

# CRACRAFT LEICH TELEPHONES

FOR SALE BY

## Electric Appliance Company

CHICAGO  
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### MAGNETO TELEPHONES

**T**HE magneto telephone has gone through numerous stages of development during the last decade and the so-called compact type has proven itself to be the most popular and satisfactory. The general appearance and the suitable way in which the apparatus

can be housed has caused this type to be generally adopted.

The perfection of the modern dry battery has made it an easy matter to design a more satisfactory cabinet than the so-called wet battery type, but even this type of telephone was not developed to its highest point of perfection until the "CRACRAFT, LEICH accessible magneto Compact Type Telephone," was produced.

The great difficulty heretofore has been in the arrangement of apparatus and the mounting of same in the cabinet.

Any piece of electrical apparatus connected to the line wires that are strung on poles is subject to abnormal electrical currents

produced by lightning discharges or crosses with high tension power transmission circuits. As partial protection only can be provided, it naturally must occur that at times some of the apparatus comprising a telephone will become disabled.

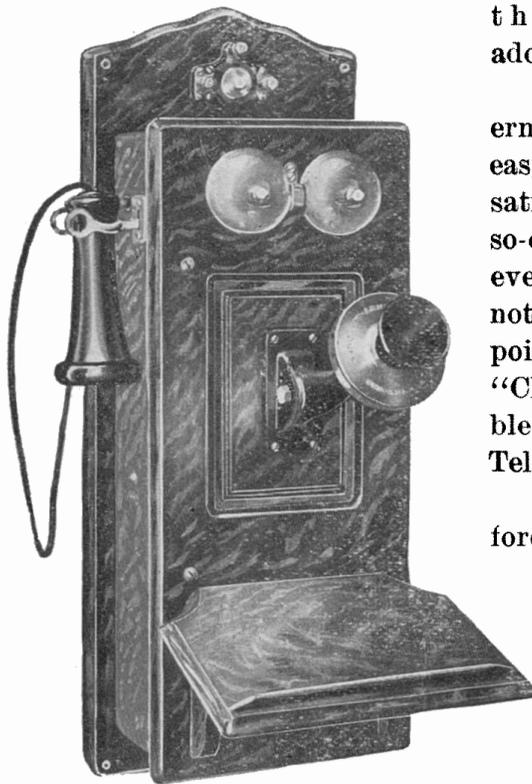


Fig. 1

In order to make it easier to remove such apparatus, it has been the practice in the past to mount part of the same on removable shelves. This has not proven very satisfactory for various reasons. Since it is not practical to have one shelf for each piece of apparatus, it becomes necessary to mount more than one piece on a shelf. It can readily be seen that in order to get at any particular part, it is necessary to remove the shelf which in turn necessitates the disconnecting of some other part from the circuit, and furthermore, this greatly interferes with the locating of defects in the apparatus or circuit connections when the telephone has become damaged, since each part is more or less dependent upon some other part of the telephone to properly perform its functions.

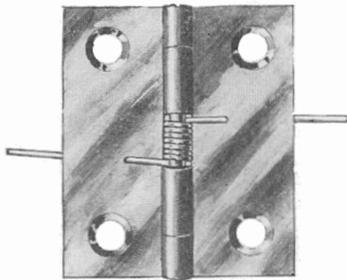


Fig. 2

In view of the above facts, it at once becomes apparent that each piece of apparatus should be so mounted in the cabinet that it can be tested and inspected without removing and that same can be removed without disturbing the circuit connections of any other part of the telephone.

The ringer, induction coil, receiver and condenser are most apt to become damaged by abnormal electrical currents due to their electrical connection with the outside circuit.

The hand generator can readily be protected by having the shunt springs automatically short circuit the armature winding when not in use.

The receiver, which is supported by the switchhook, and the transmitter on the outside of the cabinet, are naturally accessible.

That the logical place for the other apparatus, namely, the ringer, induction coil and condenser is on the inside of the door, cannot be questioned; but only under one condition, and that is, that suitable means be provided for reliable circuit connection between such apparatus and the other apparatus mounted in the cabinet.

Our hinge shown in figure (2), has overcome all difficulties formerly encountered where hinges were used as a part of the telephone circuit. This hinge embodies one continuous spring wire projecting beyond the wings on each side. This projecting

end is bent around an escutcheon pin around which the circuit wire is bent in the opposite direction, both wires being there soldered together and also soldered to the pin, making such hinge connection absolutely reliable.

The cabinet and wiring of same are very important items in the construction of a telephone. Our cabinets are made of the very best grade of quarter-sawed oak, the sides are somewhat heavier than ordinarily used. The generator shelf is securely fastened to the sides, thereby greatly strengthening the cabinet as a whole. These features are well worth considering as they safeguard against breakages in shipment. Slight warping of the cabinet or any distortion is apt to injure the wiring and we fully realize the trouble a customer is put to when a telephone is received in poor condition.

The accurate drilling of holes necessary for the mounting of apparatus and wiring is accomplished by means of special steel drill jigs.

By placing most of the apparatus on the inside of the door the wiring necessary on the backboard is reduced to a minimum. The wires on this backboard are placed in saw slots provided for them and after the backboard has been completely wired the slots are filled with hot beeswax holding them securely in place and at the same time serving as an insulator and protection.

These cabinets are finished in dark golden oak, only the very best grade of varnish being used. Two screw locks are provided

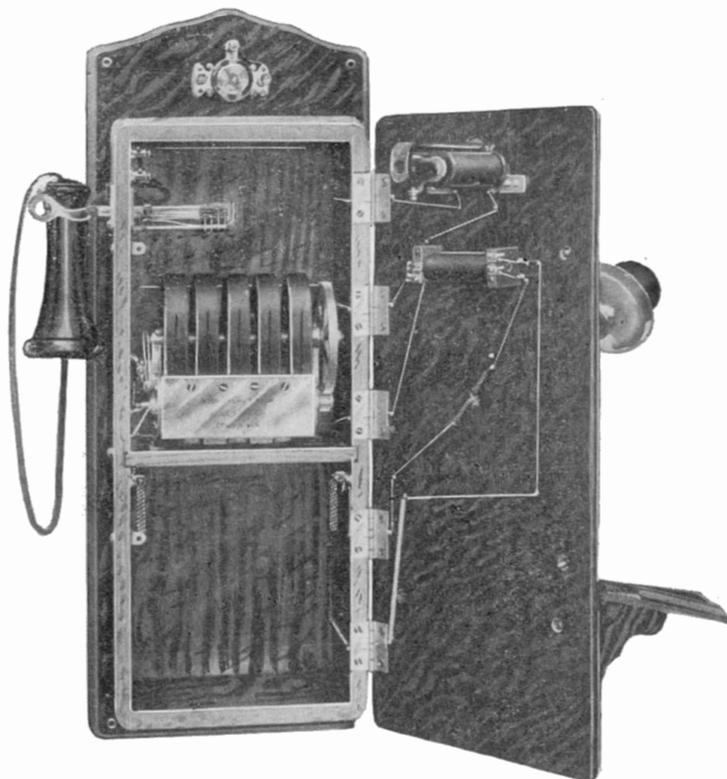


Fig. 3

and they are so constructed as to draw the door tight against the cabinet.

The receiver binding posts are constructed to accommodate either a tip or spade cord terminal. Convenient binding post for the battery connections are also provided.

Figure (3) shows an open view of our 5-bar bridging instrument. We wish to call particular attention to the mounting of

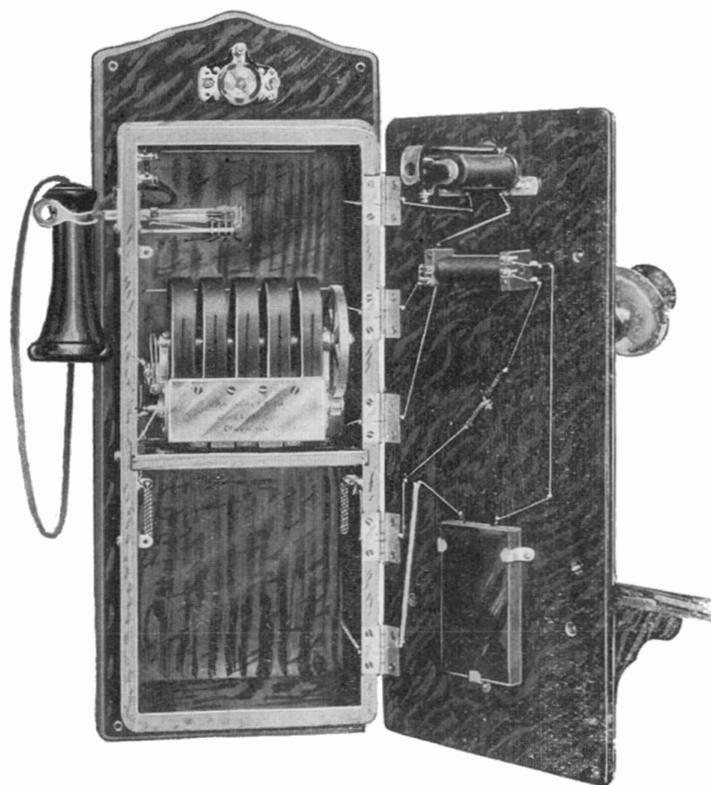


Fig. 4

the induction coil on the door and the wiring. This wiring on the door is the same for all our different types of magneto instruments which are more fully described on some of the following pages.

