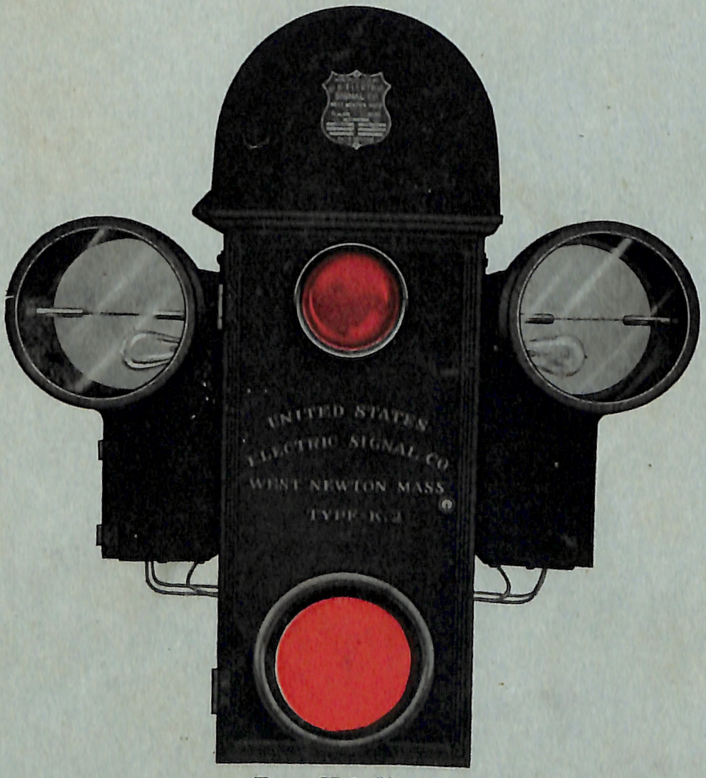
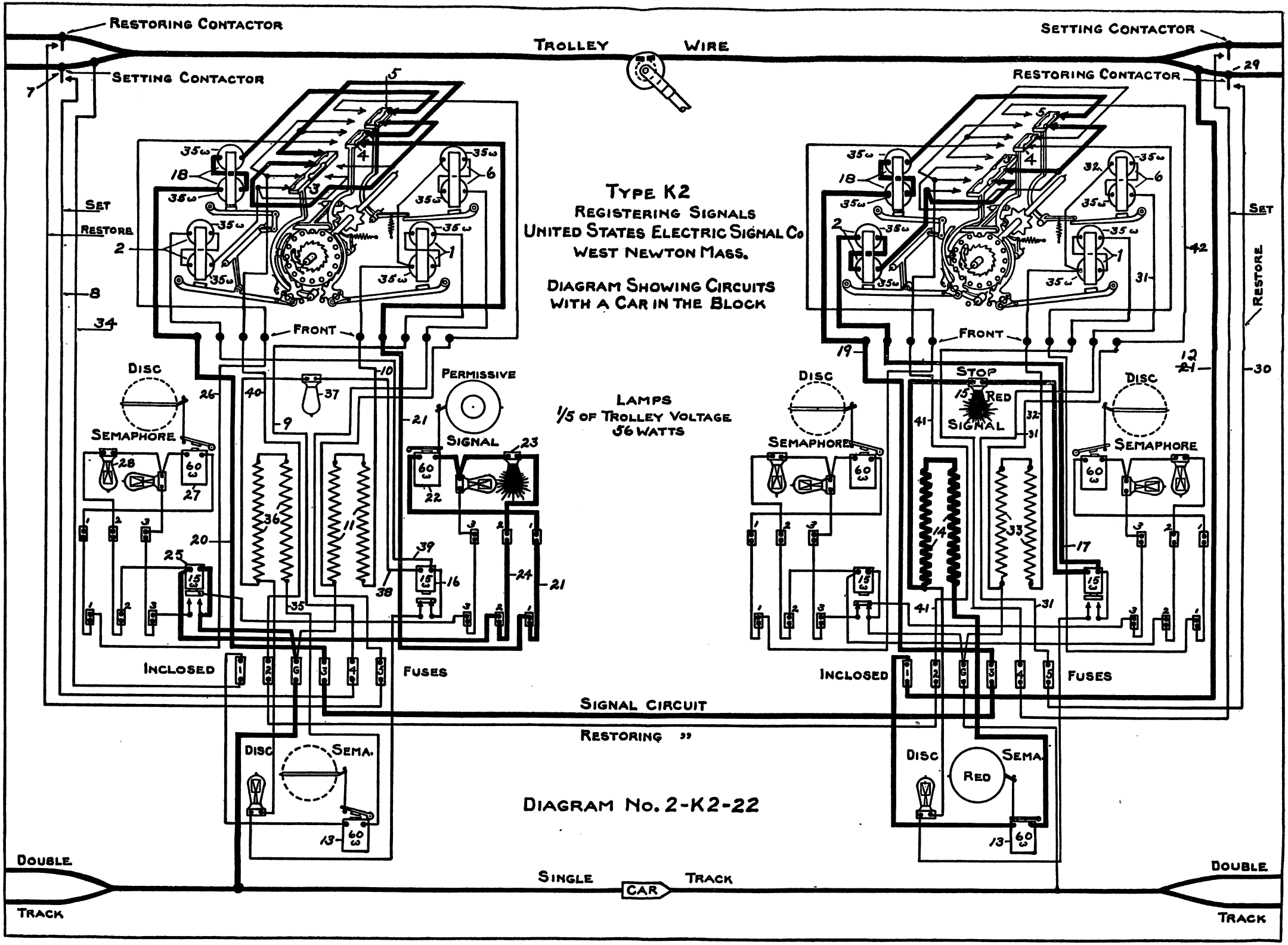
UNITED STATES ELECTRIC SIGNALS



Type K-2 Signal.

