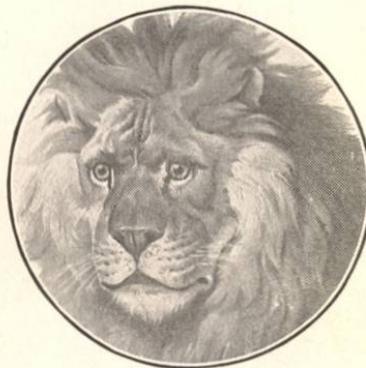


# Monarch Telephone Manufacturing Company

TELEPHONES                      SWITCHBOARDS  
EXCHANGE EQUIPMENT

**Fort Dodge, Iowa**  
U. S. A.

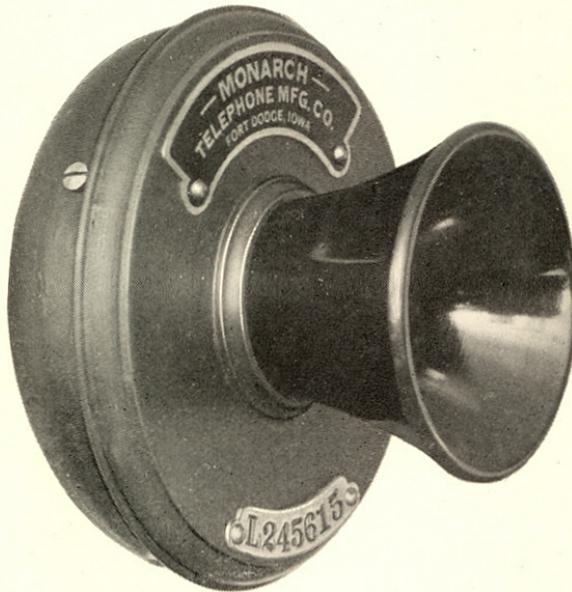


Bulletin No. 34

## MAGNETO TELEPHONES

*"MONARCH FOR SERVICE"*

## THE TRANSMITTER



No. 1 Transmitter

**T**HE principles of acoustics, electricity and mechanics are well known, but there are few transmitters in which these principles are scientifically applied. Frequently they are sacrificed for cheapening production, and sometimes because their importance is not realized. The designers of the Monarch transmitter have scientifically applied these principles and their relation to each other. The result is a transmitter perfect in operation and so highly efficient as to be extremely economical in battery consumption.

There is a reason for the particular design of each part of our transmitter, and a description of the parts and how they are made should prove of interest to any person desiring a thorough knowledge of transmitter principles and construction.

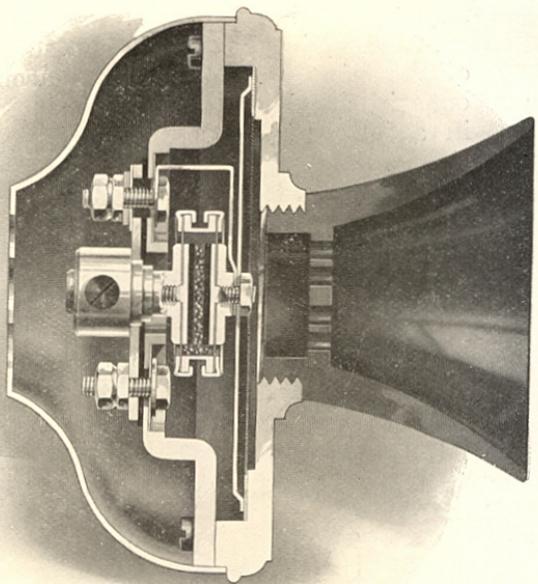
**The Front.** The front of a transmitter is really the foundation on which the other parts depend for their rigid support. In the Monarch transmitter the front is made of a heavy casting turned down in a lathe to its required form. The special tools used in this operation leave the front perfectly smooth and ready for finishing.

**The Bridge.** The bridge is the part of the main structure upon which the operating parts are mounted, and consequently must be as heavy and substantial as the front. Reference to the illustrations will show that the bridge in the Monarch transmitter is made of heavy

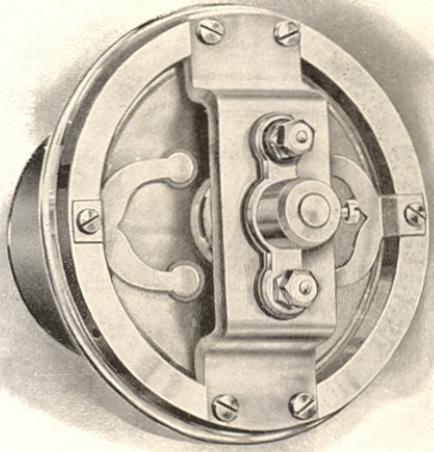
sheet metal formed up for mounting the working parts, and then fastened with four machine screws in a channel in the front. This construction absolutely insures accuracy, and provides a most solid mounting for the sensitive operating units.

**The Diaphragm.** The diaphragm being the first vibrating part in the transmitter, is made of material peculiarly sensitive to even the slightest vibrations. Specially rolled sheet aluminum is used for the diaphragms for Monarch transmitters. The greatest care is used in blanking out and forming these pieces. Straining the metal unequally while being formed will give it unnatural tension and spoil its efficiency, but when formed accurately with a flange around the rim, the sensitiveness of the diaphragm is increased. This flange also forms a support which, while part of the diaphragm, does not interfere with its vibrations.

**The Damping Springs.** Without some provision for the elimination of side tones and excessive vibrations a transmitter would not properly fulfill all requirements. To keep the transmitter from being so extremely sensitive, two damping springs with four points of contact on the diaphragm are supplied. Pads of felt are fastened to the four feet of the dampening springs so as to eliminate any metallic tone which might be caused.



Sectional View Showing Arrangement of Parts in No. 1 Transmitter.



Showing Damping Springs and Other Parts Mounted in No. 1 Transmitter.

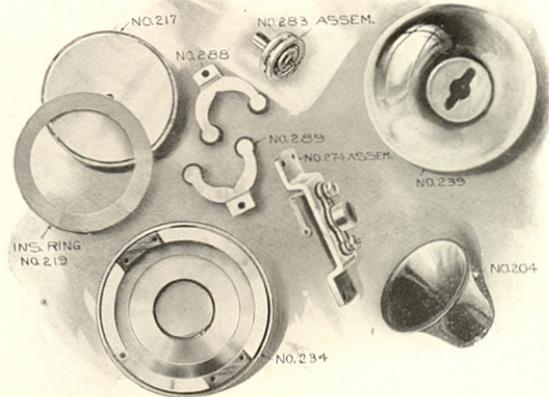
These feet are an equal distance from each other, thus insuring equal pressure at points where it is most effective.

**The Insulating Ring.** Beneath the flange of the diaphragm and between it and the cast front of the transmitter is placed a one-piece gasket of linen, treated with an insulating preparation which is not affected by heat, moisture or climatic conditions no matter how extreme.

**The Carbon Chamber.** A detailed description of the construction of the carbon chamber is of interest, as this is the part in which the voice vibrations are transformed into electrical waves.

A brass ring forms the cylinder walls of the chamber. This ring is accurately cut with special tools, and is then finished in a jeweler's lathe, making its dimensions absolutely correct.

The electrodes are of the finest carbon obtainable, and are soldered to brass

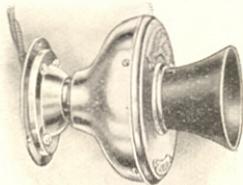


Parts Used in No. 1 Transmitter.

supporting discs. After being thus mounted the carbons are ground and polished until their surfaces are as smooth and clear as a mirror.

Mica diaphragms are placed behind the brass supporting discs and are locked in place with threaded brass nuts. The carbon electrode and mica diaphragm for the front of the carbon chamber are fastened to a brass disc having a threaded stud, which passes through the aluminum diaphragm of the transmitter and is there locked in place with a nut, so that the vibrations of the diaphragm act directly upon the front electrode. The rear electrode is fastened to a brass disc having a solid hub which extends into the transmitter, and is there locked in place by a set screw. The two electrodes mounted as described are clamped to the brass ring, thus forming a moisture-proof chamber within which is placed the hard pure carbon granules.