This arrangement of apparatus and circuit wiring has been made possible and practical by the use of our extension wire hinge shown and described on page (2), Fig. (2). The wire from the lower hinge is brought up closely to the hinge side of the door to prevent same from touching the batteries when the door is closed. It is also covered with a beeswaxed sleeving as an additional precaution. This wire is then carried across the door in such a manner that it may be cut at any time halfway between the two escutcheon pins shown and a condenser placed in circuit as in figure (4). This wire leads to the secondary winding of the induction coil and all bridging telephones can in this way, be readily changed to so-called "Sure Ring" telephones.

The second hinge from below is connected directly to the right

hand battery binding post inside of the cabinet and the wire on the door connected to same leads to the transmitter and from there to the lone primary of the induction coil.

The middle hinge is connected to a common wire for the remaining primary and secondary of the induction coil and the upper two hinges serve to carry the ringer wires to other connections in the cabinet.

This original and sensible arrangement of apparatus is being protected by patents and same are now pending in the U. S. patent office.

The generator is screwed upon a securely fastened shelf by means of four machine screws and can readily be removed. These generators are equipped with universal shunt springs and all bridging telephones can be transformed into series telephones or vice versa by simply changing the connections at the generator springs, or, either may be changed into a so-called "Silent Ringing" telephone at the generator terminals.

These telephones as shown can also be furnished with push buttons and are further described under the heading of "Subscriber's Intersignalling Telephones" and "Selective Call Central Telephones," on some of the following pages. This requires some additional wiring.

All telephones shown in this bulletin and coded are considered standard by us and carried in stock for prompt shipment..

The cabinet of the telephone shown in figure (5) is somewhat narrower than the 5-bar cabinet shown on page (1).

This cabinet is used for our 3 and 4 bar telephones as shown on pages (6) and (7). The woodwork is of the same heavy construction.

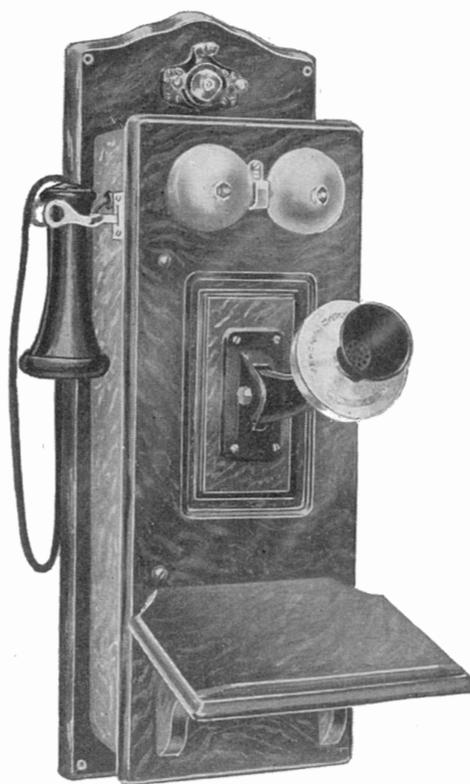


Fig. 5

The wiring and mounting of apparatus is identical with that of the 5-bar telephone.

The question of how many of our 4-bar telephones with 1000 ohm ringer or 1600 ohm ringer can be operated on a line, cannot be answered very definitely on account of the various conditions of the lines, due to line resistance, leakage, etc., also the resist-

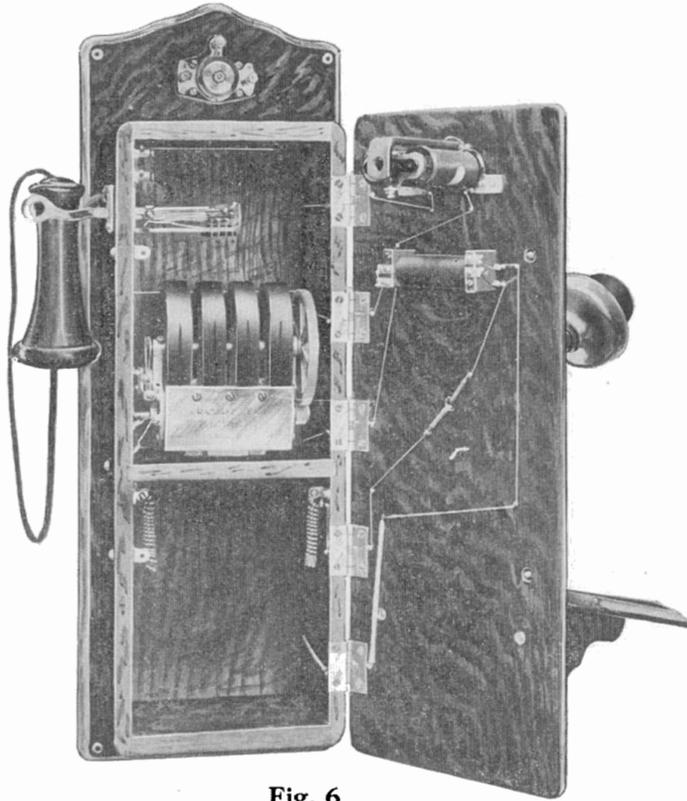


Fig. 6

ance of the switchboard drop connected to the line.

If the first telephone on the line is several miles from the exchange and the remaining telephones are beyond that, we recommend that a 500-ohm drop be used at the switchboard.

A ten mile line constructed of No. 12 iron wire of a good grade, equipped with from ten to twelve of our 4-bar 1000 ohm

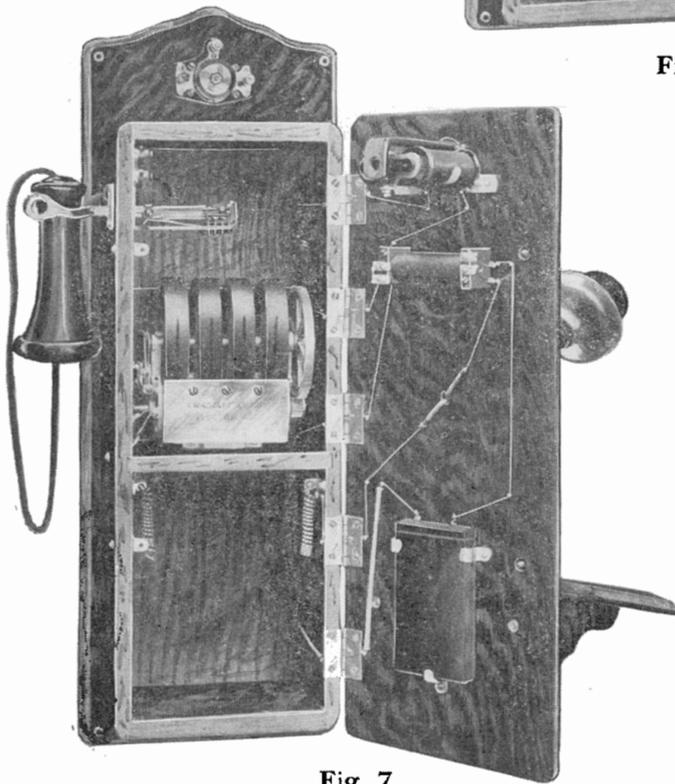


Fig. 7

telephones should give very good satisfaction. A 4-bar 1600 ohm telephone would be somewhat better for both ringing and long distance transmission, due to the greater impedance of the ringer, although this difference would not be very marked in ordinary service.

On longer lines and those equipped with more telephones, our 5-bar 1600 ohm bridging telephones should be used.

This 5-bar 1600 ohm telephone will meet all requirements within the practical limits of bridging party line telephone service.

A 1600 ohm ringer is sufficiently high in resistance and impedance for practically all uses and the increased efficiency of a line equipped with 2000 or 2500 ohm ringers is not very great and hardly warrants the additional expenditure except in very special cases.

In connection with the question of telephone signaling, no bridging party line should be installed unless the receiver cir-

cuits of the telephones are equipped with condensers. This not only protects the line from being tied up as far as ringing is concerned, when the receiver is left off the hook, but also protects the receiver from an undue amount of ringing current.

The additional cost of a sure ring condenser is very small and as it is a reliable piece of apparatus, it should not be omitted from any telephone of this type and we do not believe that the advantages gained at so small an expense are fully realized by

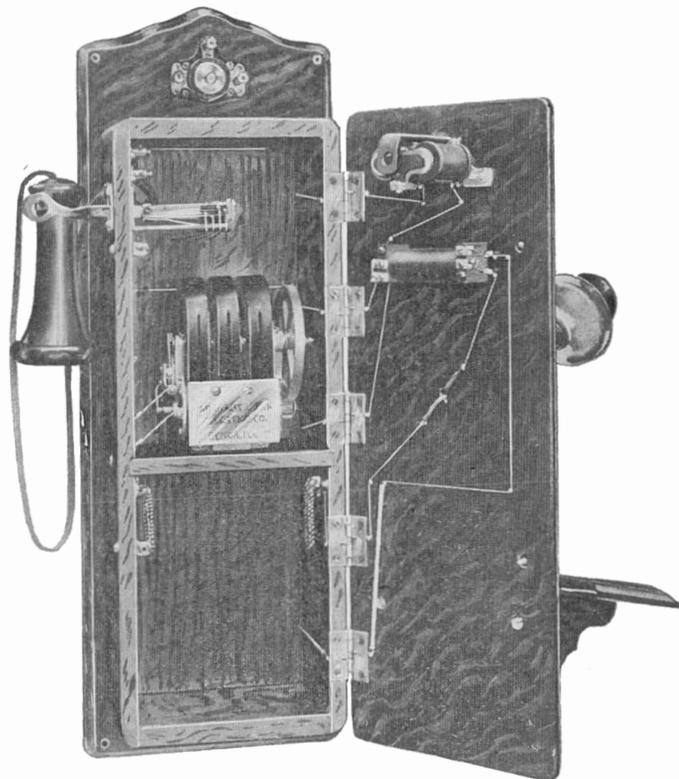


Fig. 8

some of the telephone users. Figure (7) shows our 4-bar telephone equipped with a sure ring condenser.