PRESERVE FOR REFERENCE


RESTORING CONTACTOR
SETTING CONTACTOR
TROLLEY WIRE
SETTING CONTACTOR
RESTORING CONTACTOR
TYPE K2
REGISTERING SIGNALS
UNITED STATES ELECTRIC SIGNAL Co
WEST NEWTON MASS.
DIAGRAM SHOWING CIRCUITS
WITH A CAR IN THE BLOCK
LAMPS
1/5 OF TROLLEY VOLTAGE
56 WATTS
SET
RESTORE
FRONT
DISC
SEMAPHORE
PERMISSIVE
SIGNAL
STOP
RED
INCLOSED
FUSES
SIGNAL CIRCUIT
RESTORING "
DISC
SEMA.
RED
DIAGRAM No. 2-K2-22
DOUBLE TRACK
SINGLE TRACK
CAR
DOUBLE TRACK

BALLARAT TRAMWAY
Catalogue

No 2
PRESERVATION SOCIETY

PREFACE

IT is the purpose of this bulletin to set forth by means of photographs, descriptions and drawings, the method of operation of this system together with its mechanical and electrical features.

In 1898 this Company began to manufacture automatic block signals for electric railways, and it has kept pace with the rapid developments of the past decade. No better evidence of its success could be established than that it is receiving orders from all countries where the electric railway is known. This Company, therefore, is in close touch with the needs and most advanced practices of electric railway operations of the world.

Particular knowledge of practical requirements, coupled with the best material, scientific tests and high-class workmanship, enables us to produce the most reliable signal devices of which experience, skill and ingenuity are capable.

Advice and suggestions in complicated signal propositions to-gether with plans and estimates will be cheerfully furnished. Correspondence on these subjects is invited.

Nachod and United States Signal Co., Inc.
—SUCCESSORS TO—
THE UNITED STATES ELECTRIC SIGNAL CO.
4771-4777 LOUISVILLE AVENUE
LOUISVILLE, KY., U.S.A.

THIS BULLETIN

Contains information pertaining to our Type-K-2 Counting signal, with semaphore attachment.

INQUIRIES

1. Send us a sketch of the road you intend to signal showing the length of and distances between turn-outs.
2. What is the maximum speed allowed in running through turn-outs?
3. Do your cars always take the right or left hand track, whether meeting cars or not?
4. Do you use a double or single trolley wire?
5. Do you use spring track switches and can they be manually operated?
6. Give us all the information you can concerning the running of cars in and about turn-outs.

ORDERS

For signals must be accompanied by the following information.

1. The maximum voltage at turn-outs.
2. The size and shape of trolley wire.
3. The size of standard ear bolt.
4. Height of trolley ear from bottom of wire to the top of boss, where bolt enters.

AUTOMATIC ELECTRIC BLOCK SIGNALS

IT has come to be a recognized fact among railroad men that Block Signal Systems are necessary for the safe and efficient handling of trains, especially when running at high speed on single track roads and at short intervals of time.

They not only reduce the liability of accidents, which are expensive occurrences, but in many cases the increased traffic allowable has in a short time more than paid for the cost of installation.

They are almost indespensable for the protection of cars in tunnels, deep cuts, on sharp curves, and especially in those cases where double tracks converge into one in passing over bridges and viaducts.

Each and every system should be designed to meet the local conditions of traffic in order to be as efficient as possible.

CAR REGISTERING SIGNALS

Frequently the conditions of traffic are such as to make it desirable to pass more than one car through the protected section at a time. With non-registering signals it is not advisable to operate in this manner as, if following cars enter the block while it is still occupied by preceding cars, the first car leaving the block will restore the signals to the unoccupied Block condition and the following cars will be unprotected.

To overcome the limitations of a signal permitting but one car in the block at a time, it is necessary to provide means to mechanically count all cars that enter the protected section, as they enter, and again count the cars as they depart from the Block. In the type K-2 signal an ingenious device is employed to perform correctly the above function and permits any number of cars up to **fifteen,** operating in the same direction, to occupy the block at the same time.

Not only is every car properly registered but the machine is locked both electrically and mechanically after each operation and can only be unlocked by the proper operations of cooperating parts as

cars leave the block and perform the restoring operations, each car for itself only. As each car leaves the block it automatically performs two functions, (1) unlocks the relay mechanism and (2) causes one count to be made on the restoring or counting out side.