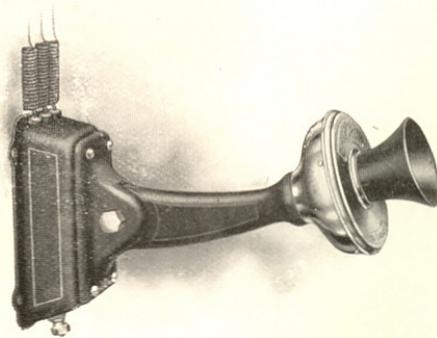
**Transmitter Mountings.** Three standard mountings are provided for Monarch transmitters. The adjustable knuckle joint is used on residence type telephones. The pony arm is used on compact and common battery type wall sets. It is made of pressed steel and is adjustable. The box arm is like the pony arm except that the base is arranged to accept an induction coil.



No. 1 Transmitter Mounted on No. 1 Arm.

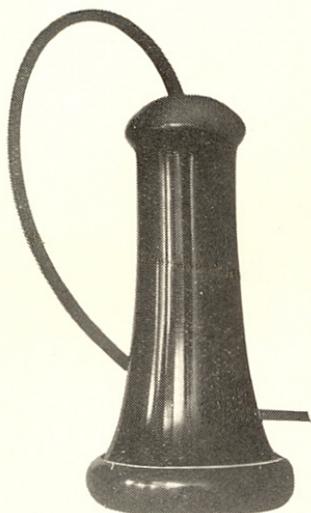


No. 1 Transmitter Mounted on No. 8 Arm.



No. 1 Transmitter Mounted on No. 2 Arm.

## THE RECEIVER



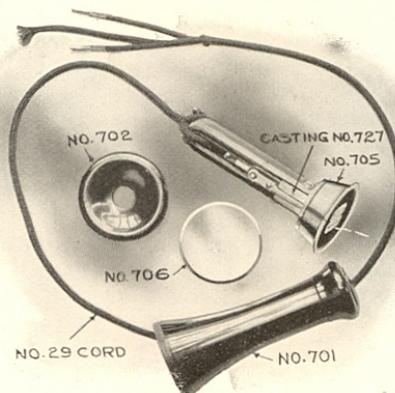
No. 7—Receiver With No. 29 Worsted Cord,  
or No. 77 Green Silk Cord.

An efficient and satisfactory receiver must meet certain requirements. It must accurately reproduce the voice vibrations transmitted to it. It must be substantial enough to withstand the hard usage to which it is often subjected. It must be so made that changes in temperature will not affect its operating parts.

**The Electro-Magnets.** The electro-magnets in the Monarch receiver are wound with the best grade insulated magnet wire on spools having extended cores. The Monarch method of winding these coils makes it unnecessary to twist together the ends of the wires of the two windings, thus eliminating a possible source of trouble found in other receivers.

**The Adjustment.** The adjustment is fixed in the factory and cannot be changed. The air gap between the electro-magnets and the diaphragm was determined after extensive experiments and tests. The extended cores of the electro-magnets fit into a body mounting casting, which casting also supports the cup on which the diaphragm rests. With the electro-magnets and the diaphragm securely fastened to the same mounting, there can be no variation in the air gap even under extreme weather conditions.

**The Magnet.** The permanent magnet in a Monarch receiver is much heavier than in most receivers. It is full thickness the entire length, thus giving it its full measure of strength. The steel is a special grade made for Monarch receivers,



Parts Used in No. 7 Receiver.

and when hardened and magnetized by our process the magnets give exceptional life and efficiency.

**The Diaphragm.** The diaphragm is made of ferrotype metal which is finished to withstand rust. As before explained this diaphragm rests upon a cup fastened to the body mounting casting.

**Cords and Connections.** The standard receiver cord furnished on Monarch receivers is made up of two tinsel conductors, each thoroughly insulated and protected with a heavy outer braiding. A tie cord extends from each end. The cord enters the receiver shell through the small end and fastens to inside binding posts arranged for either round tips or spade clips.

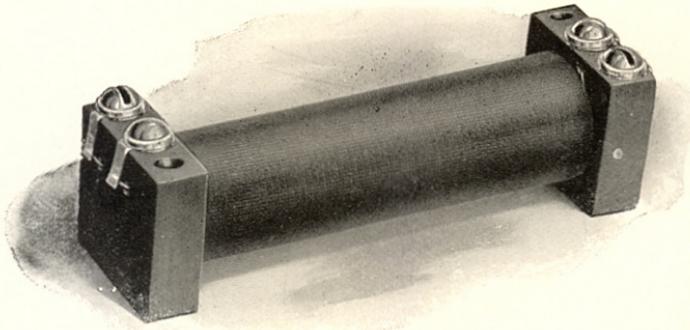
Monarch receivers are supplied in high grade composition shells made from special moulds, which give them sufficient strength to withstand even hard usage.

### Induction Coils

The induction coil is the transformer of the telephone, and must be properly designed and constructed in order to insure good results. Our experience of eighteen years shows that for general local battery work, including long distance as well as local talking, a primary winding of 1.4 ohms and a secondary winding of 175 ohms give the best service. All Monarch coils, unless made for some particular service, are wound to these resistances.

The primary winding is placed over a large core composed of a paper tube filled with soft Norway iron wires. This core is fastened between two heavy fibre heads, and the whole forms a most substantial spool for the windings. The

## THE INDUCTION COIL AND HOOKSWITCH



No. 1-A Coil, for Wall Sets.  
No. 4-A Coil, for Desk Stands.

windings are brought out to terminals plainly marked to distinguish between the primary and secondary.

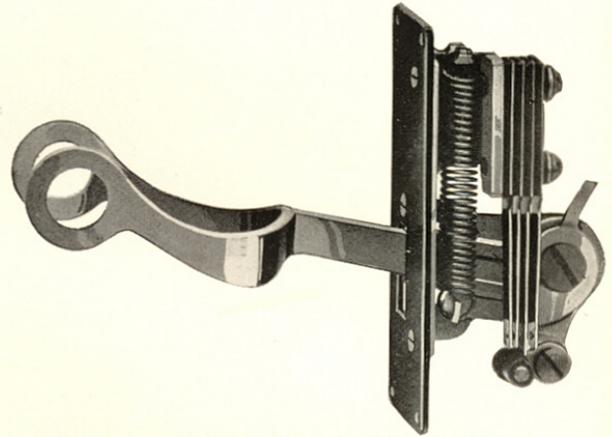
No two layers of wire come in direct contact with each other, being insulated by paper to protect coil from lightning.

**Code No. 1 Hookswitch.** The accompanying illustration shows the Monarch No. 1 Hookswitch with part of the base cut away to expose the long spiral spring. This is the operating spring of phosphor bronze which throws the hook up when the receiver is removed.

Attached to the hook lever by a shoulder screw is a stirrup holding the master contact spring. The upward movement of this spring closes the contacts above (the talking circuit) and opens the circuit with the lower spring (the ringer circuit). The movement of these contact springs is sufficient to insure the positive making and breaking of the contacts.

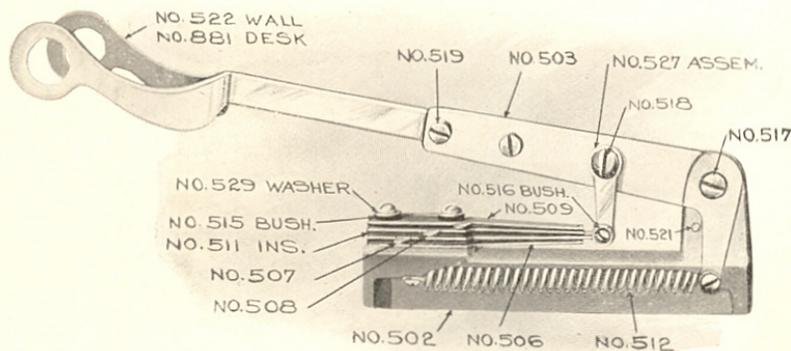
The construction of the hookswitch is extremely simple and substantial. The fork portion is formed of two heavy punchings riveted together and forming one unit which may be removed by taking out two screws. The base is a casting, so the whole switch is self contained.