Our series telephone shown in figure (8) is identical in construction and wiring with those shown on the foregoing pages. This 3-bar telephone is also made up for bridging work with all the different standard ringer resistance.



Fig. 9

There are no other working parts in the stem except the hook lever and movable rod. Either can be easily gotten at.

The switch springs, induction coil and terminal block are mounted in the base, all readily accessible and fastened in a neat and

## CRACRAFT, LEICH DESK TELEPHONES

The Cracraft, Leich desk telephone is of new design throughout. It has a strong and neat appearing adjustable head made of brass. All nickel parts are made of the same material, it being the most satisfactory for wear as well as strength.

The stem is made of steel finished in black enamel. The base will also be finished in black enamel unless otherwise specified.



Fig. 10

substantial manner. There is ample room for all; the base is small and not out of proportion to the rest of the stand. The bottom plate can readily be removed by slightly loosening three screws. The plate can then be turned and taken off.

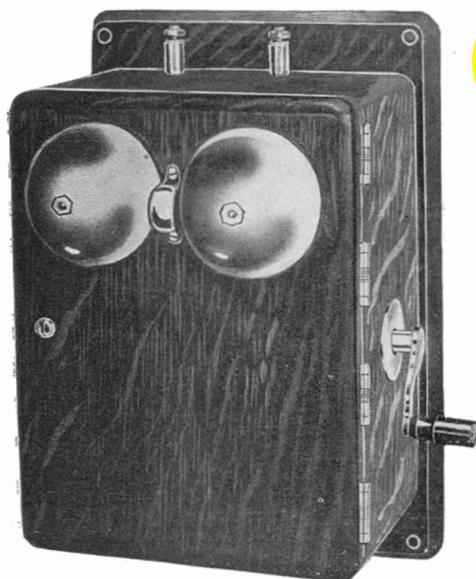


Fig. 11

#### GENERATOR BELL BOX FOR DESK TELEPHONE USE

This bell box is equipped with six binding posts on the lower part of the back board; four to accommodate the desk stand cord and two for the battery connections. Two additional binding posts are placed on the top for the line connections.

The box is made of quarter-sawed oak throughout, with a dark golden oak finish. It is neat in appearance and the door is flush with the sides, making

the generator crank more accessible.

All sets are wired in such manner that they can readily be

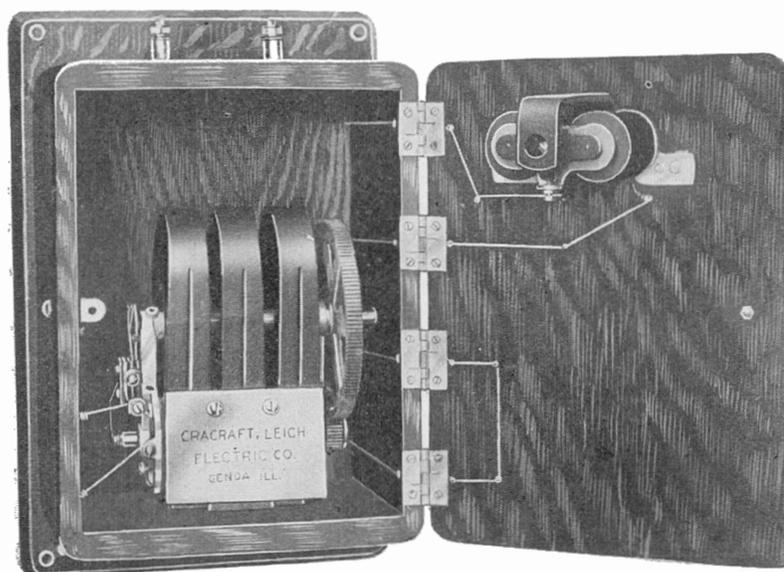


Fig. 12

changed from series to bridging by simply changing the generator connections and replacing the low wound ringer by one having a higher resistance winding.

A condenser for sure ring purposes may be added at any time by mounting same on the lower inside portion of the door, the wire connecting the two lower hinges as shown in fig. 12 being provided for same.

If desired, these sets can be equipped with lightning arresters.

The generator and ringer are of the well known Cracraft, Leich make, making the complete set a very desirous piece of apparatus. These sets can be furnished with three, four and five bar generators and with ringers of any desired resistance.

#### EXTENSION BELL BOX

It is often desirable to have the ringer and generator mounted in separate boxes for desk stand use. In that case it is not necessary to mount the bell box near the desk set as it may be placed in some other part of the room and be connected separately to the line. This bell box is commonly known as an "extension bell."

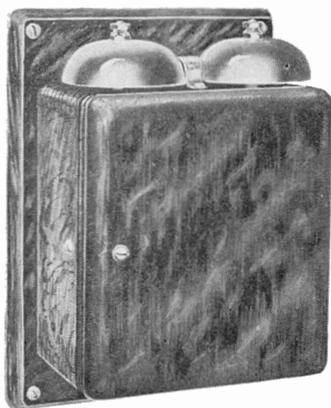


Fig. 13

The ringer is of the self contained type having the gong post fastened directly on the heel iron. Our eccentric gong adjustment makes it possible to adjust the gongs without opening the door of the cabinet. The door of the box is flush with the sides, giving the cabinet a neat appearance. It is provided with a screw lock, allowing the door to be drawn tight against the sides.

#### GENERATOR BOX

The generator box is equipped with our standard generator, having universal shunt springs, and can be used for either series or bridging sets. They are made up in three, four and five bar sizes.

The door is flush with the sides, making the generator crank more accessible, and is provided with a screw lock. When used in connection with a desk telephone, the necessary binding posts for the cords, etc., are provided.

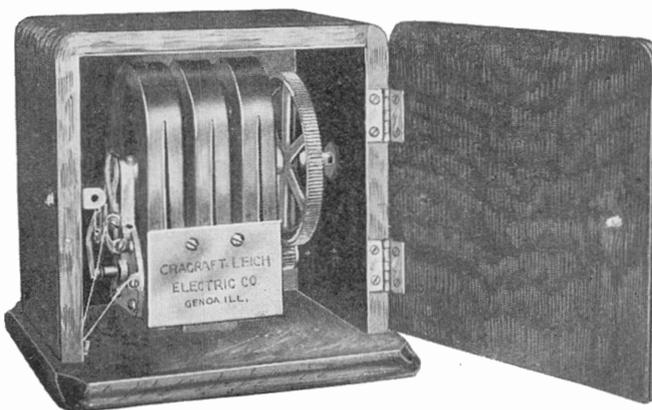


Fig. 14

## CRACRAFT, LEICH TELEPHONES FOR PRIVATE USE

This telephone is designed for local use where but two instruments are connected to a line and no switchboard connection is desired.

It is equipped with a vibrating bell and push button and will operate very satisfactorily on lines not more than 1000 feet long.

From two to three dry batteries are required at each telephone and binding posts are provided for both battery and line connections.

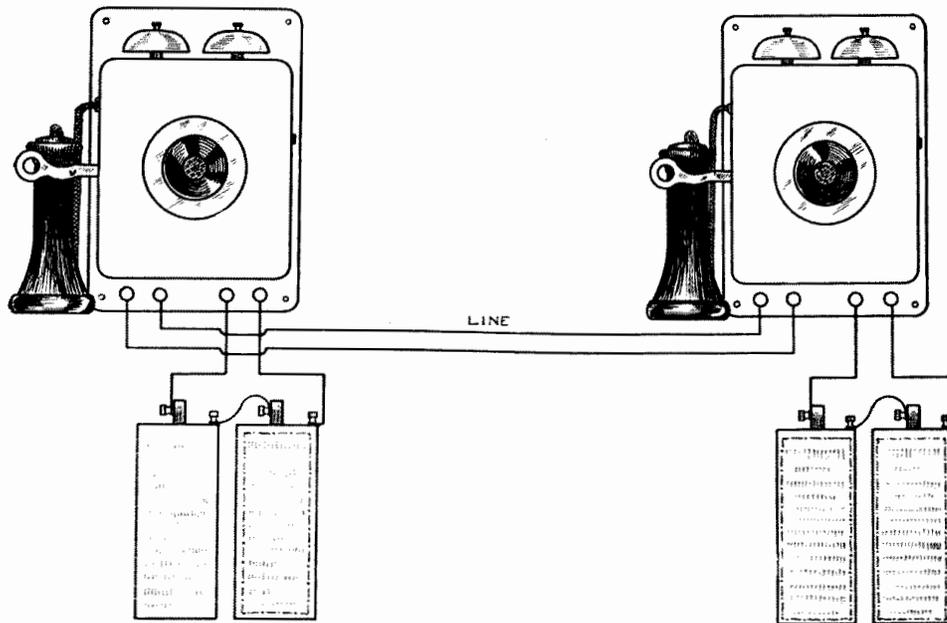
The transmitter, receiver, induction coil and hookswitch are of the same high grade as used on our magneto exchange telephones.

