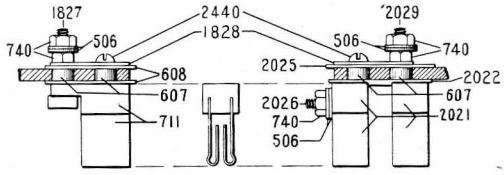
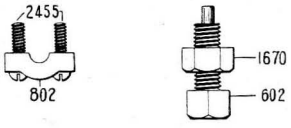
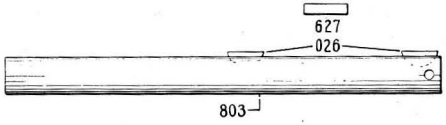
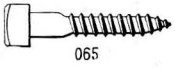
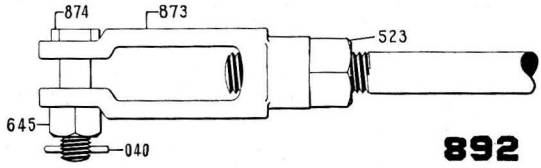


2640 2641









892

SWITCH BOXES AND GROUND SELECTORS

Order No.	LIST OF PARTS
01	Bolt with Nut for 2859 or 2877
010	Bolt with Nut for 892
026	Key for Shaft 803 or 2871 (see also 627)
040	Cotter Pin for 892
043	Cotter Pin for 858, also to prevent end movement of 2871 in single throw boxes; see note under 2850
046	Cotter Pin for 858 or 2872
051	Padlock for 2850, with or with[illegible]
065	Leg Screw [illegible]

PAGE 129.

01 Superseded by screw 3894 with nut 3893.

[illegible]	Cover for 2650
600	Pin for Crank 1823
602	Pivot Screw for 1821 or 2020
607	Bushing, insulating, for 2640 or 2641
608	Insulator for 2640
625	Crank for 1823
627	Key, old style, for Shaft 803 (see 026)
631	Pin, Cam to Shaft for 1821 or 2020
645	Nut for 892
646	Nut for 858 or 892
711	Contact for 2640
740	Nut for 2640 or 2641
800	Case for 2650
801	Cam for 1821 or 2020
802	Bearing Cap, holding 1821 or 2020
803	Crank Shaft for 2650
858	Outside Crank complete for 2650
871	Crank for 858
872	Block for 858
873	Jaw for 892
874	Bolt for 892
877	Rod for 892
892	Operating Rod complete for 2650 or 2850 with bolts
893	Foot for 892
894	Bolt for 892
1156	Nut for 2858
1463	Key Block to Crank for 858
1572	Screw for 2865
1670	Nut for 602
1773	Nut for 858
1821	Single Circuit Contact Fork complete for 2650, Right or Left as specified
1822	Pin for 1823
1823	Inside Crank complete for 2650

SWITCH BOXES AND GROUND SELECTORS

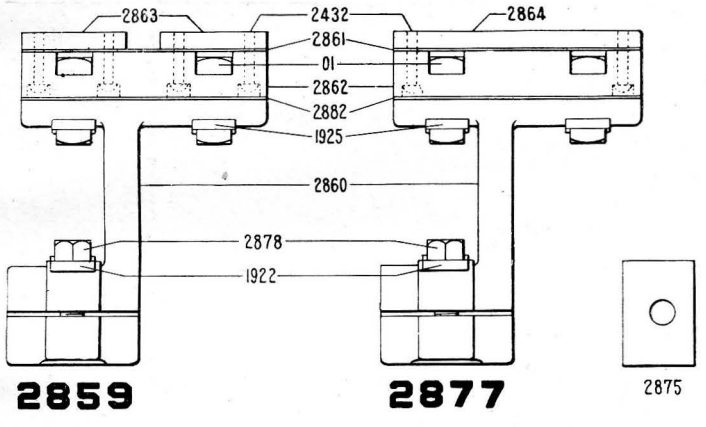
Order No.	LIST OF PARTS		
1827	Contact Bolt for 2640		
1828	Contact Plate for 2640 or 2641		
1922	Nut Lock for 2859 or 2877		
1925	Nut Lock for 2859 or 2877		
2006	Pin for 1823		
2020	Two Circuit Contact Fork, Complete, for 2650, Right or Left as specified		
2021	Contact for 2641		
2022	Insulator for 2641		
2023	Washer, square insulating for 1821 or 2020		
2025	Insulator for 2641		
2026	Stud for 2641		
2029	Stud for 2641		
2432	Screw for 2859 or 2877		
2440	Contact Screw for 2640 or 2641		
2447	Cover Screw for 2650		
2455	Screw for 802		
2640	Contact with Terminals, etc., Complete, used with 1821		
2641	Contact with Terminals, etc., Complete, used with 2020		
2650	Switch Box, Model 1, Complete, Single or Double Throw. 2, 3, or 4 Circuits as specified		
2850	Switch Box, Model 2, Complete, Single or Double Throw, also Contact Arms 2859 or 2877 as specified. Note: with Single Throw only one Contact Arm and one set of 2865 Terminals is furnished Boxes		
2852	Base, Casting only for 2850		
2853	Cover, Casting only for 2850		
2854	Staple for Hasp		
2855	Hasp for 2850		
2856	Pin for Hasp		
2857	Pin for Cover Hinge 2853		
2858	Stud holding 2865		
2859	Contact Fork, Complete, for 2850 with two Contacts 2863,		
2873	Washer for 2858		
2874	Nut Lock for 2858		
2875	Felt Washer used under 2865		
2876	Screw for 2865		
2877	Contact Fork complete for 2850 with one Contact 2864		
2878	Cap Screw for 2859 or 2877		
2879	Felt Gasket for 2850		
2882	Insulator for 2859 or 2877		

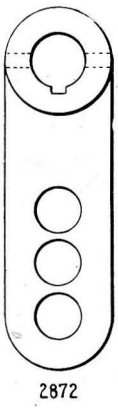
PAGE 130.

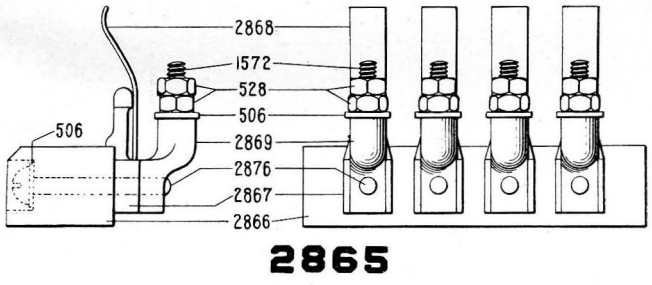
1922	Superseded in later boxes by Washer 2145 (3/8-in. hole.)
2850	Does not include Rod 892, as illustrated on page 127.
2876	Superseded by Screw 1411.
2878	Superseded in later boxes by Screw 4555 (3/8-in.)

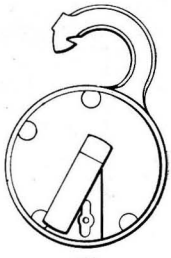
SWITCH BOXES AND GROUND SELECTORS

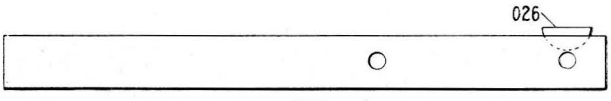
PARTS

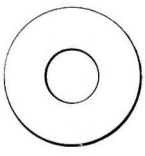


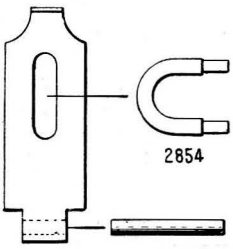


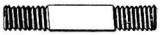












SWITCH BOXES AND GROUND SELECTORS

Order No.		

In many instances where conditions are favorable, the double benefits secured by the use of detector bars and electric locking, may be obtained by the employment of short sections of track circuit instead of the detector bars, at little or no increase in cost.

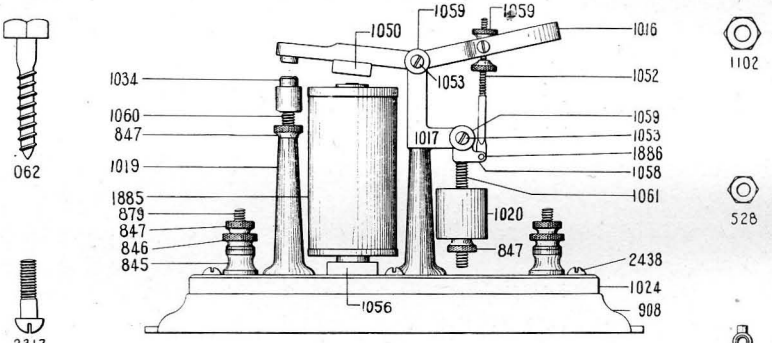
As the relay ordinarily used for track circuit work is not suited for use in the Taylor system, the relay illustrated on the opposite page was designed to meet the requirements which demand a form of contact which will carry a heavy current without disintegration or the possibility of fusing and which shall have a sufficiently wide break to guard against arcing should the relay by any chance be demagnetized while current is flowing through the contact points.

Two types of this relay are illustrated, one (No. 1018) with carbon contacts and a simple break between the stationary and movable parts of the contact; the other (No. 1880) is similar in form to No. 1018 but several layers of wire are wound around the stationary posts of the contact and the high potential current controlling a switch or signal is carried through this winding before passing through the post and the carbon contacts.