**Code No. 41 Hookswitch.** Our No. 41 is unquestionably the most reliable hookswitch on the market and is used in all



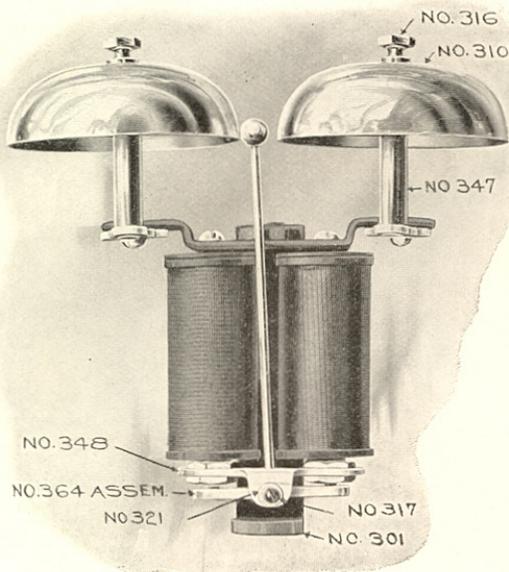
Code No. 41—New Model Self-contained Hookswitch.

Monarch New Model Compact Telephones. The hook is firmly held in place by the same phosphor bronze spiral spring that lifts it when the receiver is removed, and can easily be detached by pressing the hook locking lever, shown in the illustration, just back of the contact springs. This locking lever device makes it absolutely impossible to remove the hook, or in any way disarrange its adjustment, from the outside of the cabinet. The frame on which the parts are mounted is attached directly to the escutcheon plate by three machine screws making the entire hookswitch self contained and exceptionally compact. This hookswitch is mounted in the side of the cabinet and the contact springs and locking lever are the only parts that protrude into the interior space. The operation is practically the same as that of the No. 1 hookswitch previously described, except the contact springs are mounted in a perpendicular position with the free ends hanging downward. This arrangement, in connection with the wiping contact, makes this hookswitch positively self cleaning and eliminates all possibility of trouble caused by the accumulation of dust and other particles.



Code No. 1—Self-contained Hookswitch, Showing Piece Parts Numbered.

## THE RINGER AND GENERATOR



Monarch Ringer Showing Piece Parts Numbered.  
(In ordering specify resistance.)

The Monarch ringer needs no introduction to telephone companies. Undoubtedly there are more Monarch ringers in use today in magneto telephones than any other one make. The simple, substantial construction of the ringer makes it efficient and free from trouble.

The coils are wound on spools having Norway iron cores which are thoroughly annealed. The heads of the coils are black fibre, and the winding is carefully done with the best grade magnet wire. Each coil, before it is assembled, is tested, and its resistance measured.

Adjustment is seldom necessary, but means of changing the position of the armature are provided. The illustration shows the yoke which supports the armature held between lock nuts on the extended cores of the coils. Changing the position of these lock nuts changes the position of the yoke, and consequently the position of the armature. On one side of the yoke is a pivot point, while on the other side is a pointed set screw. The armature is suspended between these two points, thus giving it great freedom of movement.

The Monarch ringer is self contained. The base supports the gong stands, which may be swung backward or forward to secure the proper adjustment of gongs.

**The Generator.** More machine work is required in making a telephone generator than in producing any other part of a telephone. This fact should be remembered by a purchaser, and the parts

should be carefully inspected to make sure they are accurately made and heavy enough to stand the strain of hard usage.

**The Armature.** All Monarch generators have laminated armatures which prevent "eddy currents" from being set up while the armature is being revolved and thus cutting down the efficiency.

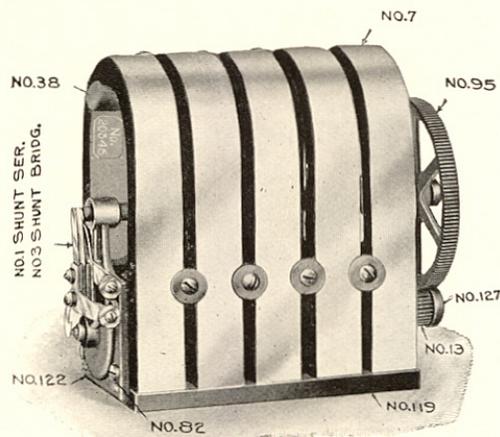
**The Magnets.** The steel used in the magnets is watched very closely, as the wonderful success of Monarch generators is partially due to the uniformly high quality of the magnet steel.

**The Field Pieces.** Soft iron castings are used as field pieces. Milling machines finish these castings so accurately that when placed between the generator heads there is just a few thousandths of an inch air space between the armature and field piece.

**The Heads.** The generator heads are made of heavy brass sheet formed to fit the field pieces, and with long bushings for the bearings of the crank and armature shafts.

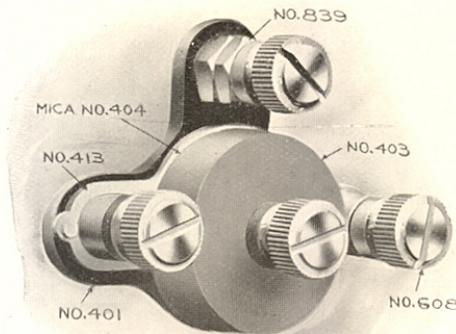
**Gear and Pinion.** Dissimilar metals wear better together than two of the same character. In the Monarch generator the pinion is made of steel and the gear of brass. This construction insures a smooth running machine and more than doubles the life of the parts. A protector cap with cushion springs inside is placed over the pinion. The springs absorb the shock of sudden starting and reduce the strain on the gears.

**The Shunt.** When the shunt springs are in normal position the winding of the armature is shunted out of the circuit. Turning the crank forces the shaft out against the long shunt spring, thus breaking the short circuit.



No. 3 C Generator. Showing Piece Parts Numbered.  
(In ordering specify number of magnets wanted.)

## LIGHTNING ARRESTERS

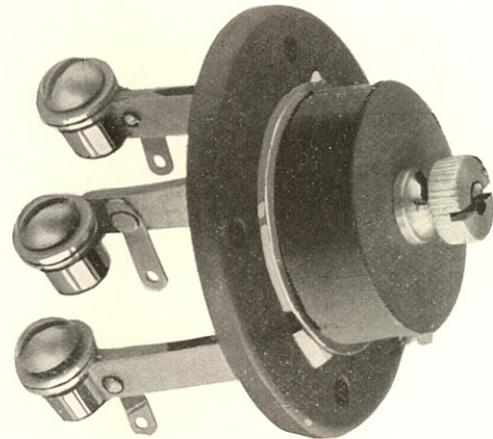


Code No. 2—Arrester Furnished With Monarch Old Model Telephones.

**The Code No. 2 Arrester.** The Code No. 2 Monarch Carbon Disc Arrester as used with the old model telephones is a self contained, simple and efficient protector against damage from lightning.

All parts used are heavy and substantial. The nuts on the binding posts are slotted for a screw driver, and also knurled so they may be removed with pliers.

**The Code No. 8 Arrester.** With the development of the Monarch New Model



Code No. 2—New Model Self-contained Disc Arrester Furnished With New Model Monarch Telephones.

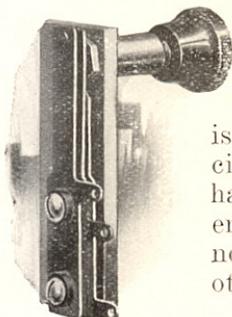
Telephone came the Code No. 8 New Model Disc Lightning Arrester shown in the illustration. This arrester is scientifically and substantially constructed and is wholly self contained. It is furnished with all Monarch New Model Telephones where it is mounted on the side of the cabinet with the line and ground terminals extending inside, thus eliminating any possible chance for "accidental" short circuits.

## TELEPHONE ATTACHMENTS

Monarch Telephones are built for all classes of service, and the attachments here described are designated by letters added to the regular code number of the instruments. Always specify the letter when an attachment is desired.

**Attachment "A"—Direct Current Generator.** The direct current will throw the drop at the switchboard, but will not ring the other telephones on the line.

**Attachment "B"—Push Button with Direct and Alternating Current Generator.** When ringing without pushing the button, alternating current from the generator rings the other subscribers on the line. When ringing with the button depressed, direct current throws the drop at the switchboard without ringing the other subscribers.



**Attachment "C"—Condenser in Receiver Circuit.** A condenser is installed in the receiver circuit so that subscribers having taken their receivers from their hooks will not interfere with ringing other parties on the line.