The experienced telephone man has learned that the life of a telephone is the most serious problem to contend with and it is due to the poor grades of such telephones that have been placed on the market in the past that they are not looked upon with much favor.



Fig. 15

On the next page is shown a diagram showing how batteries and wires are connected to the telephone.



## THE CRACRAFT, LEICH TRANSMITTER

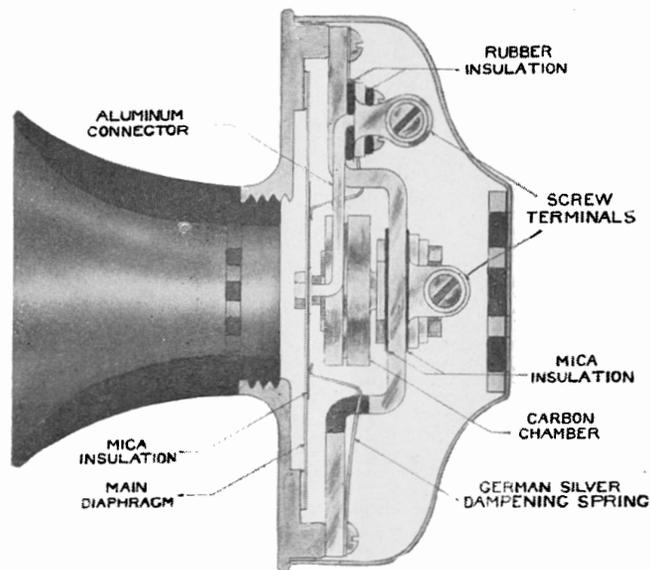


Fig. 16

The fundamental principle of the telephone transmitter is a simple one. It is a well known fact that carbon granules, when placed in a chamber and connected in series with an electric circuit, in which there is a current flowing, will offer a variable resistance when the granules are disturbed. The limits through

which this resistance can be varied with a minimum amount of energy, are of fairly large dimensions, placing carbon far in advance of any other material known for the production of electrical current waves that act in unison with the sound waves produced by the human voice.

The carbon buttons, as well as the carbon granules, in the Cracraft, Leich transmitter have, through consistent study and experimenting, been brought to a maximum point of efficiency. They are placed in a carbon chamber, as shown in figure (17), and hermetically sealed by means of a mica diaphragm which is

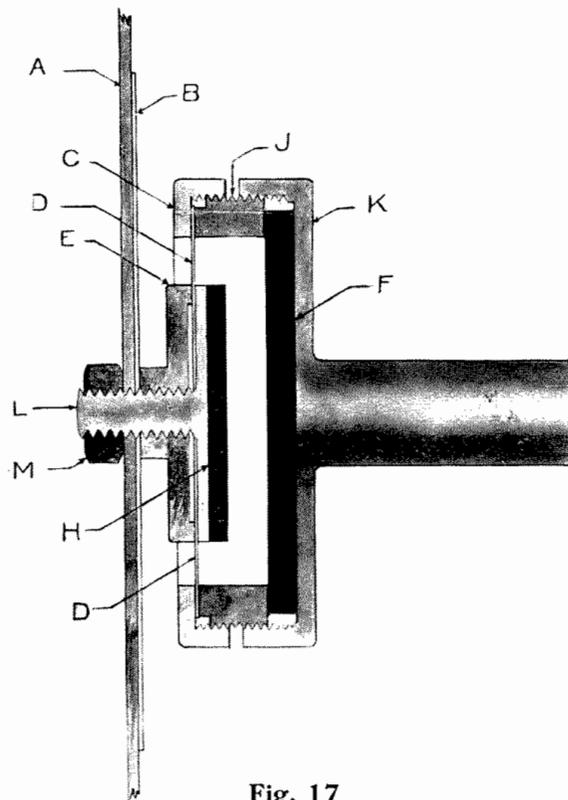


Fig. 17

uniformly and perfectly clamped around its entire periphery. This air tight carbon chamber prevents moisture or harmful gases from coming in contact with the carbon buttons and carbon granules which will otherwise coat them with a thin film of foreign matter and materially decrease the efficiency.

By so clamping a mica diaphragm, which is the only practical way known to perfectly seal the carbon chamber and still allow

one of the carbon electrodes to vibrate, this mica diaphragm immediately assumes a natural pitch.

Great care must therefore be taken in the construction of the carbon chamber, carbon buttons and their associate parts.

One of the carbon buttons which is supported by the mica diaphragm must have sufficient contact area in order to properly conduct the current to the carbon granules, in order that no sparking or frying will occur when the transmitter is in service.

The weight and area of this carbon button also becomes a factor in the proper tuning of the mica diaphragm and all parts must be proportioned in such a way that this mica diaphragm will respond most readily to the average pitch of the human voice.

Aluminum is the most sonorous metal known and is therefore well adapted for the construction of the main diaphragm.

Two German silver dampening springs rest against this main diaphragm near the center and are insulated therefrom by means of a thin mica disc. The springs prevent undue vibration of the main diaphragm, which would otherwise cause undesirable current waves to be set up in the transmission circuit.

Figure (16) shows the manner in which the dampening springs are carried through the bridge and rest against the main diaphragm and insulated therefrom by means of a mica disc.

The terminals are so placed that a screw driver can be applied from the side, which is a convenience not found in any other make of transmitter.

The back cup is provided with bayonet slots in place of the customary screw holes through which the screws, that are used to fasten the transmitter into place, pass. This makes it unnecessary to entirely remove the screws when the transmitter is removed from the back cup.

The Cracraft, Leich transmitter has met with exceptional success in the past and meets the approval of the most exacting telephone engineer.

Taking into consideration past performances of our transmitter, we do not hesitate in saying that same is unequalled today for all around commercial service and for both local and long distance transmission, and we fully guarantee same indefinitely under normal operating conditions.

## CRACRAFT, LEICH RECEIVER

It is only due to the high efficiency of the receiver originally invented by Alexander Graham Bell that voice transmission over an electrical conductor by means of variable electric currents was made possible.

Very little improvement in the efficiency of this instrument as a receiving device has been made since that time. These earlier forms of receivers were of the single pole type and the modern bi-polar receiver is of course an improvement over the former due to a better magnetic circuit insuring a more permanent magnetism.



Fig 18

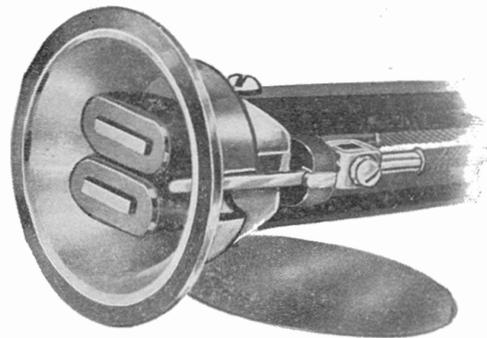


Fig. 19

It is obvious that the smaller the air gap between the pole pieces and the diaphragm, the more sensitive the receiver to weak currents, and also that the diaphragm when brought in too close proximity to the pole pieces, is apt to strike when stronger currents are passed through the receiver spools, depending, of course, largely on the thickness of the diaphragm.

The air gap, and the thickness and diameter of the vibrating diaphragm are therefore important factors in the construction of a receiver. In Cracraft, Leich receivers, special stress is laid to the accuracy of such parts controlling the above mentioned features. Great care is taken that the surfaces clamping the diaphragm are such as not to distort or buckle them and that a perfect and uniform clamping is accomplished.

Due to the accuracy required to maintain the air gap within a fraction of a thousandth of an inch of its established dimension, it can readily be seen that such parts of the receiver as the pole pieces and the diaphragm supports must be of absolute permanency. For this reason, the pole pieces of the Cracraft, Leich receiver are not adjustable and are ground exactly to the proper depth, thereby producing a uniform and permanent air gap, insuring at all times a high efficiency for those parts depending upon the mechanical construction.

Figure (19) shows the general design. The cup which supports the diaphragm is made of rolled brass formed into the desired slope. Upon the bottom of this cup is riveted a spool core and magnet supporting piece. This makes a very rigid construction. The magnets and receiver spools can readily be removed for rewinding. On the bottom side of this magnet supporting piece is fastened a heavy piece of fibre insulation which in turn supports two substantial cord connections which will accommodate either a tip or spade terminal. Magnet steel of a special quality is used to conform with the high standard of Cracraft, Leich apparatus.

The shell is made of the best grade of material known as composition rubber. These shells have the same appearance as rubber shells and on account of their lower cost, are far more preferable to the telephone buyer. The strength of this material is greater than that of rubber.

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## **CRACRAFT, LEICH INDUCTION COIL**

The object of the local battery induction coil is to transform the low voltage current produced by the battery, and which has taken the form of the variable current, due to the action of the transmitter on the same, to a higher pressure.

In this respect the induction coil performs the same functions as a transformer connected to an electric power circuit.