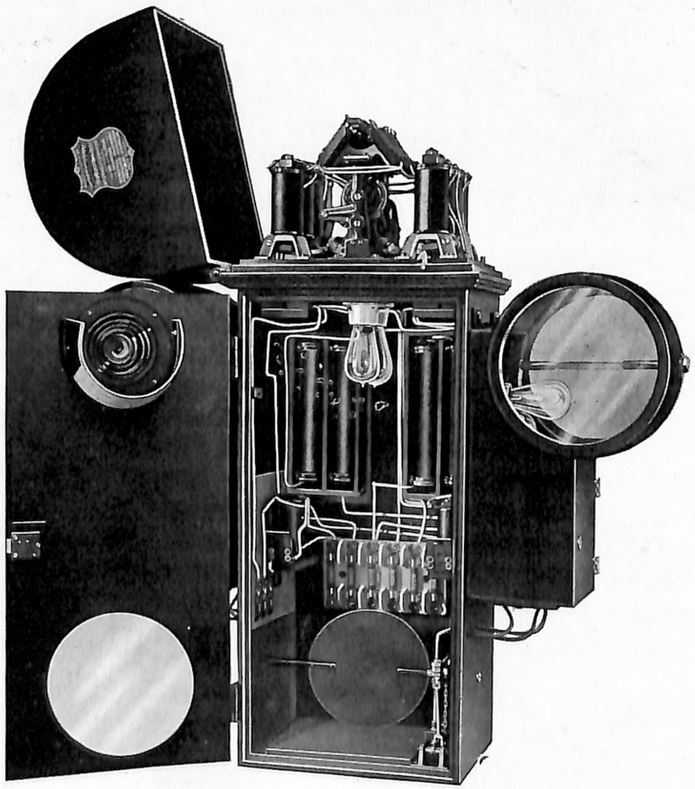


Fig. 1.

In ordinary practice the protection of one piece of single track between turn-outs requires two complete signals as illustrated and four trolley switches or contactors. The signals are erected on the regular line poles, a signal being placed at each end of the block and at a point approximately opposite the switch point.

The trolley switches or contactors are supported on the trolley wire over each of the tracks of the turn-out and at a suitable distance back from the switch points to allow for clearance to prevent fouling.

For signal aspects both lights and discs are employed. Normally, when the block is not occupied, no signal aspect is displayed.

A car approaching the block and finding no aspect visible will proceed under the contactor, operating same to close a circuit which sets the signals and causes the red light and disc to be displayed at the exit end of the Block and a white disc at the end the car is entering, at the same time lighting the lamp shown in front of the white disc.

The white disc being illuminated, serves for both daylight and night use.

This signal is provided with a white disc and lamp on each side of the signal case.

Now should a following car approach and find a white illuminated disc displayed on either side of the signal it would be known that a preceding car moving in the same direction was occupying the Block. The second car can proceed under the contactor and upon operating same will close the circuit to count itself into the Block. The operation of the signal by the second car will cause the disc displayed by the first car to be restored and its lamp extinguished but will, at the same time, cause a similar white illuminated disc to be displayed on the opposite side of the signal.

A third car entering will cause the second car's signal to be restored and will set up the same aspect the first car did. Thus for as many cars as enter the white illuminated discs will alternate from side to side.

The reason for changing the proceed aspect for each car following the first is an **important** one.

It is not only necessary to count each car as it enters the Block but it is necessary that the operators of each car have means to **positively know** that the car has been counted.

The distinct, visible, unmistakable indication of a change in position gives this positive assurance.

Cars leaving the Block do not change the aspect at the entrance end.

Signals of this type are in use throughout the United States and in several foreign countries. They have been chosen in many cases after exhaustive tests in competition with signals of other manufacture and are in use by many of the largest and most prominent railway systems.

THE EQUIPMENT

The cut on the front cover of the bulletin shows the general appearance of a signal case displaying the stop signal aspects.

Fig. 1, on page 5 shows a signal case opened, displaying the mechanism, lamps, resistance units and fuse block. This view very clearly shows the facility afforded for examination, and observation of the mechanism in actual operation.

Fig. 2 is the relay. The relay is the mechanism by means of which, in conjunction with the trolley switch, the lights and semaphores are operated. It is shown here removed from the box. It is covered by a dome, which is a one-piece casting, affording perfect protection from the weather, a vital point in any signal or electric system. This relay makes its connection automatically, by means of spring contacts with the rest of the system, and is easily removed from the box in its entirety by removing four nuts, thus no wires have to be disconnected in removing the mechanism, and by keeping in stock one or two extra relays, a system can be kept in operation without the delay usually incurred by repairs.

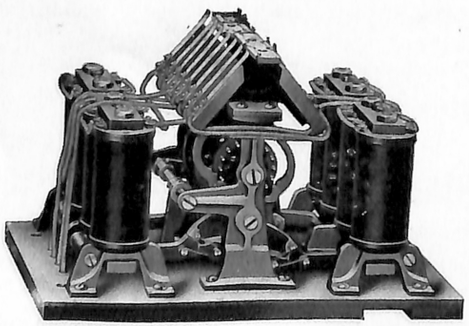


Fig. 2.

THE RELAY CONTACTS

The relay contact fingers are of cast brass composition and consist of two parts hinged together with a coiled spring connection adjacent to the pivotal pin.

The stationary leaf is adapted to be screwed to the insulating roof slate and the movable leaf affords a yielding and slightly rubbing contact which keeps the surfaces bright and assures positive contact.

RELAY BOX CONNECTIONS—The relay is connected to the box by means of nine spring contacts located on the under side of the relay base which is one piece of heavy slate. These springs engage with a set of contact points in the top of the main part of the box, and when the relay is in place are separated from each other and surrounded by fibre barriers. This reduces to a minimum the liability of lightning jumping from one terminal to another.

THE RELAY MAGNETS are of the horseshoe type designed for quick and powerful action. The coils are wound with No. 24 magnet wire and are practically waterproof.