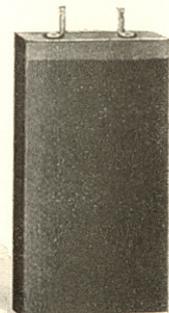
**Attachment "D"—Push Button to Ring Central Over One Side of Line and Ground.** The push button is arranged so the generator is across the line when the button is in normal position and is connected from one side to ground when button is depressed.

**Attachment "E"—Divided Circuit.** In such telephones the ringers are connected from either side of the line to ground so the operator at the switchboard rings over but one side of the line, and therefore signals but one-half the subscribers.

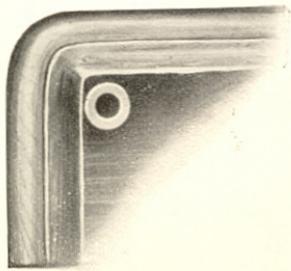
**Attachment "F"—Code Ringing.** A push button is wired in the generator circuit. The generator crank is turned continuously, and the rings are controlled by pressing the button.

**Attachment "G"—Transmitter Cut-in.** A push button wired so the transmitter circuit is open until button is pressed.

**Attachment "H"—Transmitter Cut-out.** A push button wired so the transmitter circuit is opened when the button is pressed.



## GENERAL INFORMATION

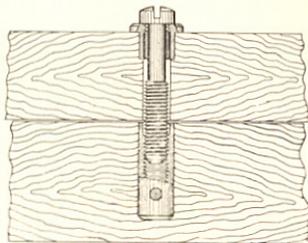


No study of Monarch Telephones is complete without an investigation of the little features which make these instruments so economical to maintain. A telephone containing excellent parts may depreciate rapidly on account of improper assembling and the lack of little features which help keep the instrument in perfect order and appearance.

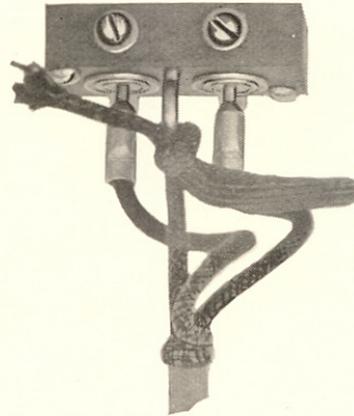
**A Metal Bushing** mounted in each corner of the back board is provided in all Monarch Telephones so that the screws used in mounting the telephone on the wall cannot mar the woodwork. Without these bushings a telephone is badly damaged after one or two removals.

Another little feature which helps to make an instrument keep its new appearance is the **special door lock**, consisting of a machine screw fitted through a bushing in the door, and arranged to lock into a metal socket mounted in the case. The screw is so constructed that it will not fall out of the bushing, so a repair man never leaves a Monarch Telephone without the door being securely closed.

**The Receiver Cord Terminal Block** is a complete unit part of the Monarch New Model Compact Telephone and is mounted in the top of the cabinet. It is known as Piece No. 595 assembled. It consists of a fibre block in which are sunk two brass receptacles for the receiver cord terminals, with connectors extending slightly beyond the block to which are soldered the wires of the receiver circuit. Binding screws extend through the side of the block and into the receptacles, making it possible to fasten either round



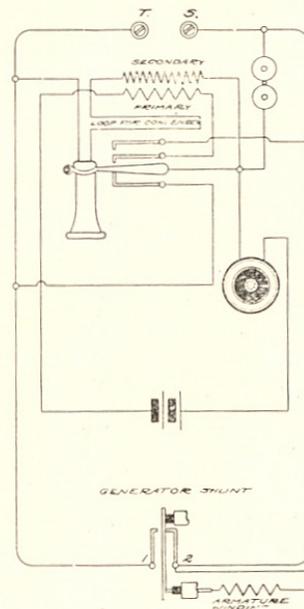
Special Door Lock.



Connecting Block Piece No. 595 for Receiver.

tip or spade clip receiver cord terminals. A screw-eye is provided in which to fasten the strain cord.

All Monarch New Model Compact Telephones are wired throughout with flexible stranded wire consisting of six strands of No. 30 guage tinned copper wire. Each conductor is insulated with one wrapping of cotton over which is a heavy cotton braiding, and the whole is thoroughly waxed. The wiring is entirely contained within the cabinet, being held in place by fibre cleats, and is placed in such a manner as to be accessible. A color code is used; each circuit requiring a different colored wire, making it very easy to trace any particular circuit. All circuit connections within the telephone are made on tinned connectors and thoroughly soldered. A study of the telephone illustrations in this catalog will show that no hinge connections are used in Monarch instruments.



Circuit of Monarch Bridging Telephone.

## NEW MODEL COMPACT TELEPHONES

The illustrations on this page show the pleasing design of the Monarch New Model Compact Telephone and the accessibility of all parts and wiring. The cabinet is built of quarter-sawed oak given a golden oak finish and in strict accordance with modern ideas, without paneling of any sort. It will be noticed that all circuit terminals are brought within the cabinet making it impossible to short circuit the telephone by inadvertently placing articles on the top. This cabinet is  $17\frac{1}{4}$  inches in height and  $7\frac{3}{4}$  inches in width and is our standard cabinet used with the various equipment arrangements shown by the Code Numbers.

### Code Numbers of Monarch New Model Compact Type Wall Sets.

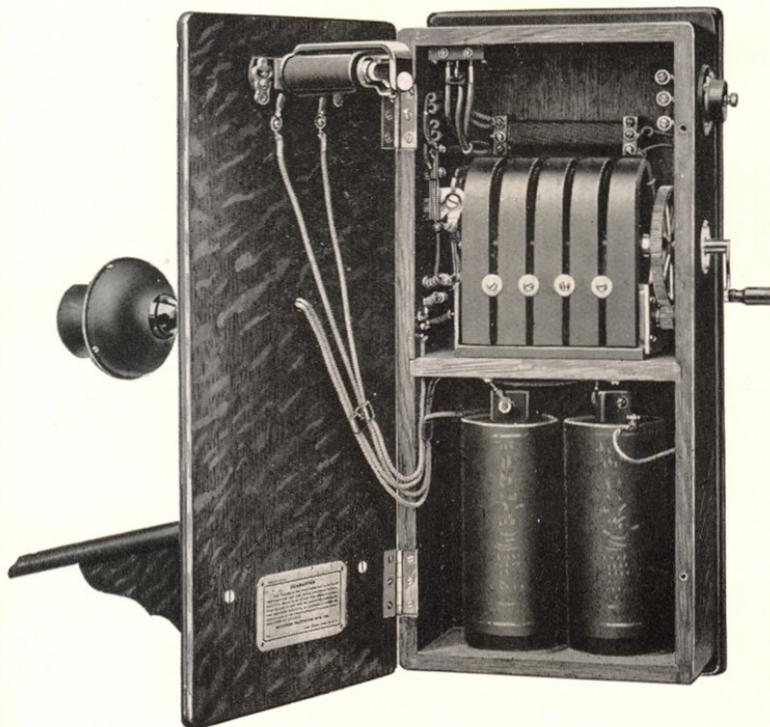
No. 230	3-bar	Generator	80	Ohm	Ringer.
No. 233	3-bar	Generator	500	Ohm	Ringer.
No. 234	3-bar	Generator	1000	Ohm	Ringer.
No. 235	3-bar	Generator	1600	Ohm	Ringer.
No. 240	4-bar	Generator	1000	Ohm	Ringer.
No. 241	4-bar	Generator	1600	Ohm	Ringer.
No. 242	4-bar	Generator	2000	Ohm	Ringer.
No. 243	4-bar	Generator	2500	Ohm	Ringer.
No. 250	5-bar	Generator	1000	Ohm	Ringer.
No. 251	5-bar	Generator	1600	Ohm	Ringer.
No. 252	5-bar	Generator	2000	Ohm	Ringer.
No. 253	5-bar	Generator	2500	Ohm	Ringer.

In ordering telephones it is only necessary to give the code number for the size of generator and ringer wanted as that number includes all of the standard equipment given in the list below. If



Code No. 251 Telephone.

some of the attachments described on Page 6 are also wanted, do not forget to add the attachment letter to the code number. To illustrate: If a No. 251 telephone is ordered, a New Model compact cabinet containing the standard equipment, with the generator having five permanent magnets and the ringer coil wound to 1600 ohms resistance, would be shipped. If a condenser in the receiver circuit is wanted the letter 'C' should be added to the code number or No. 251C. In the same manner every attachment added to the list of standard equipment should have its letter added to the code number.