In the case of the local battery telephone circuit, however, the current in the primary of the induction coil is not an alternating

one, but is a variable direct current. In the design of the induction coil, a complete magnetic circuit of iron cannot be employed due to the hysteresis of the iron which would prevent the magnetism caused by the primary current from varying to the same limits as the current itself. The core is therefore cut off at the end of the coil, leaving a large air gap in the magnetic circuit.

It can now readily be seen that there will be a large magnetic leakage in respect to the outer turns of the secondary of the coil, and that beyond a certain distance a number of turns in the secondary additional will be more of a harmful nature than effective.



Fig. 20

In the Cracraft, Leich induction coil these most important details have not been overlooked, and the induction coil as well as the other apparatus has received proper attention.

The secondary of our induction coil is kept lower in resistance and number of turns than induction coils of the past, resulting in a more perfect articulation in the outgoing transmission and less retardation in the receiver circuit for the incoming voice currents.

The heads are made of wood, eliminating the objectionable features of fibre caused by the action of chlorine and other properties contained in it.

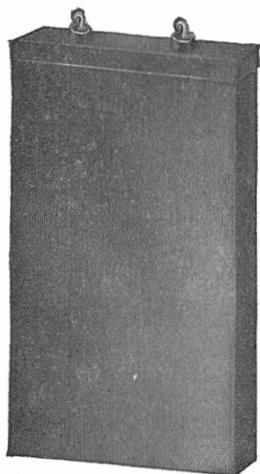


Fig. 21

### CRACRAFT, LEICH SURE RING CONDENSER

The overall dimensions of this condenser are  $4\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{2}$  inches which makes a very convenient size for magneto telephone use. These condensers are made of the best grade of tin foil, rice straw paper and paraffine and have a capacity of  $\frac{1}{2}$  micro-farad.

The terminals are brought out in a good and substantial manner and the necessary clips for mounting same are furnished with each condenser.

## CRACRAFT, LEICH PUSH BUTTON

Figure (22) shows the general construction of our telephone push button. Considerable trouble has been experienced in the past from lightning discharges burning out the insulation when all springs are mounted closely together, as the circuits of the telephone where these push buttons are used usually require that one of the springs be connected to the ground wire.

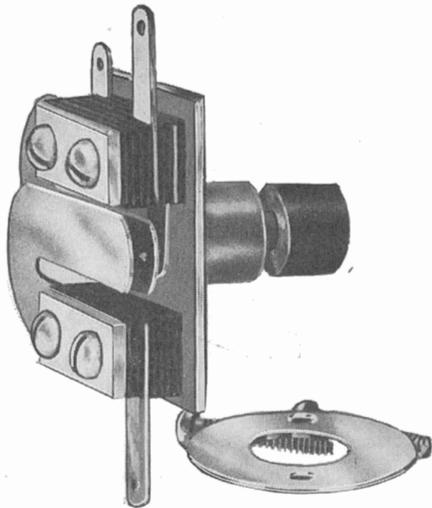


Fig. 22

We have, therefore, provided a mounting space for this ground spring on the opposite side of the frame with an exceptionally high insulation. Those experienced in the use of push button telephones will readily appreciate this construction as possessing the same high grade qualities that is so marked in the design of all Cracraft, Leich apparatus.

## CRACRAFT, LEICH HOOKSWITCH

The long lever type hookswitch has had an acknowledged success in service and the experienced mechanic can point out good reasons for the satisfaction it gives.

In order to keep the base of the switch within reasonable dimensions, the center of rotation of the hook lever is located at the extreme end of the frame.

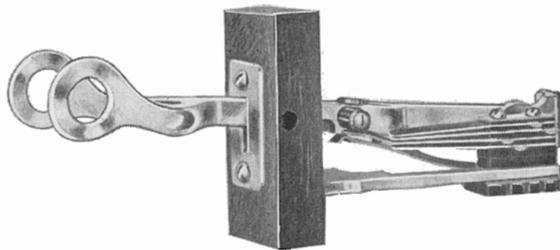


Fig. 23

This allows the hook lever itself to be a maximum length for a minimum overall length of the hookswitch. In this style of hookswitch, the part of the lever that extends outside of the cabinet will move approximately in a vertical line when the switch is operated.

In the design of the Cracraft, Leich hookswitch, shown in figures (23) and (24), great care has been taken in the manufacture of the springs, and they are so constructed that no portion can be distorted to the point at which they will take a new set.

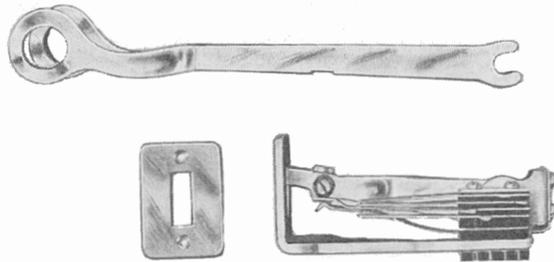


Fig. 24

The main actuating spring is screwed directly to the metal base and is no part of the telephone circuit.

Other notable features are that the hookswitch is mounted in such a way that it can be removed

from the cabinet without removing the telephone from the wall. The circuit wires are soldered to the springs from the front, in order that they may be easily reached with a soldering copper when it is necessary to remove the hook switch.

The hook lever is of the removable type, which, although being of no particular advantage in the operation of the telephone, is a convenience in the handling and packing for shipment, and also in the transportation from the warehouse to the subscriber's office or residence.

All contact springs are provided with pure platinum points, hard rubber of sufficient thickness being used for insulation between these springs, in order to prevent the breaking down of the insulation under normal operating conditions.

## CRACRAFT, LEICH GENERATOR

In the manufacture of Cracraft, Leich generators only the best quality of material is used in their construction.

The telephone hand generator falls in the general line of dynamo construction, where the quality of the material for such purposes is the basis upon which the design must rest. In the magneto hand generator, the permanent magnets constitute the field energizing power, and the largest amount of magnetic flux obtainable is practically the starting point in the design of this type of machine. As the magnetic force of the field magnets is naturally very limited, special attention must be paid to the pro-

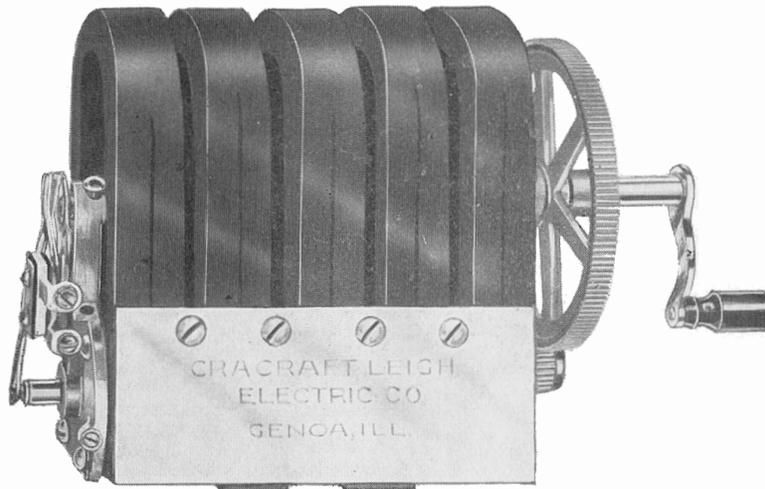


Fig. 25

per amount of iron in that part of the magnetic circuit constituting the armature, and that the necessary air gap between the armature and pole pieces be made as small as possible and still have the proper clearance for safe operation from a mechanical standpoint.

Another very important factor is the winding space, since the armature resistance is partly the controlling factor of the terminal voltage for a given current output. The number of turns of wire on the armature to obtain a given voltage should therefore be a minimum, not only to prevent the excessive drop in voltage due to the resistance of the wire, but also on account of the counter magnetism produced when the generator is operated on a load.

In the design of the Cracraft, Leich generators these points have been carefully guarded, and the output has been shown to be a maximum for the quantity of material used, the material in itself being of the highest quality obtainable.

From the standpoint of mechanical design every effort has been made to produce a machine possessing long wearing qualities.

The faces of the generator gear wheels are wide and the shaft bearings are long. The field pieces are solidly riveted together by means of brass studs and do not depend upon the end plates to hold them in their proper positions relative to each other, and at the same time they provide a good substantial support for the end plates which serve as bearing supports for the armature and gear wheel shafts only.

After the field pieces are riveted together they are bored for the swing of the armature and it is only due to this superior construction that a small air gap is practical, which plays such an important part in the possible output of the generator.

The end plates are made of heavy rolled brass, punched and formed into the desired shape. This provides excellent bearing surfaces for the steel shafts; these bearings being sufficient in length and drawn of the same stock making the end plates and bearings all one piece.