THE STEP WHEEL, PAWLS AND LOCK—The mechanical operation of these parts is of special importance, as the wheels must rotate, not only forward and backward, but must not, under any circumstances, rotate more than the distance of one pin for each car that enters or leaves the block. In this arrangement the wheel, lock and pawls co-operate in such a manner that the wheel is not unlocked until securely engaged by the pawl, after which it is under absolute control of the same until it has moved the proper distance, and is again locked before it is released by said pawl, assuring positiveness in action to the highest degree.

RESISTANCES—The resistances of the home and signalling circuit are contained in four tubes, two for the home resistance and two for the signalling circuit. These tubes are held in place by a clamp at each end, and are easily removed. By the perfect insulation of the parts by slate barriers, the effect of lightning and resultant arc of the power current has been reduced to a minimum.

THE PROCEED SEMAPHORES—The semaphores are housed in separate castings which are fastened to the main signal box by means of two hangers at the top and are mounted to the sides of the main box by means of studs, having heads over which the hanger is placed.

THE PROCEED SEMAPHORE DISC, which is 8 inches in diameter, is pivoted horizontally between two glass windows and is made of sheet metal painted white with a green center, and varnished. It is operated by a large magnet at the lower part of the housing, there being no mechanical connection between it and the main signal box. The lamps placed within the semaphore box to illuminate the same will give a distinct signal, even if the semaphore should fail to work.

THE STOP SEMAPHORE DISC, which is 8 inches in diameter is of sheet metal painted red and varnished and is pivotally mounted in the lower part of the signal case. It is operated by the same type of magnet coil as is used for operating the proceed semaphore discs.

THE WIRING—The wire used is No. 14 rubber covered flame proof and is all form bent.

FUSES—Six No-arc, five ampere fuses mounted on an insulating base are used. Each circuit, including the ground wire is fused.

When the signal circuit is in operation it contains four fuses in series, thus giving four times the protection against burn-outs that is ordinarily found in electric circuits, where one fuse is included in the feeder only.

LAMPS—Two lamps are used for each visual signal, one being held in reserve by means of a pick-up magnet, therefore, if a lamp should burn out another will be automatically cut into service. We recommend 56 watt lamps of a voltage one-fifth of the maximum trolley voltage.

SIGNAL LENSES—The lenses are 5 inches diameter smooth face optical lenses, the colors being standards adopted by the Railway Signal Association.

LIGHTNING ARRESTERS—Our prices do not include lightning arresters but we strongly recommend their use and will furnish prices upon application.

INSTALLATION

The installation of a block of signals is a simple matter, easily understood and executed, by the average line crew. A line crew of three men can install the equipment for one block, including the running of the line wires and other line work, in from two to three days, for the average length of block.

The signal cases are provided with hangers on the back of the case, and are hung on short cross arms on line poles adjacent to the junction of the single and double tracks.

The trolley contactors are mounted on the trolley wires over the double track, 100 to 200 feet from the signal case. The signal case should face at an angle to throw the signal light directly in the motorman's line of vision as he reaches the setting contactor.

The Setting Contactor is mounted on the trolley wire over the track on which the car enters the block, and is employed to charge the setting wire, which runs to the No. 4 fuse.

The Restoring Contactor is mounted on the trolley wire over the track on which the car leaves the block, and is designed to charge the restoring wire, which runs to the No. 5 fuse.

The No. 3, or signal line wire, connects with the No. 3 fuse in each signal case.

The No. 2, or restoring wire, connects with the No. 2 fuse in each signal case.

The No. 1, or feed wire, connects the trolley wire, or other feed wire, with the No. 1 fuse in each signal case.

The feeds for the two signal cases should be of the same voltage, therefore if, as sometimes happens, there is a circuit breaker between signals, the feeds for both signals should be taken from the same feed wire.

The ground wire connects the "G" fuse to the rail or other return circuit.

We recommend for the two line wires No. 12 copper clad or copper weld, or No. 10 hard drawn copper R. C. W. P. No. 10 iron wire may also be used.

The above sizes are as small as are advisable to use on account of the necessary mechanical strength required. It is inadvisable to use bare wire and is no economy as interruptions are likely to occur from grounding, etc.

The usual practice is to dead end the line wires at the insulators on the cross arms, of the pole upon which the signal case is mounted, and to make connection between the line wires and the signal case, by using No. 14 R. C. and B. copper wire.

The connections of the copper wires with the line wires should be soldered joints, wound with rubber tape, covered with friction tape, and painted with asphaltum paint.

The wires connecting the contactors with the signal case are usually run from the contactors, through porcelain insulators clipped to the span wires, and from there to the signal case on the cross arms of line poles.

It is usual practice to enclose all wires, running from the cross arms to the signal case, as well as ground wires, in fibre or iron conduit cleated to the pole.

The trolley contactors are adapted to be bolted to standard trolley ears, and suspended by span wires. The contactor wires should be looped, or pig-tailed, before passing through the insulators clipped to the span wires, to keep the wires free from rubbing on the contactor casting, or other charged part of the structure.

GENERAL DESCRIPTION

A comprehensive understanding of the principles upon which the K-2 system of signal protection is designed, may be had most clearly, by considering the steps taken in developing the system.

In end set signals, of which this system is a type, the fundamental idea is that each signal shall show a neutral aspect in its normal condition. That is, the signal at each end of the single line of track, upon which traffic is designed to operate in both directions, shall display this neutral aspect when the single line of track has no cars operating on it.