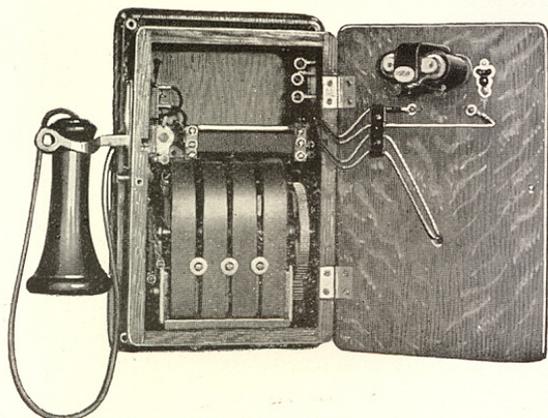


Code No. 251 Telephone.

### Standard Equipment consists of:—

- No. 1 Transmitter.
- No. 8 Arm.
- No. 7 Receiver.
- No. 29 Receiver Cord.
- No. 595 Receiver Terminal Block.
- No. 1-A Induction Coil.
- No. 41 Hookswitch.
- Generator (specify size).
- Ringer (specify resistance).
- No. 8 Arrester.

## RESIDENCE TYPE MAGNETO TELEPHONES



No. 400 Type Open.

This is a very neat little telephone and has proven a great favorite for residence use. It is a complete telephone in every respect, containing all the standard equipment found in the Compact Type, the difference being no compartment has been provided within the cabinet for containing the batteries. This necessitates locating the batteries in a closet, cellar or other out-of-the-way place and a pair of wires run to the battery binding posts within the cabinet.

All of the parts, binding posts and wiring within this cabinet are of easy access, the cabinet being hinged both front and rear. As this arrangement saves considerable wall space the reason for the popu-



No. 400 Type Closed

larity of this type of telephone at once becomes apparent. The transmitter is mounted on our No. 1 Knuckle Joint Arm illustrated on Page 2 of this catalog.

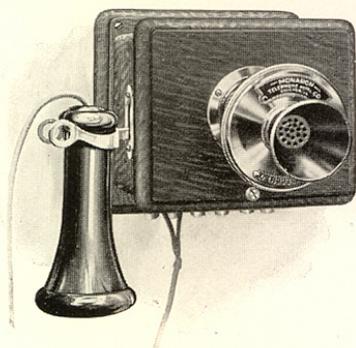
**The Standard Equipment** of this instrument includes the following:

- No. 1 Transmitter.
- No. 1 Knuckle Joint Arm.
- No. 7 Receiver.
- No. 29 Receiver Cord.
- No. 595 Receiver Terminal Block.
- No. 1-A Induction Coil.
- No. 41 Hookswitch.
- Generator (specify size).
- Ringer (specify resistance).
- No. 8 Arrester.

## BOOTH TELEPHONES

The two Booth Talking Sets shown in the illustrations are made as small as possible so they may be mounted conveniently above a writing shelf or otherwise placed in a booth without taking up unnecessary space. The illustration below shows a talking set only arranged so that the batteries must be mounted outside of the cabinet. This telephone is Code No. 1032.

The illustration in the lower right hand corner shows a booth instrument, including a ringer and talking set with the batteries mounted in the cabinet. This telephone is Code No. 1846 when an 80 ohm ringer is installed. If a ringer of other resistance is desired the resistance should be specified.



Code No. 1032.



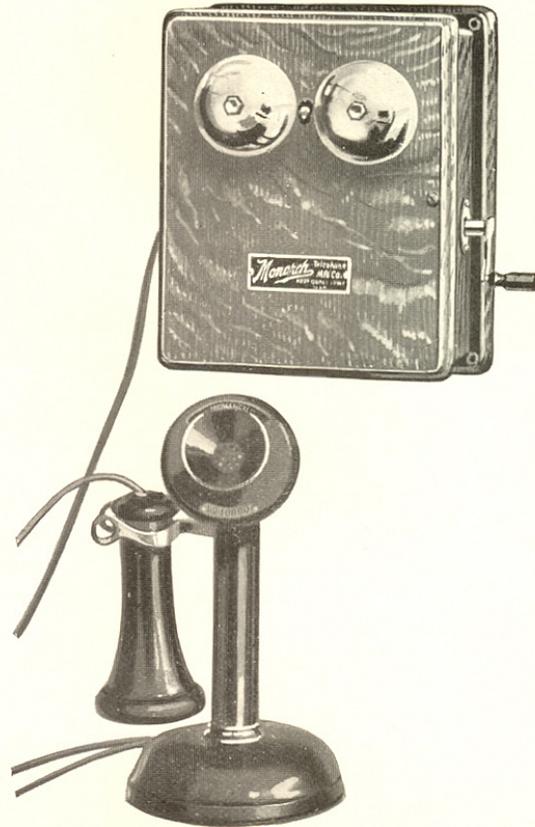
Code No. 1846.

## DESK TELEPHONES

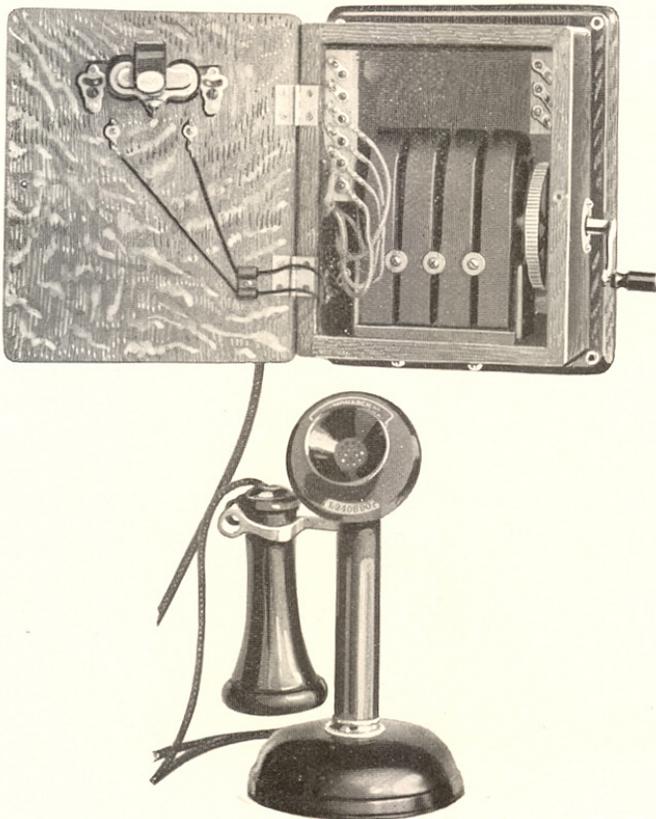
The Monarch Desk Stand combines beauty with durability. The simple, elegant appearance of the instrument makes it an ornament on any desk, either in the office or the home.

The base and upright or stem are made of steel, finished in rubber enamel. Between them rests a brass collar polished and nickel plated. The head on which the transmitter is mounted is made from a solid bar of brass turned down to the proper form and is not adjustable, thus strengthening this part. Adjustable transmitter mountings can be supplied when desired, but the solid mounting is our standard and is considered preferable because the transmitter is always in the proper position for talking. The mounting head, whether solid or adjustable, is polished and nickel plated.

The base of the stand being pressed steel, there is sufficient space within for mounting the hookswitch, induction coil and rack for the cord terminals. The hookswitch is very similar to the one used in Monarch wall sets. The springs are operated by a rod extending down through the stem from the hook. A spiral spring around this rod provides tension



No. 33 Style Desk Telephone.



on the hook and the action is absolutely positive.

The induction coil is so arranged that it may be removed without difficulty, and the cord rack is conveniently mounted and provided with good strong terminals. A felt covered protector plate is fastened to the base and effectually excludes all dirt from the interior, and provides a base which will not mar the most highly finished desk.

**The Standard Equipment** for Desk Type telephones consists of the following:

- One Desk Stand assembly, with
- No. 1 Transmitter.
- No. 7 Receiver.
- No. 77 Green Silk Moisture Proof Receiver Cord.
- No. 4-A Induction Coil.
- No. 68 Four Conductor Green Silk Moisture Proof Connecting Cord.
- No. 33 Style Box with connecting rack
- Generator (specify size).
- Ringer (specify resistance).