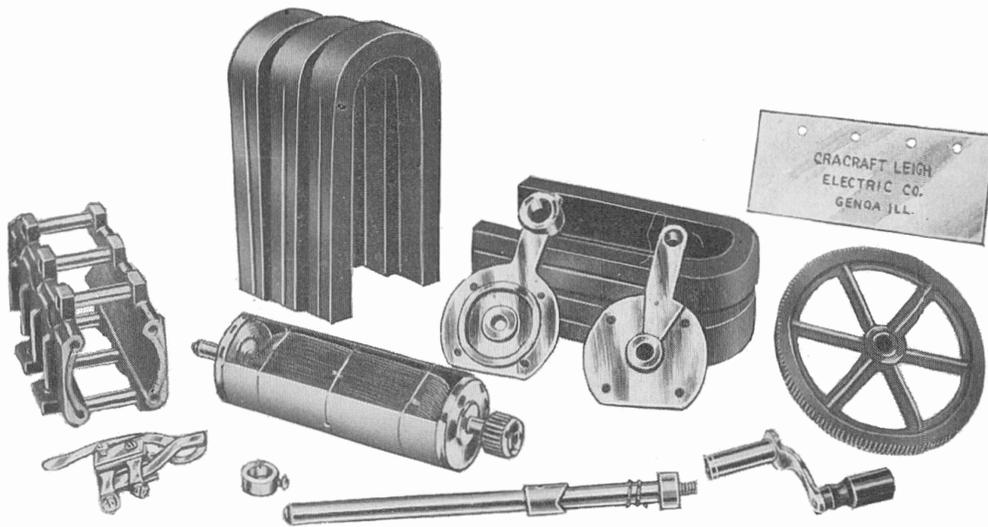


Fig. 26

All generators for both bridging and series work are equipped with a universal shunt spring. These springs are so constructed as to have sufficient length for the throw required, when the generator is operated, without bending them beyond their elastic limit.

The armature shaft is arranged in such a manner that a commutator for pulsating current can be attached at any time.

The Cracraft, Leich generator represents the highest type of magneto generators adapted to telephonic purposes.

### CRACRAFT, LEICH RINGER

One of the most ingenious and reliable calling devices is the polarized telephone ringer and which is about the only electrical piece of mechanism that has proven successful, where a permanent magnet is used as the controlling factor in combination with an electro magnet.

This is largely due to the small amount of force required to operate the clapper in proportion to the permanent magneto-motive force available. While the ringer is being operated, the electro magnets shift the path of the magnetism set up by the permanent magnet from one of the soft iron cores of the ringer spool to the other as the current in the winding reverses. It can readily be seen that a large air gap between the permanent magnet and the pole pieces of the ringer cores should be present which will allow the magnetism to be shifted more readily and thereby greatly overcome the sticking effect of the ringer armature.

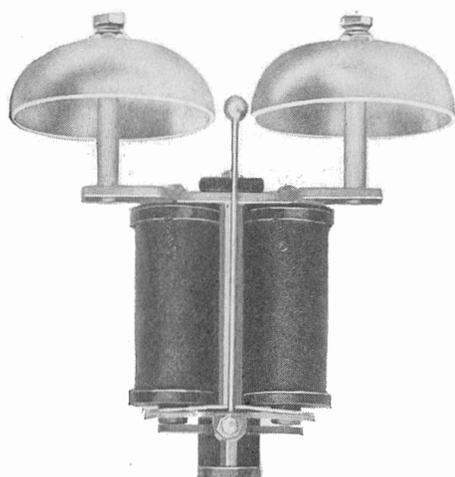


Fig. 27

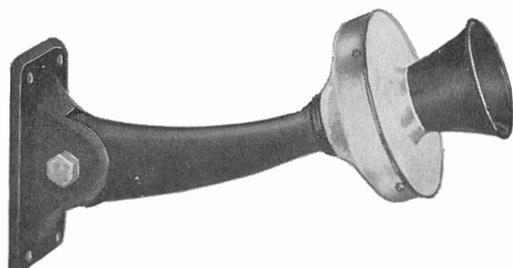
In the Cracraft, Leich ringer, as shown in figure (27), the freezing points which regulate the air gap of the armature when resting on the pole piece are sufficiently large to prevent it from sticking.

The ringer, as a whole, is self-contained. The gong posts are solidly riveted upon the heel iron, which also supports the other parts. The gong adjustment is the most permanent and reliable that can be had, and is simplicity in itself. The holes in the gongs are drilled a trifle off center, and by loosening the lock nuts slightly and then turning the gongs, any desirable adjustment can be had. This provides a very delicate adjustment through a large range. After the gongs have been turned to get the desired adjustment, they are clamped permanently into position with a double lock nut.

The armature adjustment is controlled by a single screw and all that is necessary to get any desired armature stroke is to turn this adjusting screw to the right or left with a screw driver, depending on the adjustment desired.

The ringer spools are large and provide sufficient winding space to accommodate a larger size of wire for a given resistance thereby greatly increasing the number of turns of wire. This is a very important factor where ringers are used on bridging party lines on account of the greater impedance offered to the voice currents, preventing them from being shunted from the talking circuit.

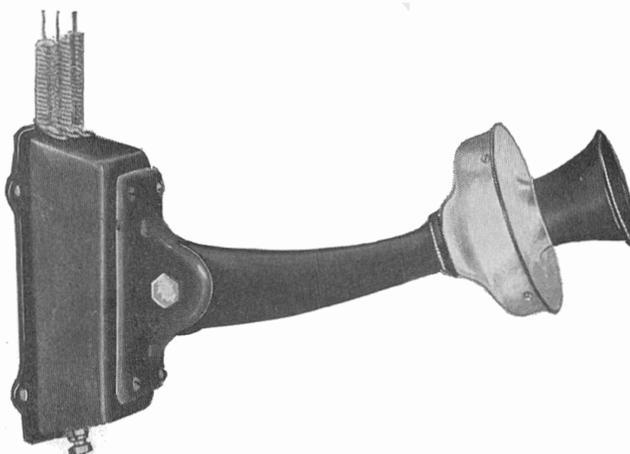
## CRACRAFT, LEICH TRANSMITTER ARMS



No. 1A ARM  
Fig. 29

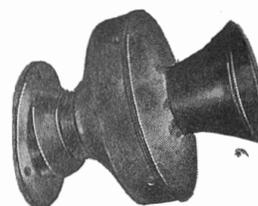
The transmitter arms shown in Figure (29) and (30) are made of pressed steel and finished with a high grade of black enamel. The No. 1A arm is used on our compact type telephones as shown on pages 1 and 5.

Our No. 2A arm has space provided in the base for the induction coil and is a very desirable piece of apparatus for re-equipping old wet battery type telephones.



No. 2A ARM  
Fig. 30

Our short arm shown in Figure (31) is made of pressed brass and is highly nickel-plated. By equipping the magneto box of the old wet battery type telephone with this arm and removing same from the back board a neat appearing telephone can be produced.



No. 3A ARM  
Fig. 31

## CRACRAFT, LEICH LIGHTNING ARRESTER

High frequency currents such as lightning discharges will jump across a small air gap rather than follow the wires of the telephone, on account of the great many turns in the circuit which

offer a large amount of impedance to a current of such a high frequency.

It can readily be understood that the smaller the air gap and the larger the area of the plates between which the discharge is to occur, the more efficient the lightning arrester. In Cracraft, Leich lightning arresters, as shown in figure (28), a carbon block with a large flat surface is connected to ground and held in close proximity of two metallic plates connected to the line binding post. A perforated mica disc of the proper thickness is interposed between these plates and the carbon block, offering a very high insulation between the line wires and ground.

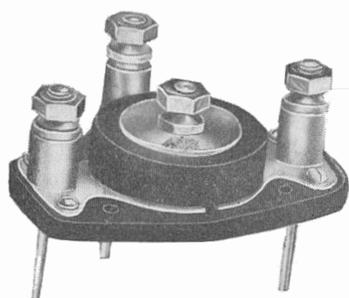


Fig. 28

This lightning arrester should always be mounted in a vertical position, due to the close proximity of the grounded block and the line plates, thereby preventing dust and other small particles of foreign matter from shorting the line connectors with the ground circuit.

The carbon block can readily be removed as is frequently necessary in order to clean out the carbon dust.

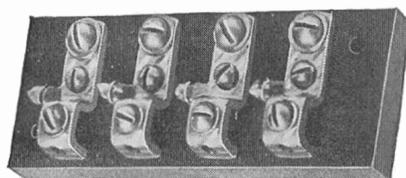
For an arrester to be placed directly on the telephone, the Cracraft, Leich arrester offers the best protection practical, and damages caused by lightning are reduced to a minimum.

## CRACRAFT, LEICH TERMINAL BLOCKS AND BINDING POSTS

Figure (32) and (33) show our terminal blocks designed particularly for desk stand use. The binding post will accommodate either a tip or spade cord terminal on one end and a wire connection on the other end for which a screw and washer is provided.

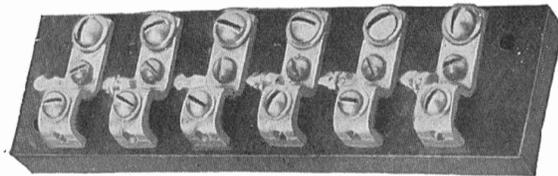
These terminals are mounted on a heavy fibre block which has a wide slot on the lower side in which wires can be placed for cross connecting them.

The 1-A terminal block is designed for local battery desk stands having a 4-conductor cord, when the stand is not operated in conjunction with our generator bell box, shown in figure 12, which



No. 2 A  
Fig. 32

is provided with the necessary binding posts for the cord. These six terminals provide for the necessary battery and cross connections,



No. 1 A  
Fig. 33.

and, with the induction coil in the base of the desk stand the terminal block is all that is necessary for a complete extension set less the signalling

apparatus. The generator and bell can be separately connected to the terminal block to make a complete telephone.