This may be illustrated by the element of this system shown in diagram No. 1 which consists of a signal circuit, through the protected section, with a feed at each end and through which of course, no current flows. The signal aspects are therefore neutral or dead.

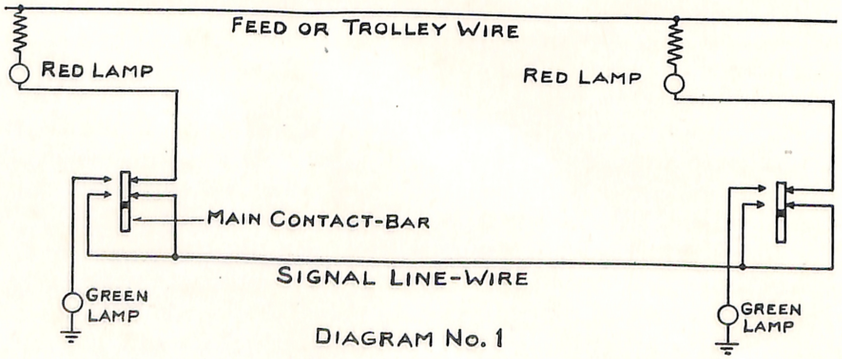


DIAGRAM No. 1

Now if we move one of the main contact bars in diagram No. 1 from its normal position at the right, over to the left, the feed at that end will be taken off and a ground branch be connected to the line

wire. The line wire therefore having a feed on the end that has not been disturbed, current will flow from that end to the ground that has been put on, and may be utilized to operate appropriate signal mechanisms or lights.

As shown by the diagram, if a red light is in the circuit at the feed end, and a green light in the ground end, a stop signal is set at one end and a proceed signal set at the other end. Also, as is evident, magnet coils operating semaphores may be included in the circuit as is the case in the K-2 system.

Although we have assumed that the contact bar at one end has been moved from the right side to the left no mention was made of the means employed. This movement may be accomplished automatically by the trolley wheel of a car running under an instrument suspended on the trolley wire, called a trolley contactor, which operates to close a circuit from the trolley wire through a relay magnet, which throws the contact bar toward the left and in which position, it may be held by mechanical means, after the car has run past the trolley contactor and the relay coil has its circuit opened again, at the contactor.

This operation is the one that takes place and is one of the functions of the setting relay.

Thus far we have seen that a very simple system is all that is required to set a stop signal at one end of the single track and a proceed signal at the other end, and a car so operating to set the signals, could proceed past the proceed signal, and continue through the protected section, called "The Block," in safety, because the motorman would have the assurance that no car running in a direction opposite his, would pass the stop signal his car had set.

However, in many cases, following cars may need to enter the protected section before the first car has left it, and it becomes necessary to consider means whereby proceed signals may be given to following cars.

The first car operated to change the signal aspect from normal, to proceed, and the assurance was thus given that the counting relay had actually operated to register the operation of the car.

The necessity for absolute assurance that the second car has been properly registered in, is evident when we consider that the system must be restored to its normal condition when unoccupied, to allow traffic to proceed in either direction; therefore when a car leaves the

protected section it should count out, or operate to take out the registration which it put in.

Hence if the second car did not count in, but proceeded forward, the first car upon leaving the protected section, would restore the system to its normal condition, and leave the second car unprotected from possible collision with a car which might enter at the end at which the first car left.

Therefore a second car must again operate the setting relay to register its count into the protected section and give a visible indication, to the motorman, that the count has been actually registered. This means that the aspect, which the first car left behind, must be changed to give visible proof, to the motorman of the second car, that registration has actually taken place.

This is accomplished in this system, by the setting relay causing an alternating contact lever to change the circuit, from one ground branch to another, for each count registered in, and thus put out the signal that a preceding car has left behind, and set up another in a different position.

Thus proceeding one step further in the development of the system we amplify diagram No. 1 and have diagram No. 2 in which the alternating lever moves first one way for one count then the other way for another count.

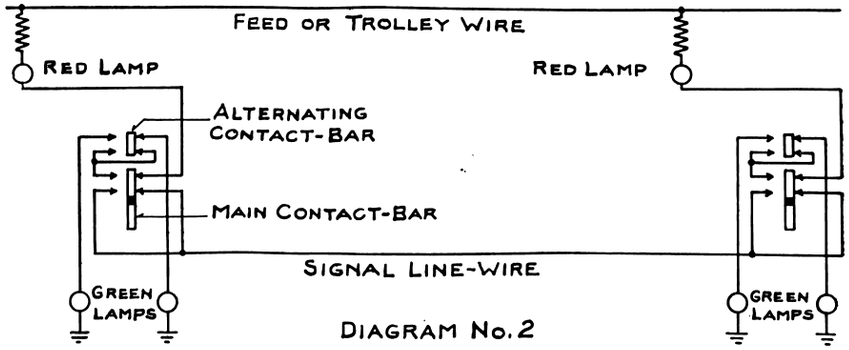


DIAGRAM No. 2

We thus see that for each registration the proceed signal is given by a change of position and not of momentary duration but fixed and constant.

Having developed a system for registering in, we now have to consider means for registering out.

As we have employed in this system a rotating counting wheel for registering in, by the operation of the counting in relay, we have but to rotate the counting wheel backward toward its normal position for each count out, to restore the system to its normal condition.

It will be remembered that in the description of diagram No. 1 we took off the feed end of the normal signal circuit and put on a ground branch for the proceed signal. We have therefore this disconnected feed that we can use by passing it through a relay magnet's coils which, when energized, operate to rotate the counting wheel toward its normal position, for each energization of its coils.