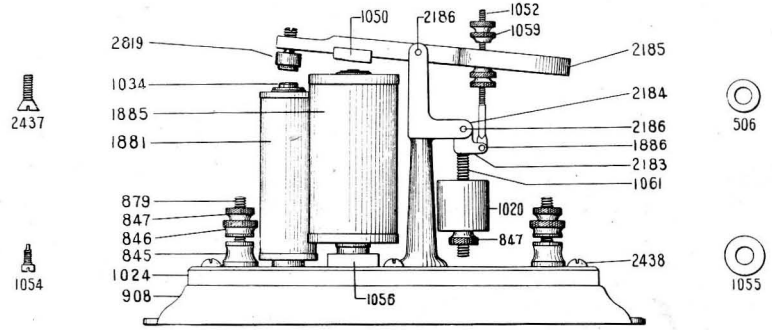
This acts as a magnetic "blow-out" and instantly snuffs out any arc formed between the carbon contacts upon the demagnetization of the relay.

TRACK CIRCUITS

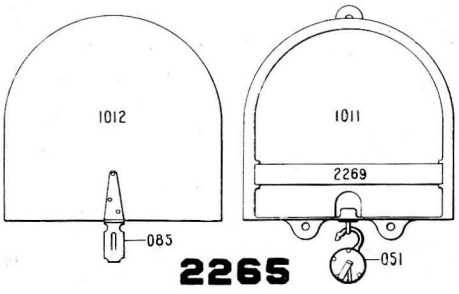
TRACK RELAYS



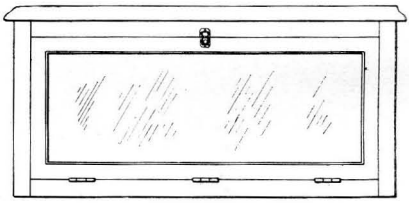
1018



1880



2265



1027 - 1028 - 1659

TRACK CIRCUITS

Order No.	TRACK RELAYS
051	Padlock for 2265, with or without key
062	Lag Screw supporting 2265
085	Hasp with Staple for 2265
506	Washer for 879
528	Nut holding Binding Posts to Base
845	Base for Binding Posts
846	Nut for Binding Posts
847	Lock Nut for Binding Posts and Counterweights
879	Screw for Binding Posts
908	Base, Iron, for 1018 or 1880
1011	Box, Cast Iron, for 2265
1012	Cover for 2265
1016	Lever for 1018
1017	Stand for 1018
1018	Track Relay, Complete, without Magnetic Blowout
1019	Contact Post for 1018
1020	Counterweight for 1018 or 1880
1024	Base, Slate, for 1018 or 1880
1027	Case, Oak 28¾″ for 4 Relays (side by side)
1028	Case, Oak 23¾″ for 2 Relays (end to end)
1034	Carbon Contact for 1018 or 1880
1050	Armature for 1018 or 1880
1052	Rod for 1018 or 1880
1053	Screw for 1018
1054	Screw, Pivot for 1057
1055	Washer for Screw 2317 and Stands 1017 or 2184
1056	Magnet Yoke for 1018 or 1880
1057	Pivot Block, used on 1018 for fastening 1052 to 1016
1058	Block supporting Counterweight for 1018
1059	Nut for 1018 or 1880
1060	Screw holding Carbon Contact for 1018
1061	Counterweight Screw for 1018 or 1880
1102	Nut holding Stands to Base for 1018 or 1880
1659	Case, Oak, 34 5-16″ for 3 Relays (end to end)
1880	Track Relay, Complete, with Magnetic Blowout
1881	Magnetic Contact Post, Complete, for 1880
1885	Magnets, Complete, for 1018 or 1880
1886	Pin for 1018 or 1880
2183	Block supporting Counterweight for 1880
2184	Stand for 1880
2185	Lever for 1880
2186	Pin for 1880
2265	Iron Case, Complete, for 1018 or 1880
2269	Block, Wood, for 2265
2317	Screw, Magnets and Contact Posts to Base for 1018 or 1880
2437	Screw, Armature to Lever for 1018 or 1880
2438	Screw, Slate to Base for 1018 or 1880
2819	Carbon Contact with Holder for 1880

PAGE 135.

1881 Superseded by magnetic contact post 3945, which has a metal shell.

1885 Superseded by magnet 3933 which has a polished hard rubber shell.

2437 Superseded by Screw 3089.

2438 Superseded by Screw 2829.

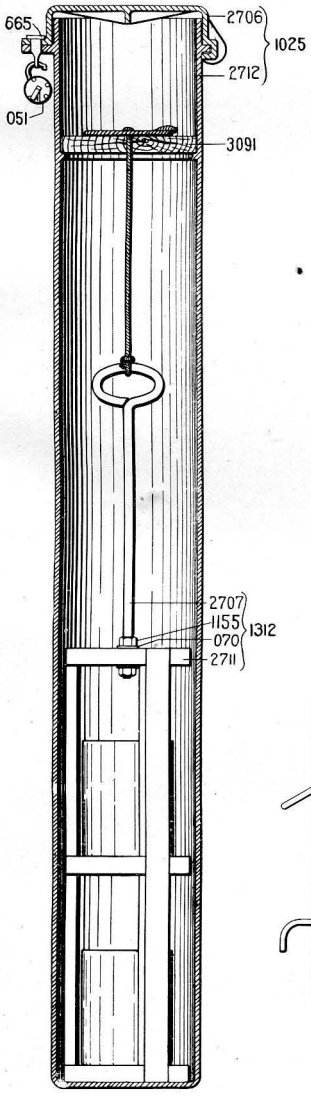
TRACK CIRCUITS

Order No.	BATTERIES AND CHUTES
051	Padlock for 2705, with or without key as specified
070	Washer for 1312
0148	Blue Vitrol for 2704; specify weight required
665	Padlock Pin for 2705
1025	Chute with Cover only, for 2705
1155	Nut for 1312
1312	Two Cell Elevator, Complete, for 2705
2704	Gravity Battery, Complete
2705	Battery Chute with Elevator and Lock, Complete
2706	Cover for 2705
2707	Handle for 1312
2708	6″ x 8″ Glass Jar for 2704
2709	Copper, with connecting wire for 2704
2710	Four Pound Zinc for 2704
2711	Wood work for 1312
2712	Chute for 2705
2714	Connector for Wire Terminal of 2709
3091	Frost Board for 2705
3092	Thumb Screw for 2710 or 2714

PAGE 137.

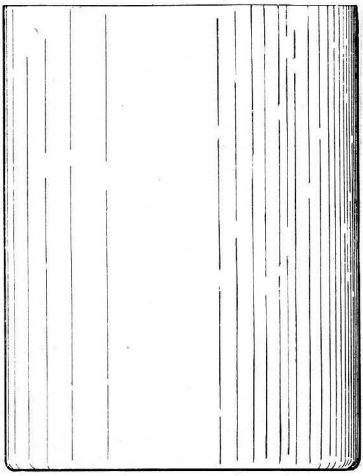
2707	Handle 2707 with its nuts, not used.

BATTERIES AND CHUTES



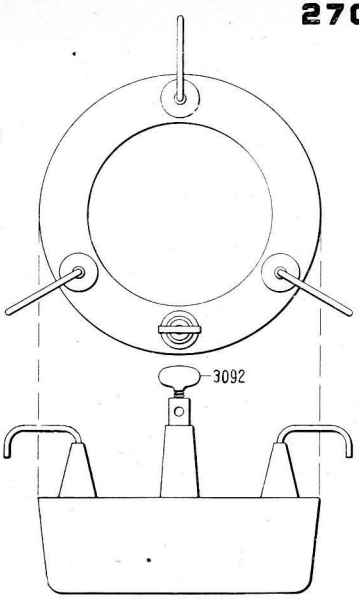
2705

2714

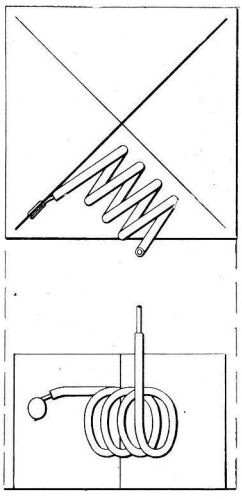


2708

2704



2710



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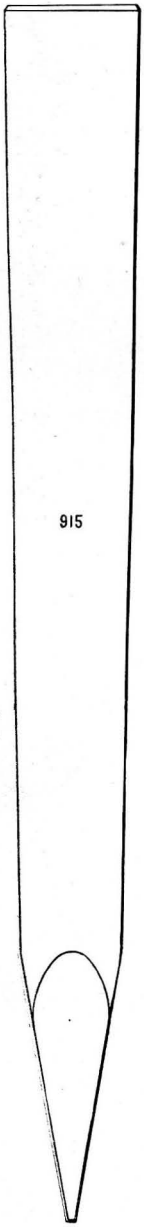
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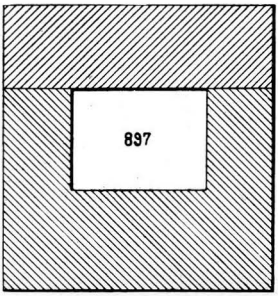
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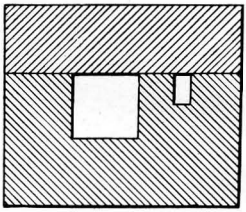
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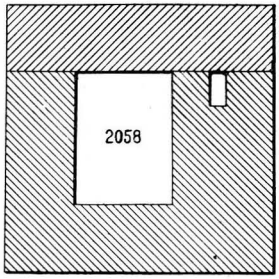
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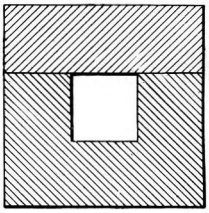
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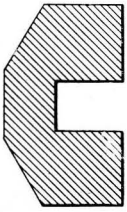
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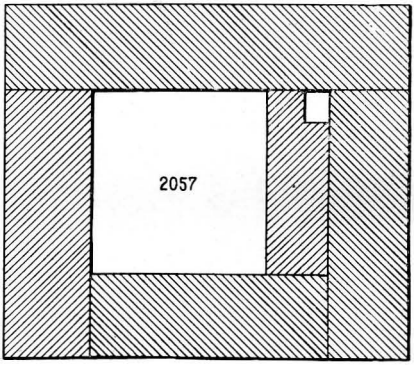