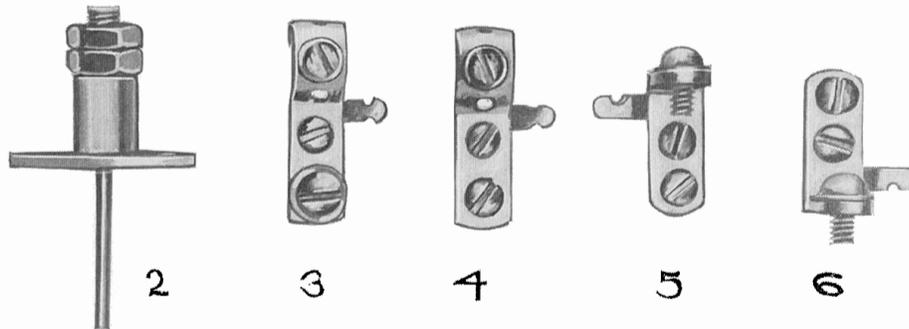


Fig. 34

Figure (34) shows a set of binding posts particularly adapted for telephone use and of which we carry a full line in stock.

**SERIES TELEPHONE**  
FOR METALLIC OR GROUNDED LINES

Our compact type series telephone circuit is shown in figure (35) and that of the desk telephone in figure (36). The wiring is identical with that of the bridging circuits with the exception of the connection of the circuit wires to the shunt springs of the generator. All our generators for series as well as for bridging telephones are equipped with uni-

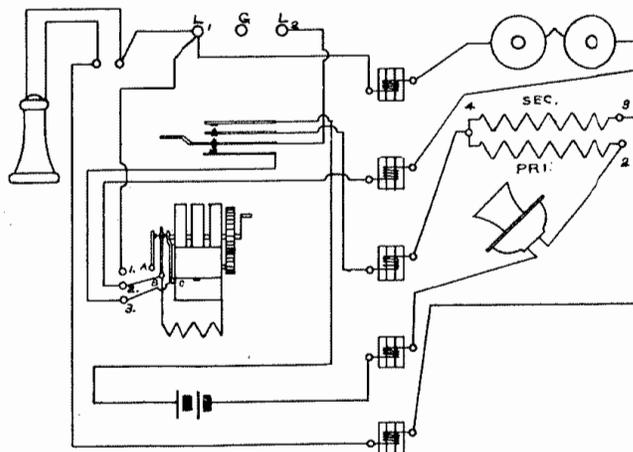


Fig. 35

versal shunt springs. The series telephone can readily be transformed into a bridging telephone by simply changing the connections of the wires leading to these generator shunt springs. For bridging telephones, it is of course necessary to substitute a high wound ringer in place of the 80 ohm ringer, with which these telephones are equipped.

Since it is sometimes desirable to connect two or three series telephones to one line, the impedance of the ringer should be kept as low as possible, it being necessary in that case for the voice currents to pass through the ringers of the idle telephones on the same line. The ringer coils are made shorter and wound to only 80 ohms, thereby keeping the number of turns as low as possible. Although these ringers greatly interfere with the voice transmission, satisfactory service can be given for local work with two or three such telephones on a line.

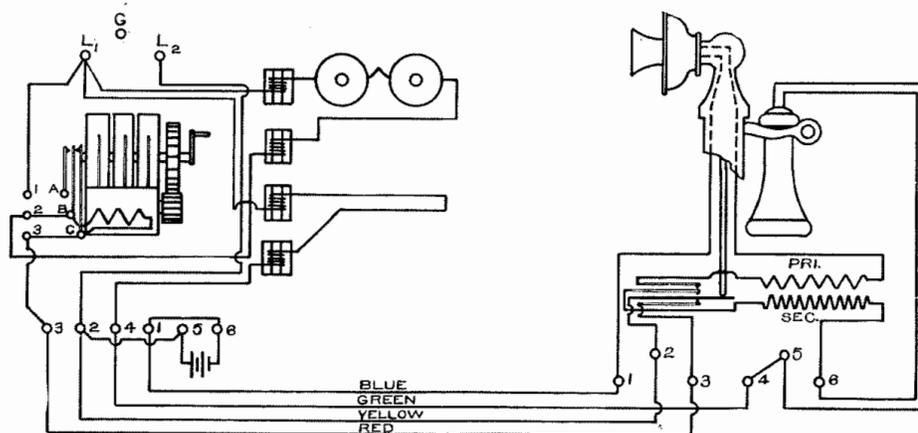


Fig. 36

## BRIDGING TELEPHONE

FOR METALLIC OR GROUNDED LINES.

Our bridging telephones are equipped with three, four or five bar generators as shown on pages 3, 6 and 7 of this bulletin. The generator bell boxes and generator boxes for desk stand use shown in figures 12 and 14 can also be equipped with the above three sizes of generators. By closely examining the different circuits shown of both the wall and desk telephone the systematic and universal arrangement of the wiring is very noticeable. The wiring of the talking circuit as shown in figure (37), most of

which is placed on the inside of the door of the cabinet, is the same for all the different types of telephones.

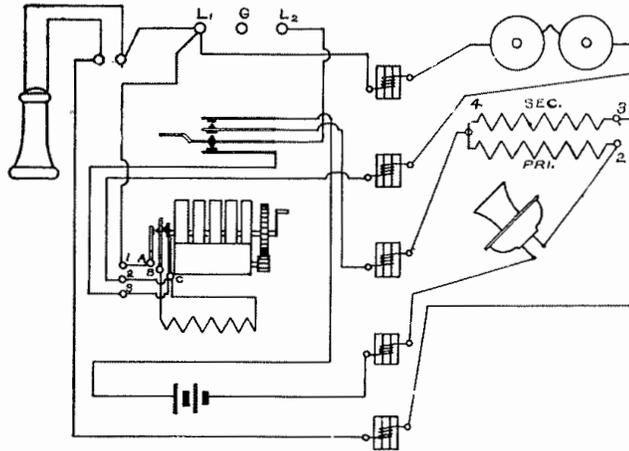


Fig. 37

This same uniformity exists in connection with the wiring of our desk telephone. The wiring and cord connections of the desk stand, the base of which contains the induction coil, being the same for all the different combinations of wiring and apparatus in the

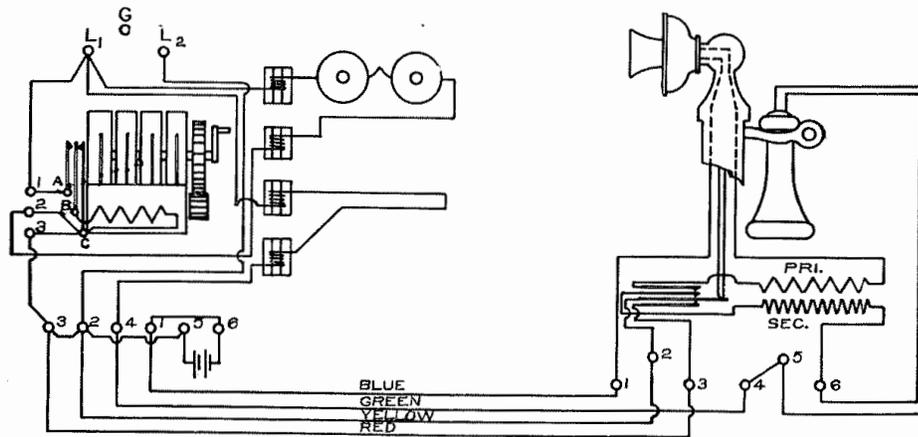


Fig 38

generator bell boxes. So standardizing the wiring of our telephones is not only of great importance in connection with the manufacturing of same, but is also found to be of great value to the exchange operator, particularly when difficult kinds of service are given on the same system.

## SURE RING TELEPHONE FOR METALLIC OR GROUNDED LINES.

Our sure ring telephones, sometimes known as "Ring Through Telephones," are wired the same as the bridging telephone. The circuit shown in figure (39) has a condenser connected in series with the receiver. The object of this condenser is to prevent the ringing current being shunted away from the ringers connected to the line by the low resistance path through the receiver and the secondary of the induction coil when the receiver is left off the

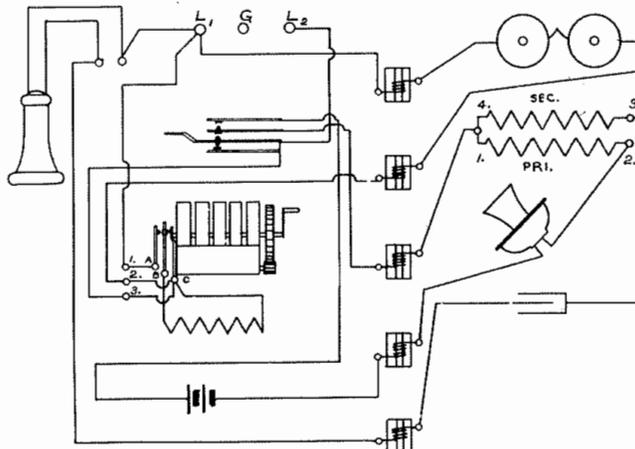


Fig. 39

hook. This condenser offers a high resistance to the low frequency generator currents, but practically no resistance to the high frequency voice currents. All telephones are wired in such a manner that they can readily be changed into a Sure Ring Telephone by simply cutting the lower wire on the door, half way between the