## EXTENSION TELEPHONES

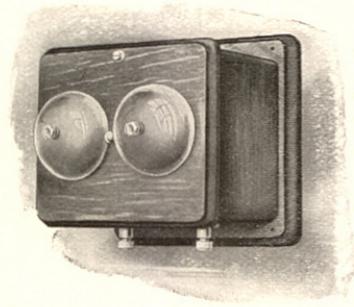


No. 3 Desk Stands.

An extension telephone adds no perceptible load on your operators, makes no increase in your switchboard or cable plant, but does make a material increase in your revenue and profits. The extra rental secured assures a splendid return on the investment as the telephone instrument is the only cost. Besides, it is a great convenience to the subscriber to have an extension telephone placed in the bed room, kitchen or other part of the house at a distance from the regular telephone, while to the business institution the time saved by extension telephones will pay for their cost many times over. To sum the matter up, it will be found that extension telephone service is mutually beneficial to both the subscriber and the operating company.

The **Monarch Desk Stand No. 3**, illustrated above, is particularly adapted to this class of service.

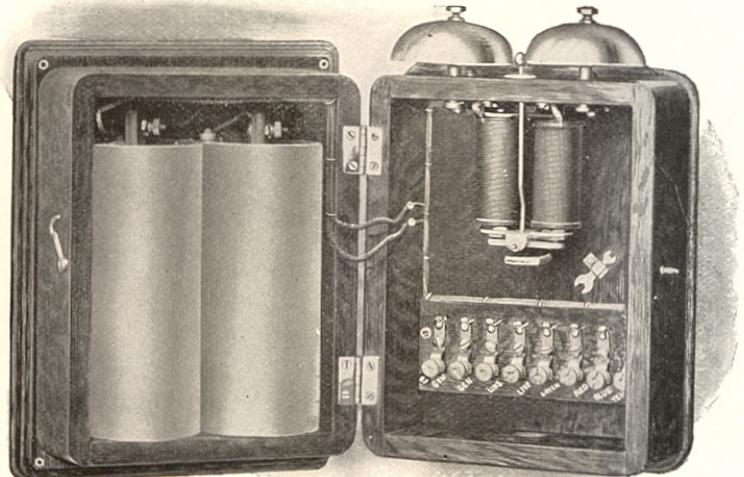
The detailed specifications of the equipment supplied when the No. 3 Desk Stand is ordered, is as follows:



Extension Bell. (In ordering specify resistance)

- No. 3 Desk Stand with
- No. 1 Transmitter.
- No. 7 Receiver.
- No. 77 Green Silk Moisture Proof Receiver Cord.
- No. 4-A Induction Coil in base of stand.
- No. 68 Six-foot Green Silk Moisture Proof Connecting Cord.
- No. 14 Terminal Block.

The No. 14 Terminal Block is equipped with binding posts for connecting line wires, battery wires, generator and ringer wires and the connecting cord to the desk stand. However, it is not necessary to equip this No. 3 Desk Stand with generator and ringers if a talking set only is desired. If ringers are desired at the extension telephone a small bell box like the one shown in the illustration in the upper righthand corner can be furnished, with batteries located in some convenient place, or a bell box like that shown in the illustration in the lower righthand corner, arranged for mounting the bells, batteries and connecting rack within the cabinet can be supplied. This arrangement is our Style No. 44 bell box.

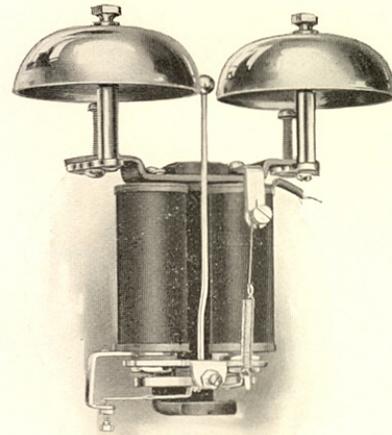
Generator in Oak Box.  
(In ordering specify size of generator.)

No. 44 Style Ringer Box.

## DIRECT CURRENT SELECTIVE SYSTEM

The success of selective party line systems has been thoroughly demonstrated in hundreds of cities and towns and the reasons are not difficult to find. First there are the advantages secured by the operating company, and these advantages make it possible for the subscribers to reap considerable benefit. To the operating company the installation of a simple and reliable selective party line system means a saving of from 50 per cent to 75 per cent in the cost of outside construction, a like saving in cost of distributing and arrester frames, and a like saving in the cost of line equipment in the switchboard. Four telephones attached to one circuit require but little more wire, cable, poles, etc., than one instrument connected to the same circuit. A company which has its switchboard full, its present cable plant or wire plant exhausted, and its entire system at a point where a large expenditure of money is required to take care of people demanding telephone service, cannot afford to disregard selective party lines as such lines form the solution of increasing revenue and profits without a proportionate increase in investment.

The Monarch Direct Current Selective System is by far the most simple, sure and economical party line system yet de-



Direct Current Selective Ringer.

veloped. The circuit drawing on the next page shows the theory of operation and the equipment necessary.

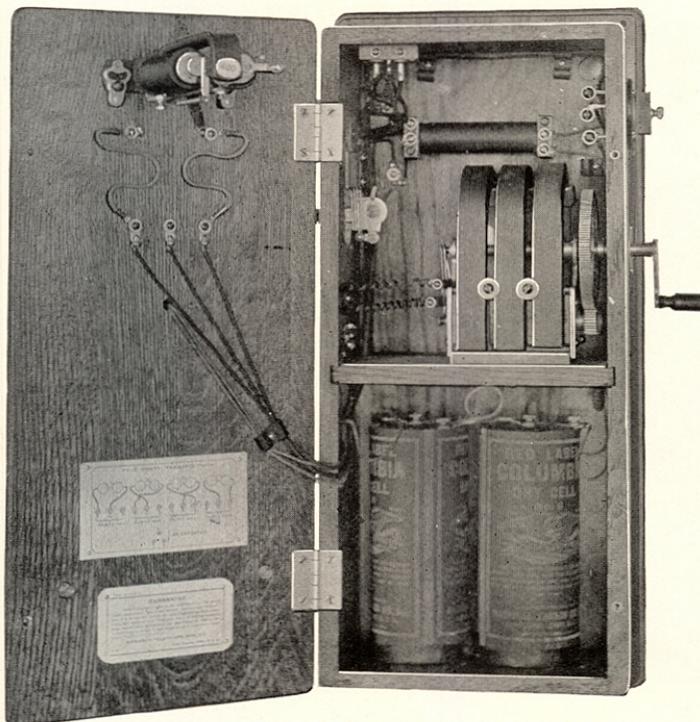
Ours is called the Direct Current system for the reason that the current for ringing the different stations is supplied by a set of dry batteries at the exchange and is fed directly out on the line without passing through a pole changer or other device. A four-button key installed in each cord circuit, or a master key installed in each position, controls the polarity of the current, thus making it possible for an operator, by merely depressing a ringing button, to project the desired ringing current out on the four-party line.

The four telephones have their generators and talking circuits bridged across the line, but the ringers are connected to ground, two from the tip and two from the sleeve side of the line.

Where but one position is equipped for selective lines forty dry cells, connected in series, is sufficient battery for ringing. The key is so arranged that its operation connects one side of the battery to the line and the other side of the battery to the ground, making it possible to use the entire forty cells for either polarity.

A different arrangement is necessary where two or more positions are equipped for selective ringing. This is for the reason that if two operators tried to ring with opposite polarities at the same time with the grounds taken from the sides, it would result in short circuiting the battery through the ground.

In order to avoid such a condition eighty dry cells are used, and the battery is grounded in the center, as shown in the drawing. This makes it possible for



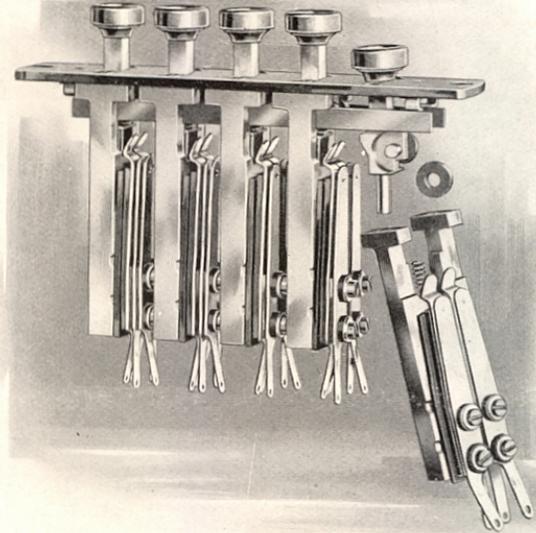
Compact Telephone Showing Connections for Direct Current Ringer.

any number of operators to ring with both polarities at the same time.