2057

WIRE, STAKES AND TRUNKING

Order No.	LIST OF SIZES		
0139	No. 6, B. & S. Copper Wire }		
0140	No. 8, B. & S. Copper Wire } With Braided, Rubber Covered In-		
0141	No. 10, B. & S. Copper Wire } sulation for use in Trunking. Spec-		
0142	No. 12, B. & S. Copper Wire } ify number of feet required.		
0143	No. 14, B. & S. Copper Wire }		
0144	No. 6, B. & S. Copper Wire }		
0145	No. 8, B. & S. Copper Wire } With "Weatherproof" Insulation.		
0146	No. 10, B. & S. Copper Wire } Specify number of feet required.		
0147	No. 12, B. & S Copper Wire }		
897	Trunking, 3″ x 4″, with Lid 1″ x 4″, groove $1\frac{1}{2}$″ x 2″		
898	Trunking, 2″ x 3″, with lid 1″ x 3″, groove 1″ x 1″		
915	Stakes, diameter 4″, length 3′		
2057	Trunking, 4″ x 6″, with lid $1\frac{1}{4}$″ x 6″, grooves $2\frac{3}{4}$″ x $2\frac{5}{8}$″ and $\frac{1}{2}$″ x $\frac{3}{8}$″		
2058	Trunking, 3″ x 4″, with lid 1″ x 4″, grooves 2″ x $1\frac{1}{2}$″ and $\frac{1}{2}$″x $\frac{1}{4}$″		
2059	Trunking, 2″ x $3\frac{1}{2}$″, with lid 1″ x 3″, grooves 1″ x 1″ and $\frac{1}{2}$″ x $\frac{1}{4}$″		
2747	Trunking, for Wood Poles, $1\frac{3}{4}$″ x 3″, groove 1″ x $\frac{3}{4}$″		

POWER APPARATUS

The most common means of providing power for the operation of the Taylor system is through the medium of a storage battery, a generator and a gasoline engine although, where commercial current of suitable voltage is available, an electric motor is often substituted for the gasoline engine, or the switch board is arranged so as to permit the battery being charged direct from the commercial circuit without the employment of motor and generator.

One hundred and ten volts being required for the operation of switches and signals, fifty-five cells of storage battery of a suitable capacity (as determined by a careful estimate of the number of train and switch movements, within the limits of the plant, during 24 hours) are provided,it being the intention to employ cells of sufficient ampere hour capacity to make it unnecessary to charge them oftener than once in from five to seven days. As the cost of generating sufficient current, with a gasoline engine and generator to fully charge the storage battery, will vary from less than twenty cents in the case of the smaller capacity cells to not over sixty cents for the largest sizes employed, it will be seen that the annual cost for the power required to operate a Taylor plant of even the largest size is such an insignificant item as to be almost eliminated from any calculations as to the cost of maintenance and this can be said of no other power system of interlocking.

Another valuable feature in connection with the use of electric power for the operation of switches and signals is the possibility it affords of lighting the signals as well as the tower electrically and this, in addition to being a great improvement over the ordinary oil lighting, will be a source of economy, especially where there are enough lamps to make the services of a lamp man necessary if oil were used.

The required number of lamps can be lighted from the generator with which the storage battery is charged and the switch board arranged to permit the use of the storage battery for this purpose in case of a temporary breakdown.

GENERATORS.

On pages 145 and 146 are illustrated the one and two kilowatt (K.W.) generators, manufactured by this company. They are designed with special reference to the extraordinary duty required of them, which is: 1st, that they shall have sufficient range in voltage to light 110 volt lamps and also to fully charge the batteries which sometimes take as high as 150 volts (including the drop in the charging wires) and 2nd, that notwithstanding this comparatively great range in voltage they shall, when lighting the lamps and when driven by a gasoline engine, give a reasonably steady voltage, shall not overheat when operating at 150 volts, shall be practically sparkless under all full load conditions and shall not spark injuriously in case full load should accidentally be thrown off at a time when they are delivering 150 volts.

Some of the details in construction are as follows: The machines are shunt wound and run at a speed of 1400 revolutions per minute. They are provided with a convenient means for adjusting the belt tension and have self-oiling bearings and carbon brushes. The brush holder mechanism is shown at 2349 and 2350, section 36. The armature is ventilated and provided with form wound coils individually insulated. The commutator segments are made of the best hard drawn copper, insulated with mica throughout, assembled under heavy pressure and baked at a high temperature, thus insuring durability and smooth running qualities. Both field terminals and both armature terminals are brought to separate binding posts so that the generators may be run in either direction by a simple change of the outside connections.

The machine as a whole is graceful in appearance, highly finished and before shipment is thoroughly tested.

On page 142 is a reduced copy of the instruction card furnished with each machine.

SWITCH BOARDS.

Switch boards of the general design, illustrated in section 37, are manufactured by this company and furnished as required. The exact combination of instruments, switches, etc., is subject to considerable variation depending upon the number of generators and batteries to be employed, upon whether or not electric lighting is required and whether or not a commercial lighting or power circuit is to be provided for lighting or as a reserve. Full information on all these points must be received before the board can be designed.

The boards are made high and narrow so they may be placed between the windows in the upper story of the tower, if desired, without obstructing the view. Where more instruments are required than one board will accommodate, two are furnished, which if convenience requires, may be located at a distance from each other.

The board (2171 section 37) is a form frequently furnished and is designed for one battery, one generator and no lighting. At the top is the voltmeter and below it, the ammeter. The ammeter is connected permanently in series with the battery and indicates whether it is discharging or being charged. It may be well to add here that an ammeter indicates, to a large extent, the working condition of the various switches and signals, and as such is most valuable and should be in full view of the leverman. Between the two instruments are two 16 C. P. lamps which normally glow faintly. If a ground occurs, one lamp will burn brighter than the other, thus indicating its presence and whether it is on the positive or negative side of the system. Below the ammeter is a switch arranged to throw the voltmeter on either battery or generator. On either side of this switch are the battery and generator fuses. Below the switch is an underload circuit breaker which is connected in series with generator and

READ CAREFULLY.

INSTRUCTIONS FOR OPERATING GENERATORS.

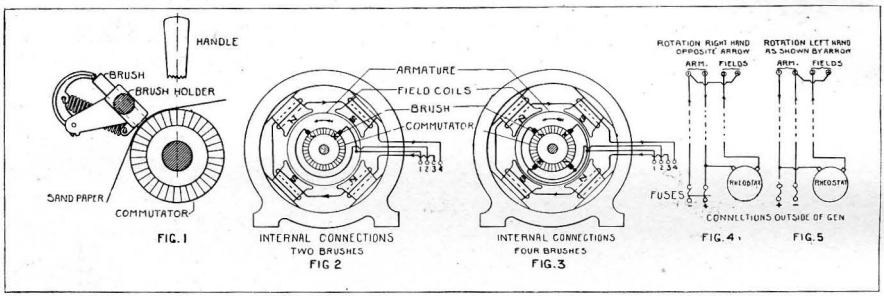


FIG. 1 — INTERNAL CONNECTIONS TWO BRUSHES FIG 2 — INTERNAL CONNECTIONS FOUR BRUSHES FIG. 3 — FIG. 4 — FIG. 5

FOLLOW INSTRUCTIONS IN THE ORDER GIVEN.

1. USE PROPER BRUSHES AND SEE THAT THEY ARE CAREFULLY FITTED TO COMMUTATOR, *as described below.*

Thorough tests have proven that brushes of the grade shipped with the machines are BEST ADAPTED to the work and other brushes are liable to cause trouble NEVER use switch motor brushes or those containing wire gauze.

Fit brushes to commutator by drawing No. 0, sandpaper under them, smooth side to the commutator (as shown in Fig. 1), the brushes to bear on the sandpaper only when it is being drawn in the direction in which the surface of the commutator will run when the machine is in operation.

Before closing circuit to battery, run the Generator light for a time until the brushes are seen (by removal and examination) to have a reasonably good bearing surface.

All machines are shipped with brushes adjusted for left hand rotation (as shown by arrows in Figs. 2 and 3). If machine is to be run in opposite direction or new brushes are to be fitted, proceed as described above.

2. OIL AND ADJUST, *as described below.*

Fill bearings with oil just so they will not run over; start generator running (without closing circuit to battery) seeing that the oil rings are working properly and that the machine is so lined up that the belt runs central and so that the armature plays freely back and forth between its bearings. Keep belt as loose as possible. Change oil occasionally.

3. SEE THAT SPEED IS CORRECT, *as described below.*

At no load, it should be slightly high so that at full load it will come down to within 2% of that marked on the name plate.

4. START, *as described below.*

See that all connections are made as shown in Figs. 2, 3, 4 or 5

Move the brush-shifter until handle stands vertical. Raise brushes from contact with commutator and then close the battery circuit through the generator fields for a few seconds and then open it.

Cut Rheostat resistance all "in"; replace the brushes and then cut "out" resistance until voltage is a little higher than that of the battery.

BE CERTAIN that the Generator voltage is in such relation to that of the battery that the current will flow in at the positive pole of the battery.

5. ADJUST BRUSHES FOR SPARKING, *as described below.*

With the machine running as in 4, close the circuit to the battery and regulate Rheostat until full current, as marked on the name-plate, is flowing. Rock brushes forward or backward until sparking between brushes and commutator ceases and so that injurious sparking will not result when the load is thrown off and the Rheostat is all cut out, the machine thereby generating maximum voltage. Lock and leave brushes in this position.

6. SHUT DOWN, *as described below.*

In shutting down, lower the voltage by means of the Rheostat until the circuit breaker on the switch-board opens of itself and then stop the engine. If no circuit breaker is provided, wait until the current is at zero before opening the switch to the battery.