The question therefore arises how this may be done and diagram No. 3 illustrates the next step.

In this diagram the greater part of the signal circuit is omitted to avoid confusion, and to show more clearly the restoring circuit. As is shown, another line wire is added to provide for the counting out operations and is called the restoring line wire. As will be noticed the counting out relay is put in the normal feed end of the signal circuit but when the main contact bar is thrown toward the left this feed is disconnected from the signal circuit and connected with the restoring line wire by a pair of contact fingers. No current flows however as thus far no ground is connected to the circuit.

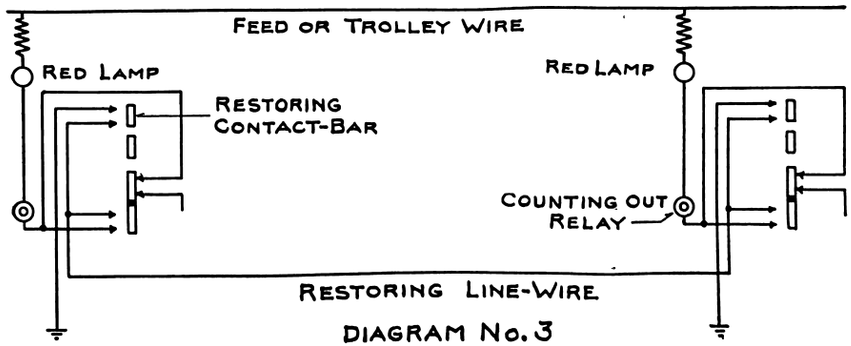


DIAGRAM No. 3

A ground is automatically connected to the restoring circuit when a car leaves the block, by the operation of the restoring contactor, charging a circuit which includes a local relay. This relay operates to throw the restoring contact-bar into position against the pair of contact fingers at the left.

Thus the counting out relay is energized, but as an accidental ground on the restoring wire would energize the counting out relay, and count cars out, a further provision must be made for the counting out operation, that would preclude the possibility of counting out by the occurrence of accidental grounds.

If provision is made so that counting out cannot take place, by the energization of the counting out relay while the signal circuit is flowing, counting out could not take place accidentally.

This idea is incorporated in the system as shown in the complete diagram, 2—K-2—22. The signal circuit goes through relay magnet coils 18. This relay, called the "Lock Relay," when energized by the flow of the signal current, operates to throw a detent or locking lever into engagement with the Restoring Relay mechanism, so that the latter cannot operate while the signal current is flowing.

Therefore the signal circuit must first be opened to de-energize the lock relay, and a ground put on the restoring line to energize the restoring relay, in order to complete the restoring operation.

Referring to Diagram 2-K2-22, it will be seen that contact bar No. 5, as it is thrown from right to left, by the operation of the restoring contactor energizes relay coils No. 6, opens the signal circuit, and thus de-energizes the lock relay.

It is of course necessary, that counting out operations may take place when cars leave the block, at the end at which they entered, and it is seen that all the elements for counting out, are present in the system, at the entering end of the block, as well as at the distant end.

There is one further consideration that has to be taken into account, and that is, that the system should not be improperly affected by a car running under the setting trolley contactor, at the end of the block where a stop signal is set.

It will be noticed that the signal circuit, at the end where the stop signal is set, goes through the counting out relay No. 2, and, as its armature is, normally, picked up, its strength is very much greater than the counting in relay No. 1, and as No. 2 opposes the action of No. 1, counting in cannot take place while No. 2 is energized.

In the foregoing analysis the principal object has been to show how the K-2 system has been developed to provide a simple but safe system of automatic signal protection under normal conditions; abnormal conditions having been touched upon but slightly.

It will be understood however that an important consideration in the development of any system is the matter of safety involved

when abnormal conditions, such as accidental grounds, crosses, and breaks occur; such as are likely to happen in any system.

The effects of such abnormal conditions have been carefully studied in the development of the K-2 system with the result that a high degree of safety is assured.

DETAILED DESCRIPTION OF K-2 CIRCUITS AS ILLUSTRATED BY LOOSE LEAF WIRING DIAGRAM, NO. 2—K-2—22

No. 1 is the setting magnet which when it is energized rotates the counting wheel one step for each energization and No. 2 is the restoring magnet which rotates the counting wheel one step for each energization in the opposite direction to the direction to which it is rotated by setting magnet No. 1. Contact bar No. 3 rests in its right hand position when there are no cars in the block but is thrown over to the left hand position when the first car is counted in on the counting wheel and remains in the left hand position until the last car is counted out of the block. Contact bar No. 4 is operated by a star cam on the counting wheel so that when the first car is counted in it remains in its right hand position, when the second car is counted in it remains in the left hand position, when the third car is counted in it moves back to the right hand position and so on. When it is in the right hand position it causes the right hand green and white semaphore to be displayed and when it is in the left hand position it causes the left hand green and white semaphore to be displayed so that, unless the counting wheel actually moves and counts, the motorman will not receive the proceed indication. Contact bar No. 5 normally remains in its right hand position but is momentarily thrown to the left hand position when magnet No. 6 is energized but as soon as No. 6 is de-energized it falls back into the right hand position. This magnet No. 6 is energized by the restoring contactor for making up the circuits to restoring magnet No. 2 for rotating the counting wheel in the opposite direction to which it is rotated by magnet No. 1.