To prevent the current from arcing across keys, plugs, or burning fuses, which would be the case if too great an amount of current were allowed to flow out on the line, resistance coils are placed between the battery and the keys.

The ringer, which will be seen in the illustration, is nothing more than a regular Monarch bridging ringer with a biasing spring attached to one side of the armature, and a make and break contact controlled by the movement of the armature. The biasing spring is for the purpose of holding the armature against the core of one coil so the ringer will not operate on current in one direction, but will respond to current in the opposite direction. In one case the action of the current pulls the armature toward the core to which it is already held by the biasing spring and no action follows. In case the current is reversed the pull of the biasing spring is overcome and the armature is attracted to the other core. The make and break contact then comes into use. The fixture through which this contact is made can be seen at the left of the armature in the illustration.

The contact, which is normally "made" by the small, flat spring against the screw in the fixture, is broken just as soon as a current in the right direction or of the proper polarity overcomes this pull. As the windings of the ringer coils are connected through this contact the power operating the ringer is shut off as



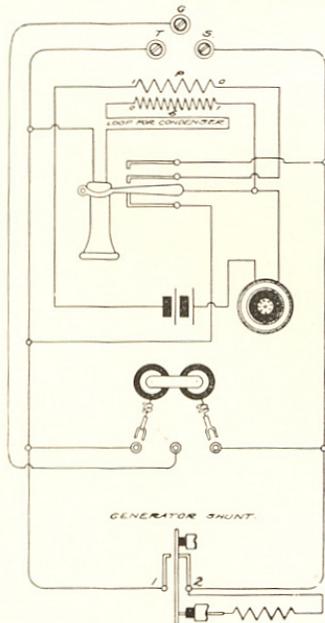
Master Key for Direct Current Selective System

the contact is broken. Then the biasing spring again pulls the armature back to normal position and again closes the circuit. The rapid repetition of this action gives a louder, steadier ring than is secured from an alternating current ringer. The principle of an ordinary vibrating bell is applied to a substantially constructed piece of telephone apparatus.

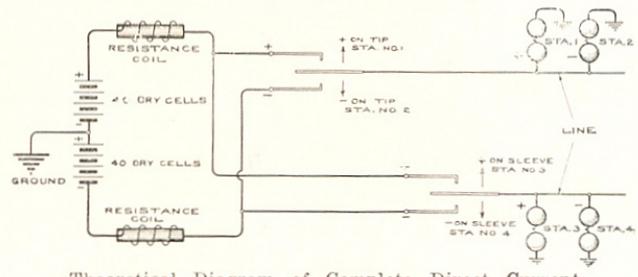
The only real adjustment necessary is secured by tightening or loosening the biasing spring. This spring must be tight enough to cause the ringer to remain inactive when subscribers ring central with alternating current and must be loose enough to allow the battery current from the switchboard to operate the ringer properly.

### Equipment Necessary

From the foregoing it will be seen that the only equipment necessary for the installation of this Direct Current system is a battery of eighty dry cells, one master key for each position, or an individual key for each cord circuit, and two resistance coils.

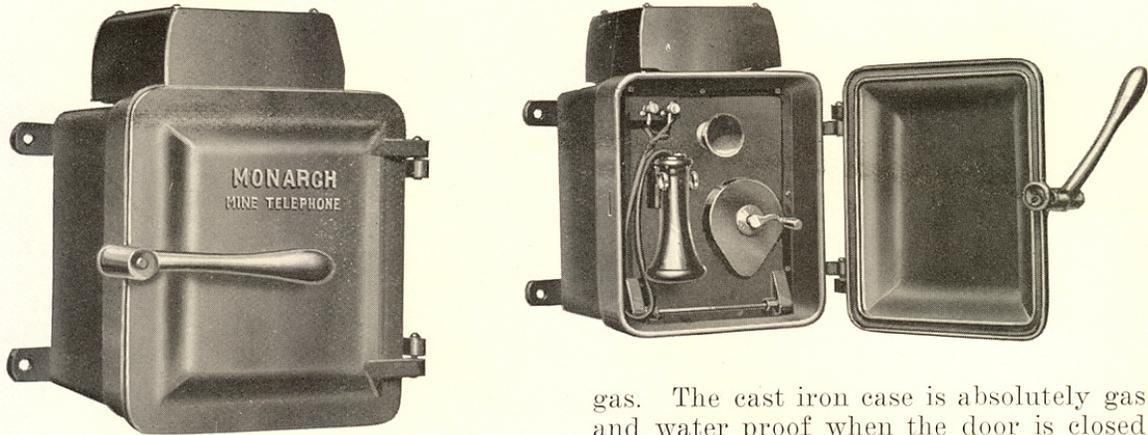


Circuit of Direct Current Selective Telephone.



Theoretical Diagram of Complete Direct Current Selective System.

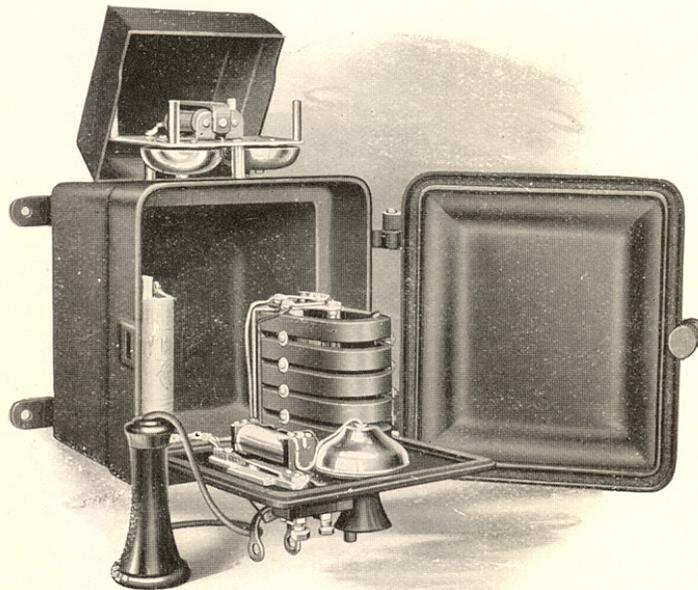
## MONARCH MINE TELEPHONE



In developing the Monarch Mine Telephone we have constantly kept in mind those features which an instrument for mine service must possess in order to give reliable and satisfactory service under the most unfavorable operating conditions—namely: Dependable Apparatus assembled in a moisture-proof and rust-proof case, and arranged so as to be readily accessible for inspection. The talking and signaling apparatus used is especially designed for mine installations. The windings of the receiver, generator, bell coils and induction coils are especially treated to protect them from acid fumes, gases and moisture. The circuit has been so designed that there is no sparking at the contacts of the hookswitch or generator on opening or closing the circuit. This feature prevents all danger of an explosion in case the inner compartment should accidentally become filled with

gas. The cast iron case is absolutely gas and water proof when the door is closed and fastened. The outer door, which is fitted with a long lever handle having a cam lock, is flanged so as to house the edges of the box, and the groove flange is fitted with a heavy felt gasket into which the edge of the box is firmly pressed when the outer door is closed. The edges of the box are turned outward so that water cannot remain in contact with the gasket and rot it. We use heavy felt gaskets as they are more durable than rubber under mine conditions.