Never open the circuit with full current on.

7. DO NOT USE LUBRICANTS TOO FREELY ON COMMUTATOR.

The free use of lubricants on the commutator is not recommended.

If at any time the brushes become dry and noisy, boil them five hours in vaseline, wipe dry and replace, refitting by the use of sandpaper as described in section 1, if necessary. Wipe commutator occasionally with a clean rag until the excess vaseline has disappeared. The commutator should assume a dark brown glossy appearance if proper brushes are used and kept from sparking, and if the capacity of the machine as indicated on the name plate is not exceeded.

TAYLOR SIGNAL COMPANY

battery and automatically opens and prevents battery current flowing back through the generator if for any reason the engine should stop unawares. Below the circuit breaker is the rheostat for controlling the charging current. A side view of the board is shown which indicates the method of support.

Board 2268 (section 27) is shown for illustration only. It is one of two boards for controlling one generator, two batteries, the interlocker, the electric signal lights and a commercial lighting circuit. (The board upon which is mounted the instruments, circuit breaker and rheostat is not shown). At the top is located the ground detecting lamps, two for the lighting circuit and two for the regular power circuit. Directly underneath are six switches by which the various required combinations of circuits are set up. The three vertical switches control the lighting circuits and the three pairs of fuses protect the two batteries and the commercial lighting circuit.

The various instruments, switches, etc., are shown in detail section 37 and by reference to the corresponding lists of parts, the function of each may be learned.

POWER APPARATUS

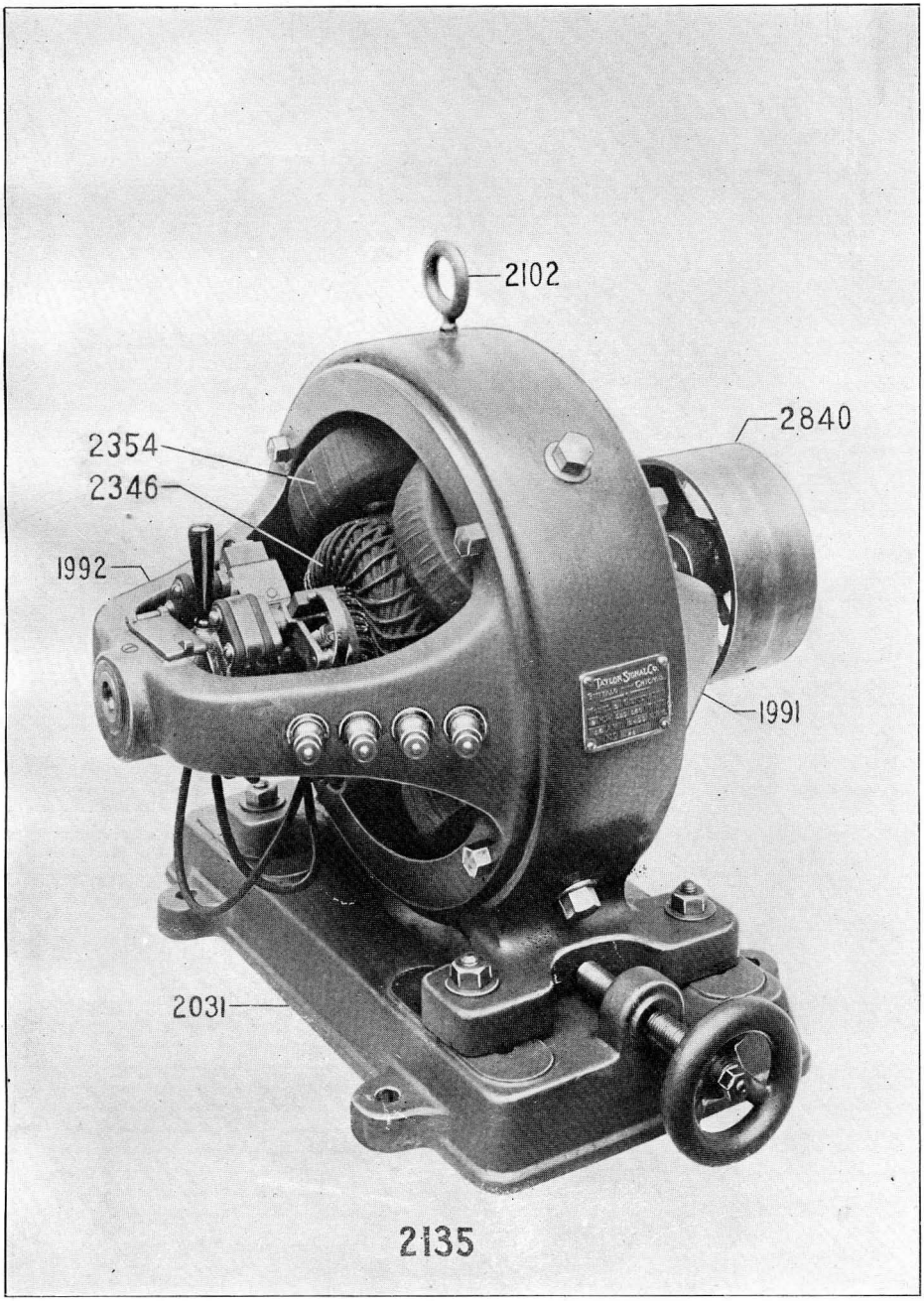
ENGINES AND BATTERIES

Storage batteries and gasoline or gas engines of any desired make are furnished to suit the preference of the purchaser, and the following table shows the size of generator and engine which it is recommended should be used with storage batteries of the various capacities most frequently employed in this class of work.

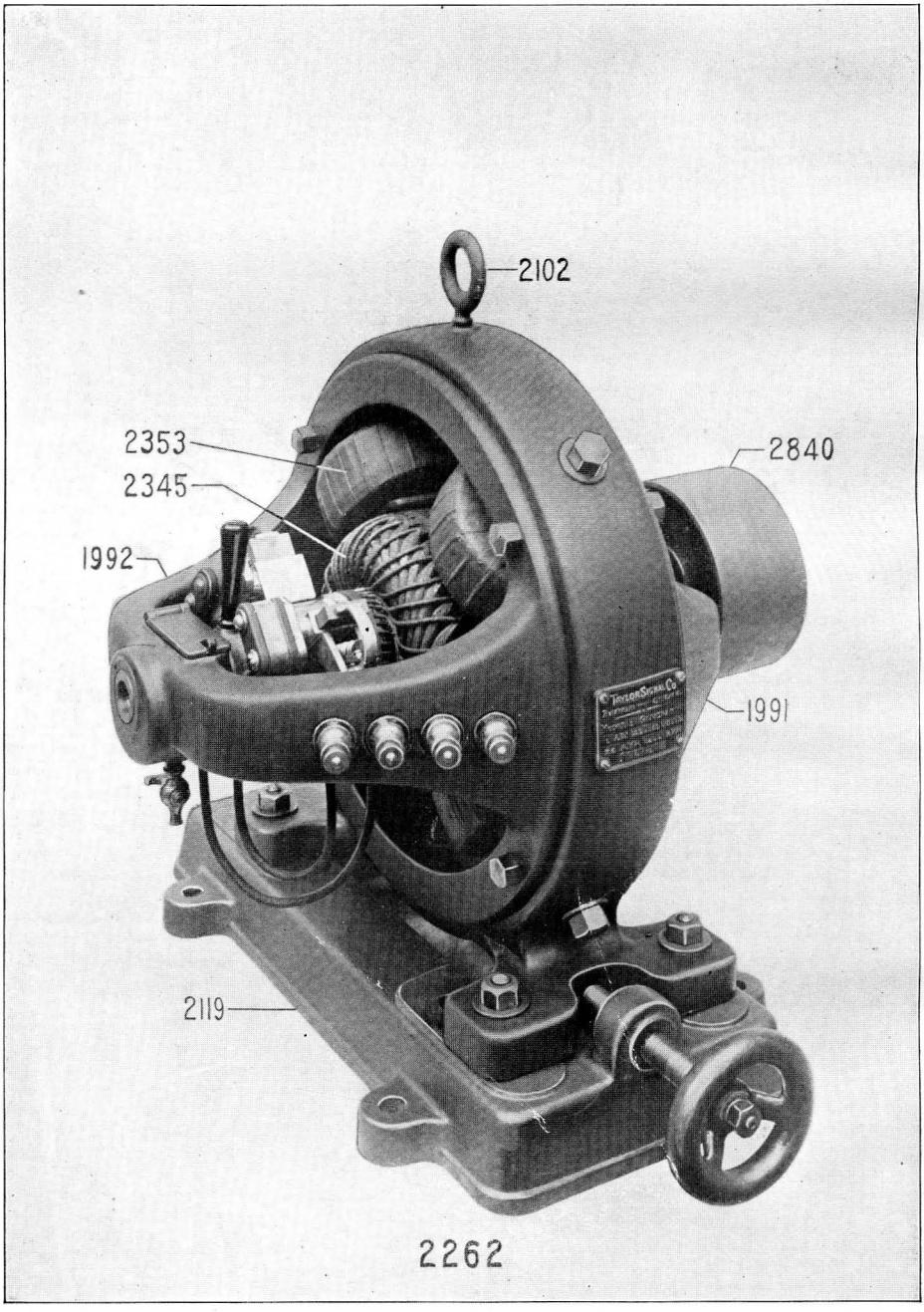
STORAGE BATTERY.	TAYLOR GENERATOR.	GASOLINE OR GAS ENGINE.
30 A. H. Capacity	1 Kilowatt	2 H. P.
40 " "	1 "	2 "
60 " "	1 "	2 "
80 " "	2 "	4 "
100 " "	2 "	4 "
120 " "	2 "	4 "
150 " "	2½ "	5 "

In ordering, specify make of battery or engine desired.

Order No.			