If the block is unoccupied and a car should proceed to enter the block from the left, as the trolley wheel passed over setting contactor No. 7 a circuit would be completed from the trolley wire thru the moving lever of the contactor along wire No. 8 thru fuse No. 4 along wire No. 9 thru magnet No. 1 along wire No. 10 thru resistance No.

11, thence thru the fuse to ground. This will cause the setting wheel to be rotated one notch and move contact lever No. 3 into the left hand position. As soon as the trolley wheel passes beyond the contactor the circuit just described is opened and the armature of magnet No. 1 falls back by gravity into its normal position. A circuit is then completed thru the two signals as follows:

From the trolley wire at the right hand end of the block along wire No. 12 thru fuse No. 1 thru red semaphore magnet No. 13 thru resistance No. 14 thru red lamp No. 15 thru pick up magnet No. 16 along wire No. 17 thru the restoring magnet No. 2, thru the two right hand contact springs which are bridged by contact lever No. 3 thru the two contact springs which are bridged by contact lever No. 5 thru locking magnet No. 18 along wire No. 19 thru fuse No. 3 thru signal circuit line wire thru fuse No. 3 in the left hand signal along wire No. 20 thru locking magnet No. 18 in the left hand signal thru the contact springs bridged by contact bar No. 5 thru upper left hand springs bridged by contact bar No. 3 around the contact springs bridged by contact bar No. 4, thence along wire No. 21 thru the green semaphore magnet No. 22 thru the green light No. 23, thence along wire No. 24 thru pick up magnet No. 25 and to ground. If a second car should pass over the contactor magnet No. 1 would be energized in just the same manner described for the first car and the counting wheel would be rotated one more notch and contact bar No. 4 would be thrown to the left hand position and the circuit would then be completed thru the signal at the right hand end of the block in just the same manner as described but it will be completed thru the left hand signal as follows:

From fuse No. 3 along wire No. 20 thru locking magnet No. 18 across contact bar No. 5 thru the upper left hand contact springs on contact bar No. 3 thru the left hand contact springs bridged by contact bar No. 4 along wire No. 26 thru green semaphore magnet No. 27 thru green light No. 28 thence thru the pick up magnet No. 25 to ground. This will cause the opposite green semaphore disc to show. As the car is leaving the block at the right hand end of same, as the trolley wheel passes over the restoring contactor No. 29 a circuit is completed from the trolley wire thru the contact lever of contactor No. 29 along wire No. 30 thru fuse No. 5 along wire No. 31 thru magnet No. 6 along wire No. 32 thru resistance No. 33 and thence to ground. This will cause contact bar No. 5 to move into its left hand position opening the signal circuit just previously described and completing a circuit across the left hand pair of contacts. This will de-energize the circuit which was flowing along signal circuit line wire and complete a circuit along the restoring circuit line wire as follows:

From the trolley wire at the left hand end of the block along wire No. 34 thru fuse No. 1 thru red semaphore magnet No. 13 at the left hand end, along wire No. 35 thru resistance No. 36 thru lamp No. 37 along wire No. 38 thru pick up magnet No. 16 along wire No. 39 thru the restoring magnet No. 2 thru the lower left hand contact springs bridged by contact bar No. 3 along wire No. 40 thru fuse No. 2 along the restoring circuit line wire thru fuse No. 2 in the right hand signal along wire No. 41 thru the left hand pair of contact springs bridged by contact bar No. 5 thence along wire No. 42 to ground. This will energize restoring magnet No. 2 in the left hand signal and cause the counting wheel to be rotated one step in the opposite direction to which it was rotated by setting magnet No. 1. As the trolley wheel passes off of contact No. 29 the circuit just described will be opened, magnet No. 6 in the right hand signal will be de-energized and contact bar No. 5 will fall back on to the right hand pair of contacts. This will again place the signal circuit back in its normal condition. When the last car is counted out of course contact bar No. 3 in the left hand signal will be thrown into its right hand position and both signals will then be neutral. If a car should enter from the right hand end of the block instead of the left hand end the circuits would be completed in just the same manner except that it would be fed in the opposite direction, that is fed from the left hand end instead of the right hand end. When the signal is neutral and the contact bar No. 3 is in the right hand position in both signals the signal line wire is on feed at both ends but when the contact bar No. 3 is moved into the left hand position it puts that end of the signal circuit on ground.

In this signal the pick up magnets described are in series with one lamp in each indication so that if this lamp should burn out the armature of the pick up magnet would fall by gravity completing a circuit thru another lamp so that the signal would continue to indicate. The function of locking magnet No. 18 is to hold a mechanical lock on restoring magnet No. 2 so that if a ground should come on restoring circuit line wire while a car was in the block, the ground could not cause No. 2 to restore the signal. The line wires of this signal are so arranged that if a break, cross, or ground should come on these line wires the signal would remain on the safe side.

TROLLEY CONTACTORS

The trolley contactors used with United States signals are of the so called pendulum type. In this type of contactor, a pendulum is pivoted and hangs adjacent to the trolley wire, in which position it is struck by the trolley wheel as it passes under the contactor.

The movement of the pendulum is transmitted to the contactor mechanism which is adapted to produce the effect of counting in or counting out as desired.

As usually employed the movement of the pendulum by the trolley wheel going in one direction operates to charge a circuit either to register in or out of the signal mechanism. Movement of the trolley wheel in the other direction produces no effects whatever. This is known as the one way directional contactor.