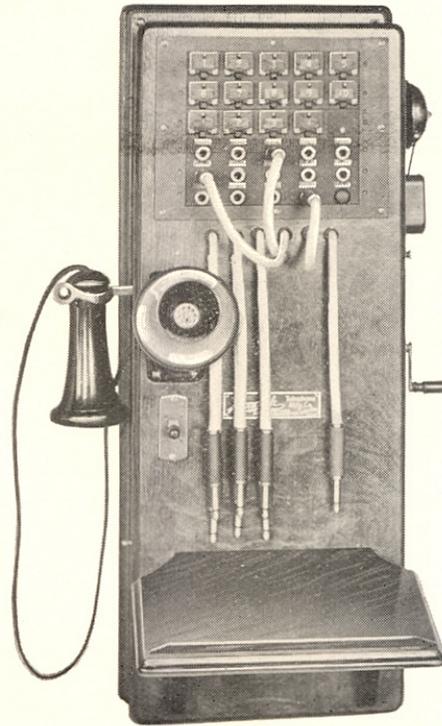
Opening the outer door exposes the parts of the telephone necessarily accessible for signaling and talking purposes. The receiver hangs free and clear so as to be easily grasped. The generator crank is set well to the front allowing free movement for turning. The contact springs of the hookswitch are operated by a close fitting pin passing through



the inner door and the generator crank passes through a brass bushing fitted with a gasket. This construction prevents moisture from penetrating to the inner compartment. The inner door, on which the apparatus is mounted, is also fitted with a felt gasket and fastened securely by brass screws at the sides and top and a heavy brass hinge at the bottom, as it is only necessary to open this inner door for inspecting the apparatus or renewing the batteries. The hinge is so arranged that this door may be easily removed and a duplicate door with the equipment mounted thereon, inserted in its place, a facility which is a unique feature of the Monarch Mine Telephone and which would prove very desirable in an emergency. All screws and washers used are of solid brass; in fact every detail is designed for security against rust, corrosion and the destructive influences of mine water and gases. The ringer is mounted in a separate hood, supported on brass studs screwed onto the top of the case. The wires to the ringer coils are brought up through these studs so that there is no opening into the inner compartment. The ringer coils are protected from moisture by a brass plate from which large three-inch gongs are suspended. The suspension of the gongs bring them close to the opening between the lower edge of the hood and the iron case, offering but little obstruction to the sound waves. The line wires are taken off through binding posts set in the iron case beneath the ringer hood.

Standard Monarch wall telephones are recommended for use in offices, residences, engine rooms and other places where a telephone will be used above ground in connection with the underground system. If a portable telephone is desired, we call attention to our Standard Magneto Desk Set.

Think of the many uses of waterproof and weatherproof telephones of this



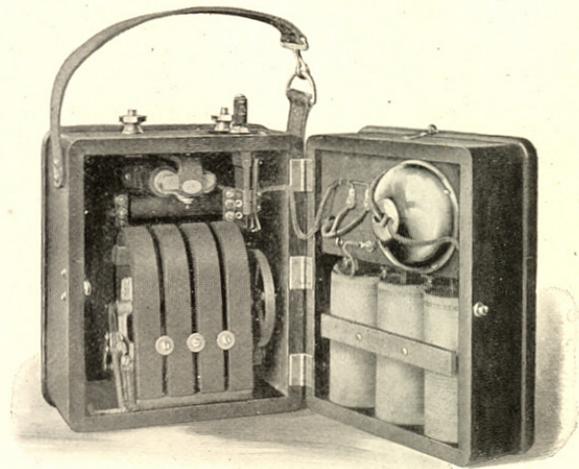
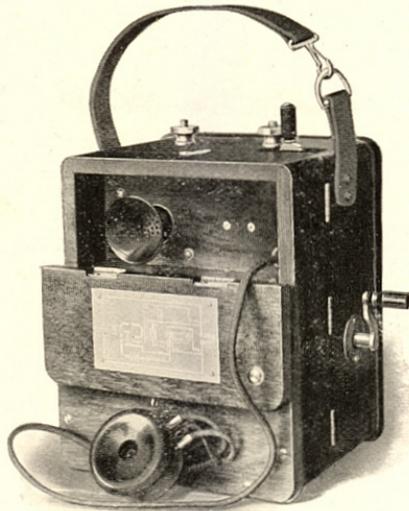
Compact Wall Type Switchboard. Very convenient for Mine Systems.

kind. They are ideal for police systems, street railway and interurban lines, quarries, mines, lumber yards, etc. One of the largest railroad terminals in this country has Monarch Mine Telephones in its train sheds. Others have been sold for use by contractors while erecting large buildings. There are many uses for an instrument so well made and free from trouble as this one.

**The Monarch Mine Telephone** is equipped with a heavy five-bar generator and ringers wound to 1600 ohms unless otherwise specified. Instruments for common battery service can be supplied and are made up very similar to the illustration.

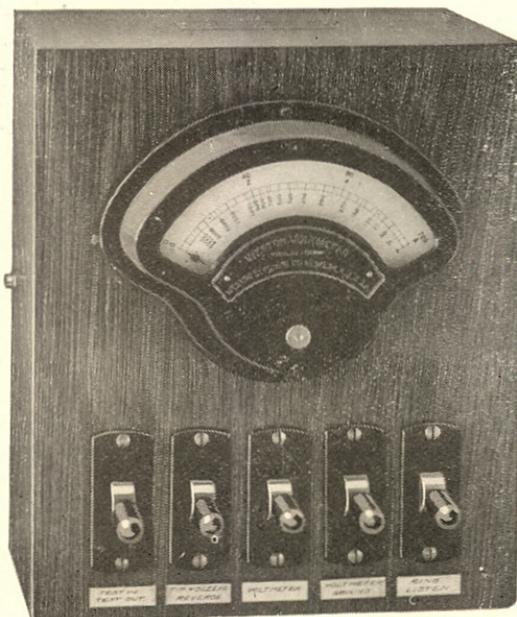


## PORTABLE TELEPHONE AND TEST SET



There has long been a demand for a test set or portable magneto telephone in which the essential feature was strength rather than lightness. Too often test sets have been designed with lightness as the chief aim, and strength has been sacrificed. The man who has tried to test a long and heavily loaded bridging line and found his generator too light to call the exchange, or his talking set inefficient, knows that lightness at the cost of reducing the efficiency of his set is not always desirable. Although this test set is small, it contains all the standard parts of the most powerful bridging telephone. The transmitter and induction coil are the same as used in Monarch

Telephones while the receiver is a standard operator's watch-case receiver. The buzzer is the same type as the regular Monarch ringer. A cam type key is used for opening and closing the talking circuit. A box containing these parts is made remarkably substantial and capable of withstanding hard usage. It is of convenient shape to carry, is provided with a strong strap and no parts are exposed. The binding posts at the top are unusually large, making it possible for a man to handle them easily without taking off his gloves. While there has been a considerable demand for this portable telephone from exchange men, there has also been a large demand from power companies in the extreme West, where it is necessary for a lineman to carry a complete telephone on horseback to enable him to communicate with headquarters. Ranchmen have also found the instrument convenient for connecting temporarily with the telephone line. These instruments can be furnished with buzzers of any resistance and generators of any size and type.



Wire Chief's Test Unit.

### Wire Chief's Test Unit

All wide awake exchange managers have felt the need of some kind of testing equipment to help them find trouble from the office. To meet this demand we have designed and standardized a Test Unit which will fill the requirements of the exchange not now supplied with a wire chief's desk. This Test Unit is illustrated here and is described more fully in our Switchboard Bulletin No. 35. If you do not have one of these Bulletins, write us for it.

#### GUARANTEE

The Monarch Telephone Manufacturing Company guarantees its Telephone and Switchboard equipment to be free from defects in workmanship and material, and agrees to repair or replace any parts showing such defects, providing such defective parts are returned to the factory, charges prepaid, for inspection and test.

#### TERMS

Our terms to individuals or companies of established credit rating are *Thirty Days Net*. If you are not rated in the credit agency books your first order should be accompanied by bank or mercantile references. C. O. D. shipments will be made when a sufficient sum is sent with order to cover transportation both ways.

#### SHIPMENTS

*Always Specify whether goods are to be shipped by freight, express or parcel post.* If no instructions are given we reserve the right to use our best judgment in this matter.

## Monarch Telephone Manufacturing Company

Factory and General Offices  
Fort Dodge, Iowa, U. S. A.

#### DISTRIBUTORS

Tel-Electric Co., Houston, Texas      Electric Supply Co., New Orleans, La.  
Coker Electric Supply Co., Los Angeles, Cal.  
Hendric & Bolthoff Mfg. Supply Co., Denver, Colo.

**R. O. PALMER, State Representative,  
MONARCH TELEPHONE MFG. CO.,  
2417 EMERSON AVE. SOUTH,  
MINNEAPOLIS, MINN.**