TWO KILO-WATT GENERATOR



ONE KILO-WATT GENERATOR

POWER APPARATUS

Order No.	GENERATORS		
027	Key for 2776		
028	Key for Pulleys		
072	Washer for 092		
079	Bibb Cock for Oil Wells		
082	Lag Screw, Generator to floor		
092	Bolt with Nut, holding Generators to Bases		
0105	Leather Belt, 2½″ single ply, for Generators 2135 or 2262; specify length		
506	Washer for 2098 or 2099		
528	Nut for 2598		
845	Base for 2598		
846	Thumb Nut for 2598		
847	Lock Nut for 2598		
879	Screw for 2598		
1061	Screw for 2349 or 2350		
1156	Nut for 2776		
1407	Terminal for 2349 or 2350		
1547	Arm for 2098 or 2099		
1553	Pin for 2098 or 2099		
1581	Spring for 2098 or 2099		
1834	Insulating Washer for 2598		
1893	Terminal for 2349 or 2350		
1991	Back Bearing Bracket for 2135 or 2262		
1992	Front Bearing Bracket for 2135 or 2262		
2031	Base for 2135		
2036	Bushing for 2778		
2047	Brush Holder for 2098		
2048	Brush Holder for 2099		
2049	Arm, supporting Brush Holders, for 2350		
2050	Cover for Oil Wells		
2068	Screw holding 2777 or 2778 to Brackets		
2069	Oil Ring for 2777 or 2778		
2076	Handle for 2349 or 2350		
2094	Insulator for 2098 or 2099		
2098	Brush Holder, Right Hand, complete for 2349 or 2350		
2099	Brush Holder, Left Hand, complete for 2349 or 2350		
2102	Eye Bolt for 2135 or 2262		
2103	Pin for 2050		

POWER APPARATUS

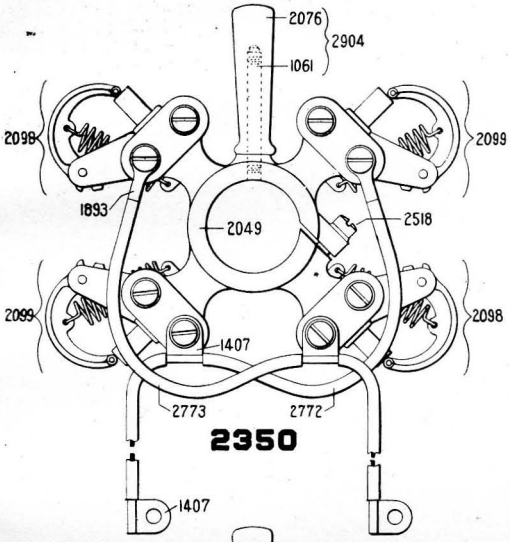
Order No.	GENERATORS		
2116	Screw for 2776		
2117	Hand Wheel for 2776		
2118	Washer for 2776		
2119	Base for 2262		
2135	Two Kilo Watt Generator, Complete		
2137	Arm supporting Brush Holders for 2349		
2262	One Kilo Watt Generator, Complete		
2345	Armature, Complete, for 2262		
2346	Armature, Complete, for 2135		
2349	Brush Holders with Arm, Complete, for Generator 2262		
2350	Brush Holders with Arm, Complete, for Generator 2135		
2353	Shunt Field Coil for 2262		
2354	Shunt Field Coil for 2135		
2368	Bushing for 2777		
2370	Insulating Bushing for 2098 or 2099		
2400	Washer for 2521		
2402	Guide for 2777 or 2778		
2417	Carbon Brush for 2349 or 2350		
2489	Screw for 2098 or 2099		
2518	Screw for 2349 or 2350		
2519	Screw for 2777 or 2778		
2521	Cap Screw, holding Magnet Cores for 2135 or 2262		
2595	Insulating Strip for Binding Posts		
2596	Insulating Bushing for 2598		
2598	Binding Post, Complete, for Generators 2135 or 2262		
2612	Insulating Washer for 2598		
2772	Lead Wire, long, with Terminals for 2350		
2773	Lead Wire, short, with Terminals for 2350		
2774	Lead Wire, long, with Terminals for 2349		
2775	Lead Wire, short, with Terminals for 2349		
2776	Belt Tightening Screw, Complete, for 2135 or 2262		
2777	Bushing complete for Bearing Bracket 1991		
2778	Bushing complete for Bearing Bracket 1992		
2818	Cap Screw holding Brackets 1991 or 1992		
2840	Pulley, 7″ diameter, 3″ face, for 2135 or 2262		
2841	Set Screw for Pulley 2840		
2904	Handle with Screw 2349 or 2350		

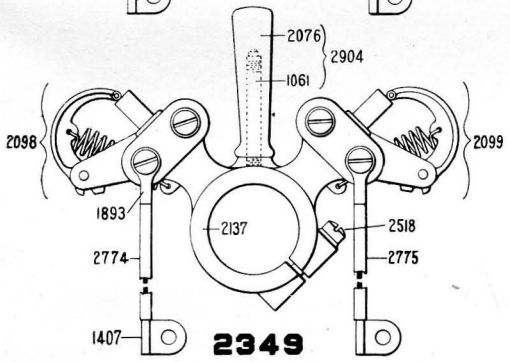
PAGE 148

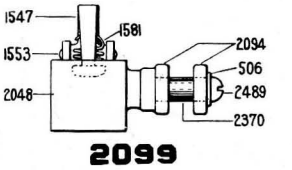
2345	Superseded by Armature 4353.
2489	Superseded by Screw 4579.
2521	Superseded by Screw 4514.

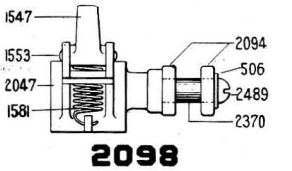
POWER APPARATUS

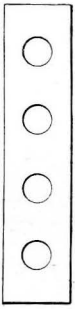
GENERATOR PARTS

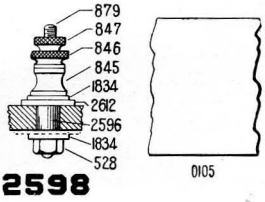


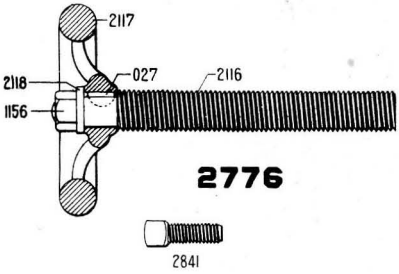


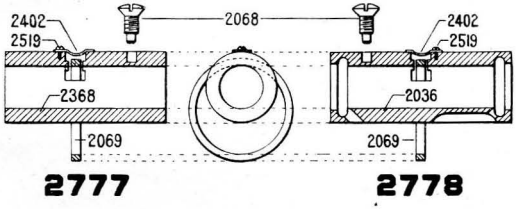


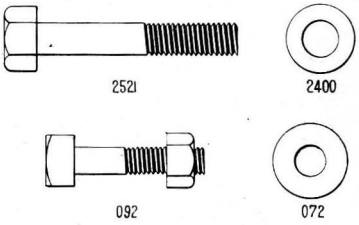


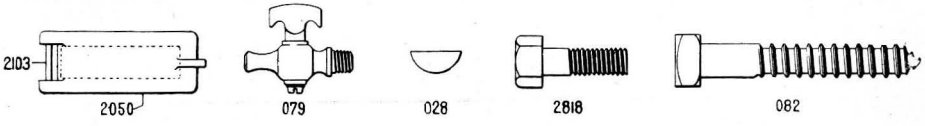








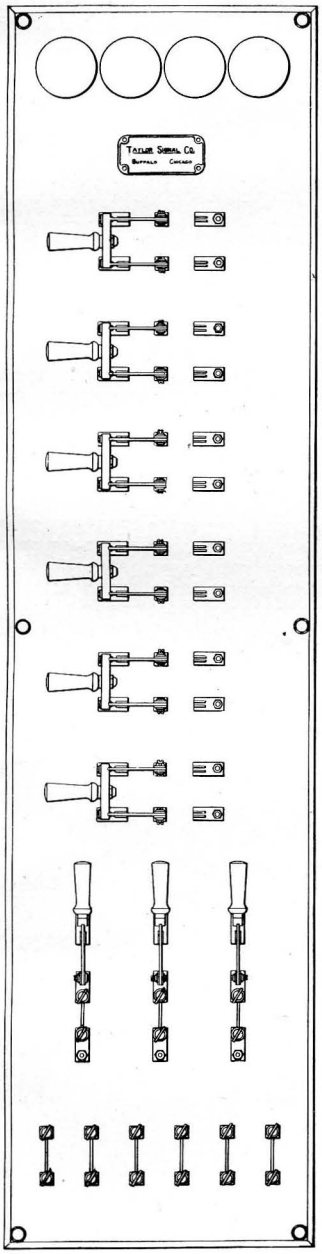




Order No.		