However we can supply contactors for two way operation if requirements demand it.

These directional characteristics are of much utility in the flexibility and safety of car movements in and out of the protected block sections.

This is apparent when one considers the case of a car failing to count in as it runs under the setting contactor. It should in no case then be able to count out in backing up for another trial. Again consider the case of a car accidentally running under the setting contactor at the end of the block where a stop signal is set.

In backing up to get into position to properly set the signals when the block becomes clear; it should in no case be able to count out, unless the system has special provision to give positive indication of counting in, at the danger end of the block.

We are prepared to furnish such systems where it is necessary to operate cars into the block and out again at the danger end, but such systems while employing standard apparatus are special in arrangement and are made to order only.

THE NO. 12 TROLLEY CONTACTOR

This contactor is the latest development in trolley contactors, is very light in weight, of simple but rugged construction, positive in action, and adapted to operations at high speed.

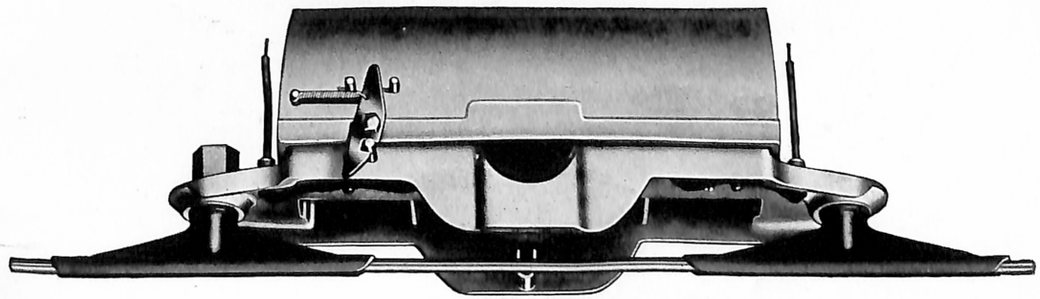
The main castings are of a light tough aluminum alloy, all wearing parts are generously proportioned and the materials used are the

best of their kinds, for the purpose, that many years of experience have demonstrated.

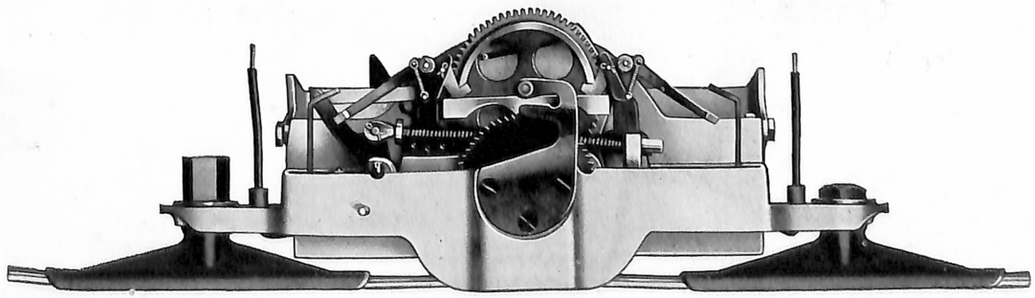
The operating mechanism is completely enclosed and protected from the weather and yet easy of access for inspection or replacement of parts.

The total weight is only 12 pounds which compared to other contactors ranging in weight from 18 to 30 pounds shows a very material reduction in the strain on the overhead structure where these contactors are used.

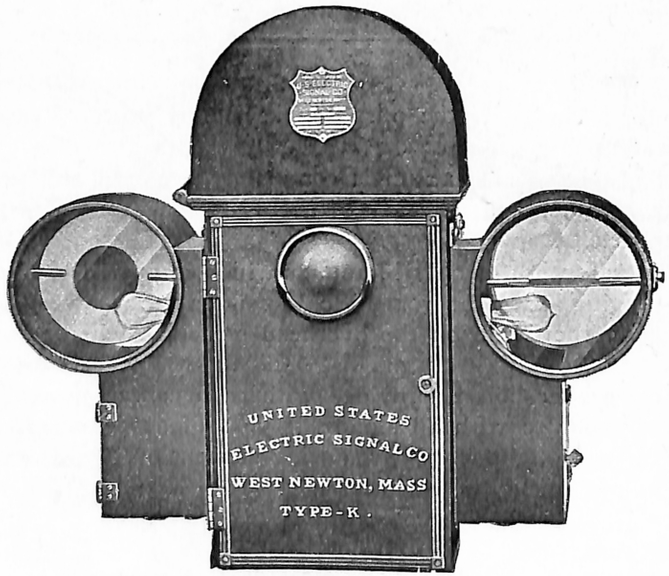
A special ear bolt is provided with each contactor, which provides for their use with all standard types of suspensions; and on account of their light weight, requiring suspension at one end only, are easily and quickly installed.



No. 12 Contactor.
Showing Contactor with Cover Closed.



No. 12 Contactor.
Showing Contactor with Cover Opened.



Type K Signal.

The Type K system is identical with the K-2 system with the exception that the stop aspect is a red light only.

As shown by the illustration of this signal, a shorter signal case is used than that for the K-2, in which provision is made for housing the red semaphore in the bottom of the case.

The K Signals have been used in a large number of installations, but the K-2 has been much more in demand in later years, and we recommend it in preference to the K, on account of the double stop indication, which is more easily seen in daylight.