POWER APPARATUS

SWITCH BOARDS



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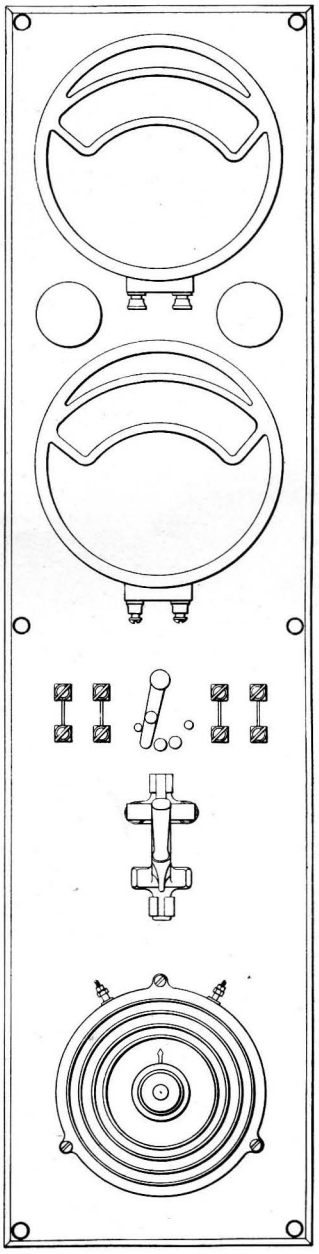

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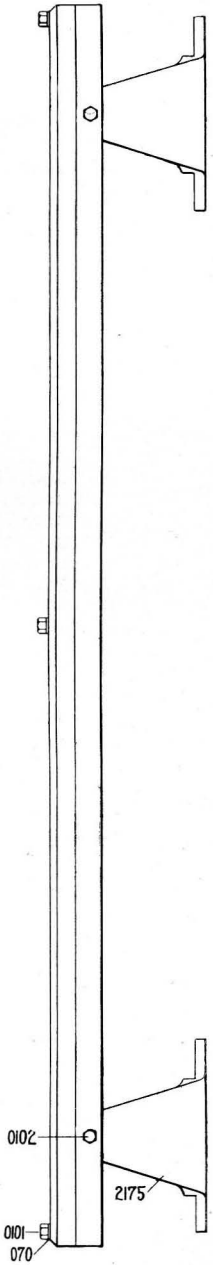


POWER APPARATUS

Order No.	SWITCH BOARDS		
064	Lag Screw, Brackets 2175 to wall		
069	Washer for 2912 and 2913		
070	Washer for 0101		
0101	Bolts Holding Switch Boards to Angle Iron Braces		
0102	Bolts holding Switch Boards to Brackets 2175		
0104	Rheostat for 1 K. W. or 2 K. W. Generator		
0107	Lamp Bracket		
0108	Volt Meter, 0-150 Volt Scale		
0109	Lamp, 16 C. P., 110 Volts		
0110	Ammeter with "0-25" Ampere Scale		
0111	Ammeter with "0-50" Ampere Scale		
0112	Ammeter with "15-0-35" Ampere Scale as shown, for indicating both charge and discharge		
506	Washer for 2070		
528	Nut for 2070, also 1894 and others		
740	Nut for 2912, 2913, also 1984 and others		
975	Washer for 2911, 2070, also 1984 and others		
1245	Pin for 1981, used with Washer 1987		
1407	Wire Terminal for $\frac{1}{4}$" Screw		
1408	Wire Terminal for $\frac{3}{8}$" Screw		
1418	Stud for 2070		
1981	Voltmeter Switch, Single Pole, Two Circuit		
1982	Voltmeter Switch, Single Pole, Three Circuit		
1983	Voltmeter Switch, Double Pole, Two Circuit		
1984	Voltmeter Switch, Double Pole, Three Circuit		
1987	Washer for 1981, used with Spring 2005		
1988	Contact for 1984 and others, 2800 excepted		
1989	Contact, Insulating, for 1984 and others		
1994	Washer for 1984 and others		
1995	Screw for 1984 and others		
1996	Lever for 1984 and others		
1997	Stop for 1984 and others		
1998	Stud for 1984 and others		
1999	Handle for 1984 and others		
2000	Cross Bar for 1984 and others		

PAGE 152.

2070 In ordering specify coils as follows:

For 10 ampere underload breakers order two coils 2078.

For 15 ampere underload breakers order two coils 2827.

For 20 ampere underload breakers order two coils 4869.

For 10 ampere differential breakers order one coil 2078 and 1 coil 3211.

For 15 ampere differential breakers order one coil 2827 and one coil 3211.

For 20 ampere differential breakers order one coil 4869 and one coil 3211.

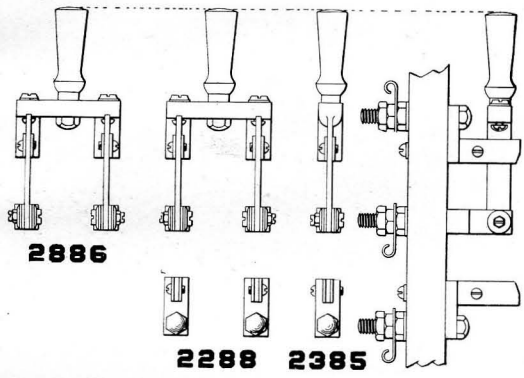
NOTE:—The "underload" circuit breakers open before the current reaches zero.

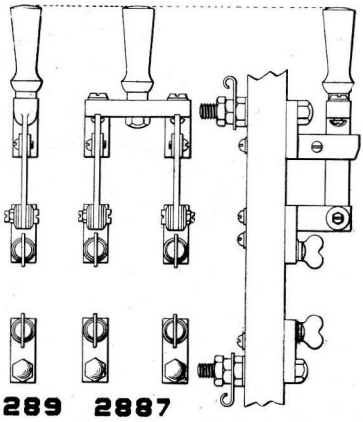
The "differential" circuit breakers open only after the current passes zero and starts to reverse.

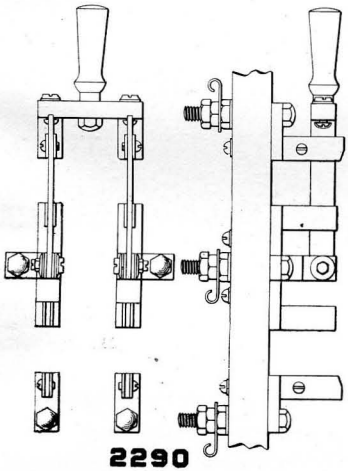
2086 Superseded by Spring 3276.

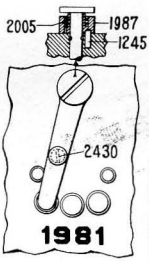
POWER APPARATUS

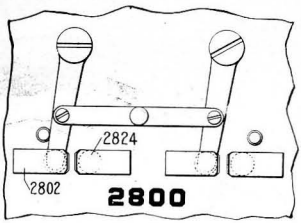
SWITCH BOARD PARTS

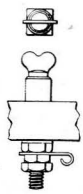


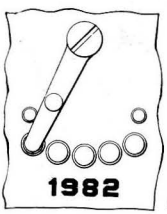


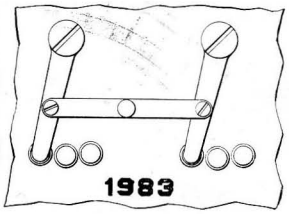


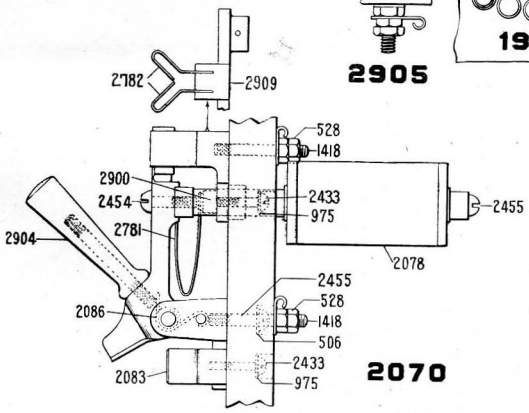


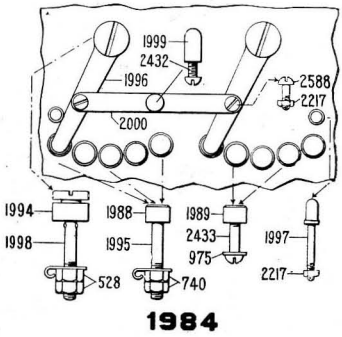






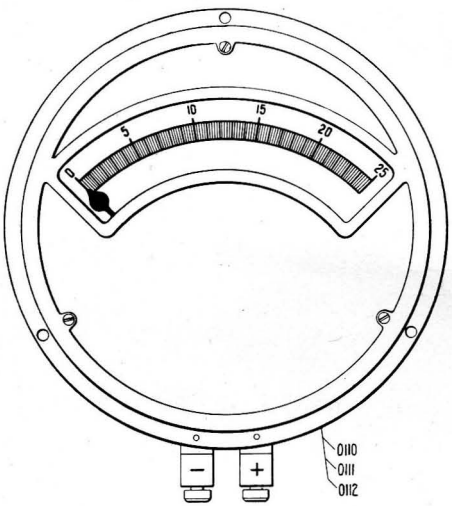


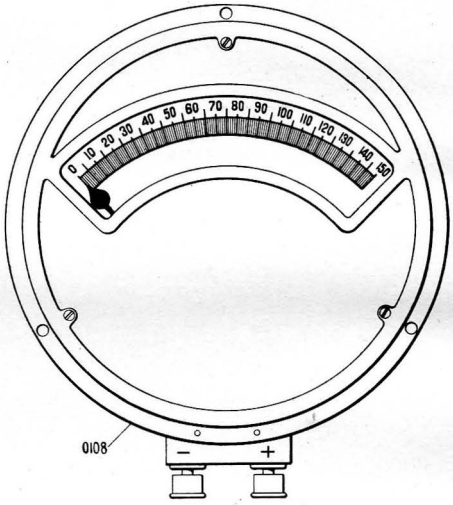


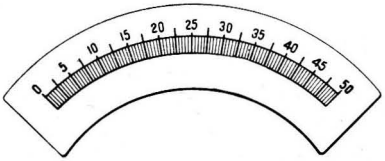


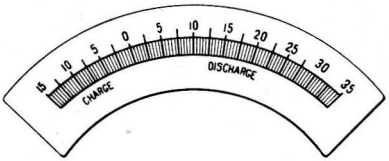
POWER APPARATUS

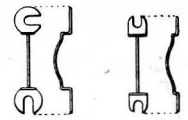
SWITCH BOARD PARTS

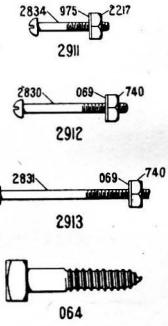


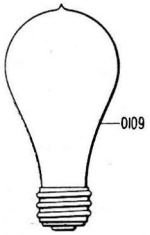


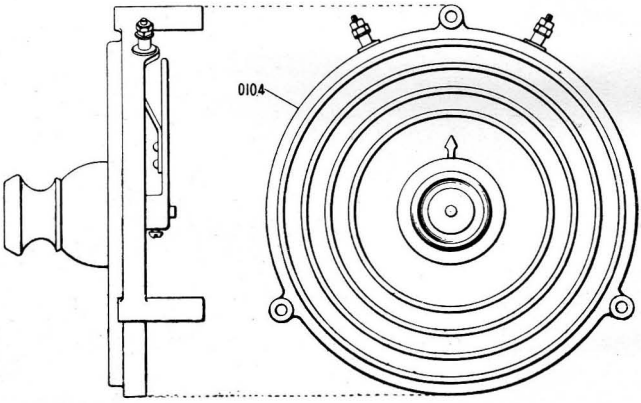












POWER APPARATUS

Order No	SWITCH BOARDS		
2171	Switch Board complete for one Generator, one Battery, no Lighting	....	....
2175	Brackets supporting Switch Boards 2171 and others	....	....
2217	Nut for 2911, 1984 and others	....	....
2259	Fuse, 10, 15, 20, 25 or 30 Ampere as specified	....	....
2260	Fuse, 40, 50 or 60 Ampere as specified	....	....
2268	Switch Board, Special, for illustration only	....	....
2288	Knife Switch, 25 Ampere, Double Pole, Double Throw	....	....
2289	Knife Switch, 25 Ampere, Single Pole, Single Throw with Fuse	....	....
2290	Knife Switch, 25 Ampere, Double Pole, Double Throw with Extra Contact at Hinge	....	....
2385	Knife Switch, 25 Ampere, Single Pole, Double Throw	....	....
2430	Screw for 1981 or 1982	....	....
2432	Screw for 1983, 1984 or 2800	....	....
2433	Screw for 1984, 2070 and others	....	....
2454	Screw for 2070	....	....
2455	Screw for 2070	....	....
2588	Screw for 1984 and others	....	....
2781	Auxiliary Contact Spring for 2070	....	....
2782	Contact Spring for 2070	....	....
2800	Ammeter Pole Changer	....	....
2802	Contact Spring for 2800	....	....
2824	Contact for 2800	....	....
2830	Screw for 2912	....	....
2831	Screw for 2913	....	....
2834	Screw for 2911	....	....
2886	Knife Switch, 25 Ampere, Double Pole, Single Throw	....	....
2887	Knife Switch, 25 Ampere, Double Pole, Single Throw with Fuse	....	....
2900	Carbon Contact with Holder for 2070	....	....
2904	Handle with Screw for 2070	....	....
2905	Fuse Post, 25 Ampere	....	....
2906	Fuse Post, 50 Ampere	....	....
2909	Contact Block with Springs complete for 2070	....	....
2911	Screw with Nut and Washer, Lamp Socket to Board	....	....
2912	Screw with Nut and Washer, Instruments to Board	....	....
2913	Screw with Nut and Washer, Rheostat to Board	....	....
.....	.....	....	....
.....	.....	....	....
.....	.....	....	....

PAGE 155.

2588 Superseded by Screw 3827.

TOWERS

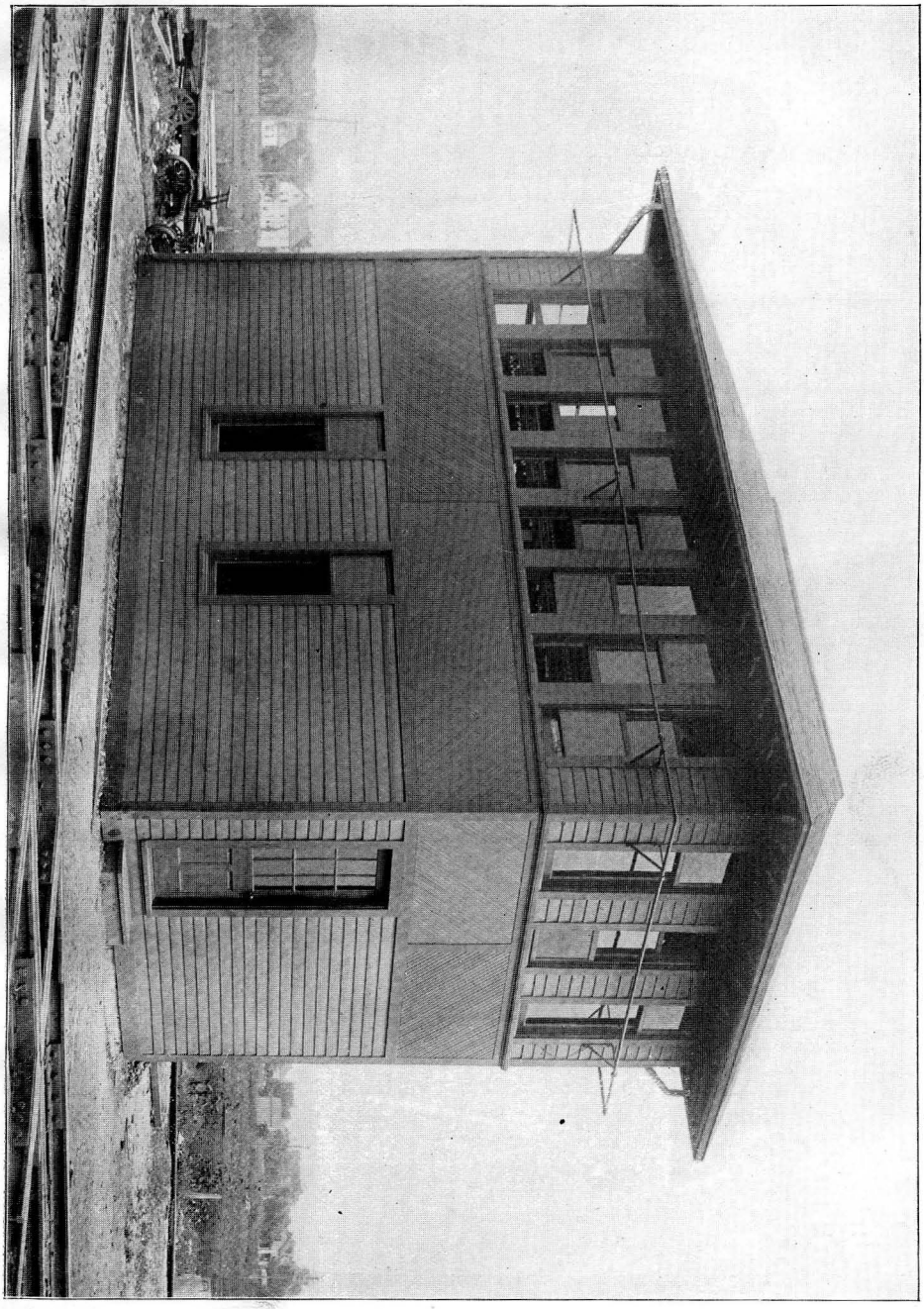
On the opposite page is an illustration of our standard tower which is furnished of any desired size and with either inside of outside stairway.

For a plant of moderate size it is customary to place the generator and gasoline engine on suitable foundations, and the storage battery in a convenient cupboard, provided with ventilating pipes, in the lower story of the tower, but where, for any reason, it is deemed preferable, a separate one-story power house for the engine and generator is provided in close proximity to the tower.

Below is given a list of the various sizes of towers most commonly used but, should any intermediate size be required, the inside dimensions may be determined by multiplying the number of spaces in the interlocking machine by two inches and adding five feet for clearance between the walls and ends of machine. All towers are 12 feet wide inside.

Order No.	LIST OF PARTS.		
695	12 feet long for machines of from 8 to 40 spaces		
3178	15 " " " " " " 44 " 60 "		
3179	17 " " " " " " 64 " 72 "		
3180	19 " " " " " " 76 " 84 "		
3181	22 " " " " " " 88 " 104 "		
3182	27 " " " " " " 108 " 132 "		
764	30 " " " " " " 136 " 152 "		

Order by Section and Number



BOLTS, SCREWS, ETC.

The following is a list of commercial bolts, cotter pins, lag screws, screws and rivets. In giving dimensions the diameter or number is given first, the number of threads per inch next (when required), and lastly, the length.

The following abbreviations have been used: br. (brass); hd. (head); mch. (machine); pt. (point); C. S. (countersunk); hdls. (headless); rd. (round); fil. (fillister); hex. (hexagon); sq. (square).

BOLTS AND NUTS

Order No	NAME		SECTION
02	Sq. hd. mch.	$\frac{1}{4}$-20x1	22, 23, 26, 28
03	" " "	$\frac{1}{4}$-20x1$\frac{1}{2}$	22
04	" " "	$\frac{1}{4}$-20x1$\frac{3}{4}$	22
06	" " "	$\frac{3}{8}$-16x1	23, 24, 26, 21
07	" " "	$\frac{3}{8}$-16x1$\frac{1}{4}$	18
08	" " "	$\frac{3}{8}$-16x2	26
010	" " "	$\frac{1}{2}$-13x1$\frac{1}{2}$	23, 26, 29, 15, 21
011	" " "	$\frac{1}{2}$-13x2	4, 22, 25, 18
012	" " "	$\frac{1}{2}$-13x2$\frac{1}{2}$	4, 25
013	" " "	$\frac{1}{2}$-13x6	25
014	" " "	$\frac{1}{2}$-13x6$\frac{1}{2}$	25
015	" " "	$\frac{1}{2}$-13x7	25
016	" " "	$\frac{1}{2}$-13x7$\frac{1}{2}$	25
017	" " "	$\frac{1}{2}$-13x8	22
018	" " "	$\frac{5}{8}$-11x4	24
019	" " "	$\frac{5}{8}$-11x4$\frac{1}{2}$	22
022	" " "	$\frac{3}{4}$-10x6	18
023	" " "	$\frac{3}{4}$-10x6$\frac{1}{2}$	24
024	" " "	$\frac{3}{4}$-10x2$\frac{1}{4}$	24
077	" " "	$\frac{1}{2}$-13x1$\frac{1}{4}$	22
086	" " "	$\frac{5}{8}$-11x12	24
092	" " "	$\frac{7}{8}$-13x2$\frac{1}{2}$, hex. nut	36
098	" " "	$\frac{1}{2}$-13x3$\frac{3}{4}$	22
0101	Hex. hd. mch.	$\frac{5}{16}$-18x1$\frac{3}{4}$	37
0102	" " "	$\frac{5}{16}$x1	37
0117	Sq. hd. mch.	$\frac{1}{2}$-13x9	25
0118	" " "	$\frac{1}{2}$-13x12	25
0119	" " "	$\frac{1}{2}$-13x14	25, 21
0120	Carriage	$\frac{5}{8}$x2$\frac{1}{2}$	21
0127	Sq. hd. mch.	$\frac{5}{8}$-11x2$\frac{1}{4}$, hex. nut	18
0128	C. S. hd. mch.	$\frac{3}{4}$-10x1$\frac{1}{2}$, sq. nut	28
0131	Sq. hd. mch.	$\frac{3}{4}$-10x13	21
0134	" " "	$\frac{1}{4}$-20x$\frac{3}{4}$	28
0135	" " "	$\frac{5}{8}$-11x9	24
0149	" " "	$\frac{5}{8}$-11x2$\frac{1}{2}$	4
0151	" " "	$\frac{3}{4}$-10x10	21
0152	" " "	$\frac{3}{4}$-10x20	21
0153	" " "	$\frac{3}{4}$-10x14$\frac{1}{2}$	21
.....	.....	.....	.....
.....	.....	.....	.....

PAGE 158.

0128 Should be section 18 instead of section 28.

SCREWS

Order No.	NAME		SECTION
084	Sq. hd. cap	$\frac{3}{8}$-16x1$\frac{1}{2}$	25
094	Flat hd. wood	10x1$\frac{1}{4}$	16
095	" " "	12x1$\frac{1}{2}$	16
0122	Rd. hd. br. wood	6x$\frac{3}{8}$	14
422	Sq. hd. rd. pt. set	$\frac{5}{16}$-18x$\frac{1}{2}$	11
982	Sq. hd. cap	$\frac{3}{8}$-16x1$\frac{3}{4}$	28
1104	" " "	$\frac{5}{16}$-18x1	4
1410	Rd. hd. mch.	12-28x1$\frac{1}{2}$	24. 28.

PAGE 159.

2427 Should be 8-32 x 5/16-in.

2433		8-32x$\frac{5}{8}$	28, 37
2434	" " "	10-32x$\frac{1}{4}$	24
2435	" " "	10-32x$\frac{3}{8}$	25
2436	Flat hd. br.	10-32x$\frac{3}{8}$	7
2437	C. S. hd. mch.	10-32x$\frac{1}{2}$	31
2438	Rd. hd. br. mch.	10-32x$\frac{1}{2}$	31
2441	Rd. hd. mch.	12-28x$\frac{7}{8}$	28
2446	Rd. pt. set	$\frac{1}{4}$-20x$\frac{3}{8}$	25
2447	Sq. hd. cap	$\frac{1}{4}$-20x$\frac{7}{8}$	29
2457	" " "	$\frac{5}{16}$-18x$\frac{3}{4}$	25, 13.
2459	Sq. hd. cup pt. set	$\frac{5}{16}$-18x1$\frac{1}{4}$	11
2460	Sq. hd. rd. pt. set	$\frac{5}{16}$-18x1$\frac{1}{4}$	24
2461	Sq. hd. cap	$\frac{5}{16}$-18x1$\frac{1}{2}$	10
2462	Flat hd. mch.	$\frac{5}{16}$-18x1$\frac{1}{2}$	4
2467	Cup pt. sq .hd. set	$\frac{3}{8}$-16x$\frac{1}{2}$	26
2468	Rd. pt. sq. hd. set	$\frac{3}{8}$-16x$\frac{3}{4}$	25
2469	Sq.. hd. cap	$\frac{3}{8}$-16x$\frac{3}{4}$	26, 28.
2470	Rd. pt. hdls. set	$\frac{3}{8}$-16x$\frac{7}{8}$	11
2471	Sq. hd. cap	$\frac{3}{8}$-16x1	10, 28
2474	Fil. hd. mch.	$\frac{3}{8}$-16x1$\frac{1}{2}$	4
2476	Sq. hd. cap	$\frac{3}{8}$-16x2$\frac{1}{2}$	10
2478	" " "	$\frac{1}{2}$-13x$\frac{3}{4}$	22
2479	" " "	$\frac{1}{2}$-13x1	13
2480	Flat hd. mch.	$\frac{1}{2}$-13x1	28
2482	Rd. pt. set	$\frac{1}{2}$-13x1$\frac{1}{2}$	24
2483	Sq. hd. cap	$\frac{3}{4}$-10x2$\frac{1}{2}$	12
2484	" " "	$\frac{3}{4}$-10x2$\frac{3}{4}$	11
2485	" " "	$\frac{3}{4}$-10x3$\frac{1}{4}$	12
2486	Rd. hd. mch.	$\frac{5}{16}$-18x1$\frac{1}{4}$	25
2524	Sq. hd. cap	$\frac{5}{16}$-18x1	10
2552	Rd. hd. mch.	6-32x$\frac{3}{8}$	25
2553	Rd. hd. br. mch.	8-32x1	5
2556	Rd. hd. mch.	12-24x$\frac{3}{8}$	25
2588	Rd. hd. br. mch.	8-32x$\frac{1}{2}$	37
2784	Rd. hd. mch.	10-32x$\frac{5}{8}$	11
2818	Hex. hd. cap	$\frac{1}{2}$-13x1$\frac{1}{2}$	36
2834	Rd. hd. br. mch.	8-32x1$\frac{1}{2}$	37
2841	Sq. hd. cup. pt. set	$\frac{3}{8}$-16x1	36
2878	Hex. hd. cap	$\frac{5}{16}$-18x1$\frac{1}{2}$	29
2890	" " "	$\frac{5}{8}$-11x2$\frac{1}{4}$	10
2891	Hex. hd. cap	$\frac{5}{8}$-11x1$\frac{1}{2}$	10
2999	Rd. hd. br. mch.	6-32x$\frac{3}{8}$	14
3044	Rd. hd. mch.	10-32x1	14
3057	Sq. hd. rd .pt. set	$\frac{3}{8}$-16x1$\frac{3}{4}$	14
3089	Flat hd. br. mch.	10-32x$\frac{1}{2}$	14

COTTER PINS

Order No.	NAME		SECTION
034	Cotter Pin	$\frac{3}{32}$x$\frac{1}{2}$	13, 16, 28, 25, 24
035	" "	$\frac{3}{32}$x$\frac{5}{8}$	5, 13
036	" "	$\frac{3}{32}$x$\frac{3}{4}$	14, 28
038	" "	$\frac{1}{8}$x$\frac{1}{2}$	24
039	" "	$\frac{1}{8}$x$\frac{3}{4}$	11
040	" "	$\frac{1}{8}$x1	14, 24, 28, 29
041	" "	$\frac{1}{8}$x1$\frac{1}{4}$	23, 10
042	" "	$\frac{3}{16}$x1	18
043	" "	$\frac{3}{16}$x1$\frac{1}{4}$	18, 26, 12, 29
044	" "	$\frac{3}{16}$x1$\frac{1}{2}$	18, 22, 26, 15
045	" "	$\frac{3}{16}$x1$\frac{3}{4}$	10, 11
046	" "	$\frac{3}{16}$x2	18, 12, 29
047	" "	$\frac{1}{4}$x1$\frac{1}{2}$	18, 22
048	" "	$\frac{1}{4}$x1$\frac{3}{4}$	11
049	" "	$\frac{1}{4}$x3	23, 24, 12
050	" "	$\frac{1}{4}$x4	18
088	" "	$\frac{3}{16}$x$\frac{3}{4}$	5

LAG SCREWS

Order No.	NAME		SECTION
062	Lag Screw	$\frac{3}{8}$x2$\frac{1}{2}$	31
064	" "	$\frac{1}{2}$x2$\frac{1}{2}$	18, 22, 23, 26, 37, 21
065	" "	$\frac{1}{2}$x3	25, 29
066	" "	$\frac{5}{8}$x3	10, 21
067	" "	$\frac{3}{4}$x4	18, 23, 24, 15, 16
068	" "	$\frac{3}{4}$x5	21
082	" "	$\frac{5}{8}$x4	36

RIVETS

Order No.	NAME		SECTION
058	Rd. hd.	$\frac{3}{16}$x$\frac{3}{4}$	28
059	" "	$\frac{1}{2}$x1$\frac{1}{8}$	18
060	" "	$\frac{5}{8}$x1$\frac{1}{8}$	18
089	C. S. "	$\frac{5}{8}$x1	16
096	" " "	$\frac{3}{16}$x$\frac{1}{4}$	16
097	Rd. "	$\frac{3}{4}$x2$\frac{1}{4}$	15
099	C. S. hd.	$\frac{3}{4}$x1$\frac{1}{2}$	16
0114	Rd. hd.	$\frac{1}{4}$x1$\frac{1}{2}$	18
0115	" "	$\frac{1}{4}$x1$\frac{1}{4}$	23

TABLE OF CONTENTS