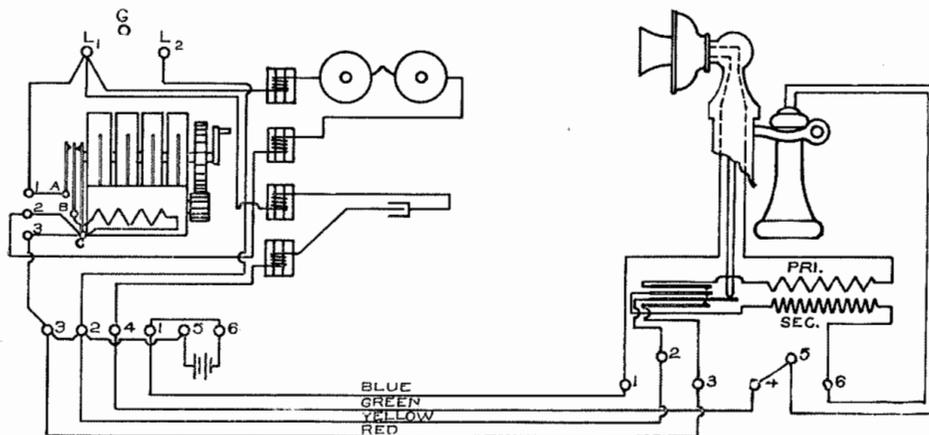


Fig. 40

two escutcheon pins, and introducing a condenser in the circuit as shown by telephone on page 6.

This sure ring feature is not only applicable to the straight bridging telephone, but may be used in connection with any telephone circuit where the ringers are bridged. A condenser can, therefore, be added to any of the following circuits in this bulletin, if desired.

Figure (12) shows a wire connecting the two lower hinges. For sure ring purposes in connection with desk telephones the condenser is connected into the circuit by cutting this wire half way between the two escutcheon pins and connecting same to the condenser terminals. Figure (40) shows the complete "Sure Ring Desk Telephone Circuit."

## DIVIDED CIRCUIT TELEPHONE FOR METALLIC LINES.

It is oftentimes desirable to divide the number of bells on a party line in such a way that one-half of the bells are connected to one wire of the metallic circuit to ground and the other half to the other wire to ground. It is then possible for the operator to ring the subscribers on one side of the line without disturbing the sub-

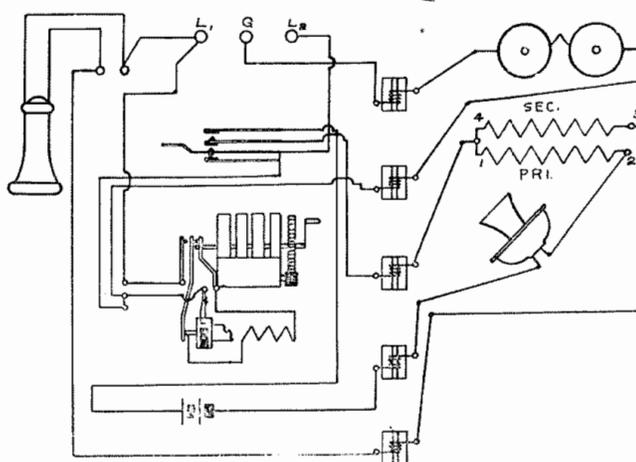


Fig. 41

scribers whose bells are connected to the other side. For this purpose, a divided circuit ringing key must be installed in connection with the operator's cord circuit equipment at the switchboard. The ringers in these telephones are connected from line binding post L2 to ground as shown in figure (41). The genera-

tor is equipped with a pulsating current commutator, which enables the subscriber to call central without disturbing any of the other parties on the line.

This telephone is practically the same as our Central Checking Telephone, with the exception of the connections of the ringer, which are connected to ground instead of being connected metallic.

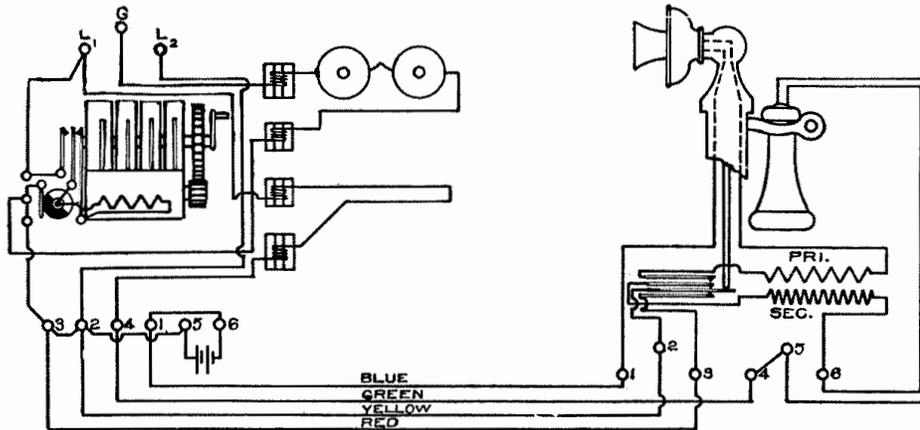


Fig. 42

It can readily be changed into a straight bridging telephone by simply changing the circuit wire connections at the shunt springs of the generator and connecting the ringer to line binding post L1 in place of ground binding post G.

Figure (41) shows the circuit for the compact type wall telephone and figure (42) that of the desk telephone.

## CENTRAL CHECKING TELEPHONE

FOR METALLIC OR GROUNDED LINES

Our central checking telephones are wired the same as our divided circuit telephones, with the exception of the ringer, which in this case is wired to line binding post L 1 instead of the ground binding post G, as shown in figures (41) and (42). The equipment is the same as shown, the generator being equipped with a pulsating commutator, making it necessary for the subscriber to call central who in turn will call the other parties on the line for the subscriber.

This will give the operator at central an opportunity to check the number of calls on the line.

## SILENT RINGING TELEPHONE

FOR METALLIC OR GROUNDED LINES

In figures (43) and (44) we show the circuits of our silent ringing bridging telephones. All of our straight bridging telephones are wired in such a way that by changing the connections at the shunt springs, the ringer becomes disconnected from one side of the line and short circuited when the generator crank is turned. This will prevent the telephone's own bell from ringing while calling other parties. This is a very desirable feature when telephones are installed in public places, such as hotel lobbies

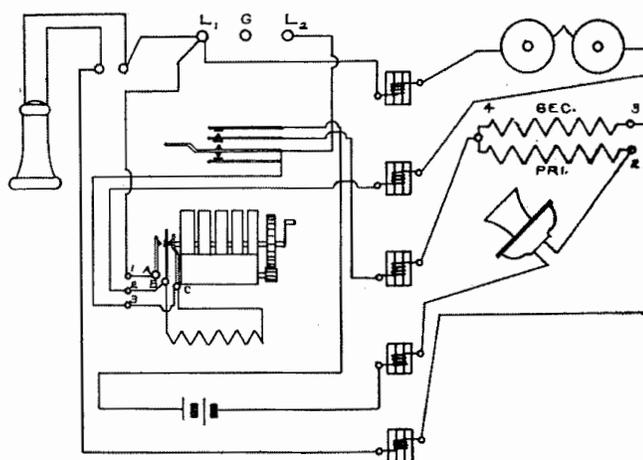


Fig. 43

and stores. A great many managers also prefer such service for other exchange work.

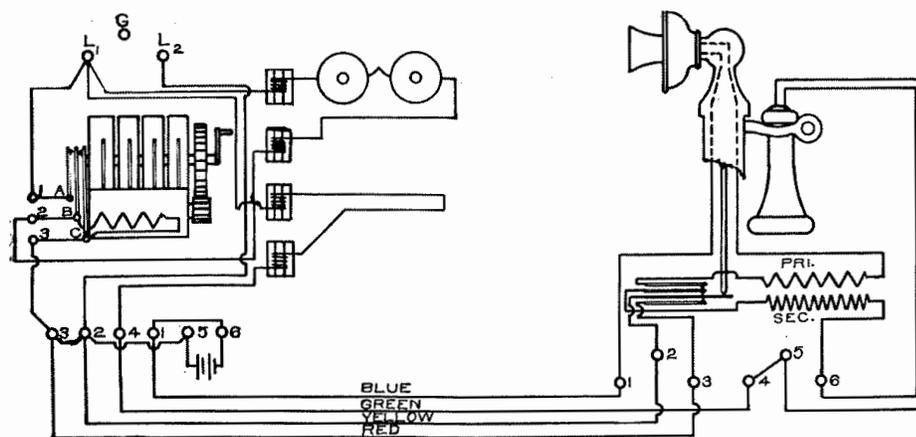


Fig. 44

This so-called silent ringing feature is also applicable to our series telephones and the generator connections of the series telephones are the same as those shown in the bridging telephone circuits (43) and (44), no additional generator springs or other apparatus being required.

## SUBSCRIBER'S INTERSIGNALING TELEPHONE FOR METALLIC LINES

Where a great many telephones in the same community are connected to the same line, and where only a small percentage of the total number of calls require connections to some other line at the switchboard, such telephones as our Subscriber's Intersignaling Telephones (sometimes called Non-Interfering Telephones,) figures (45) and (46) often fill a long felt want.

These telephones are equipped with a push button, which, if depressed while the subscriber operates the generator, an alternating current will be sent out on one wire of the metallic circuit

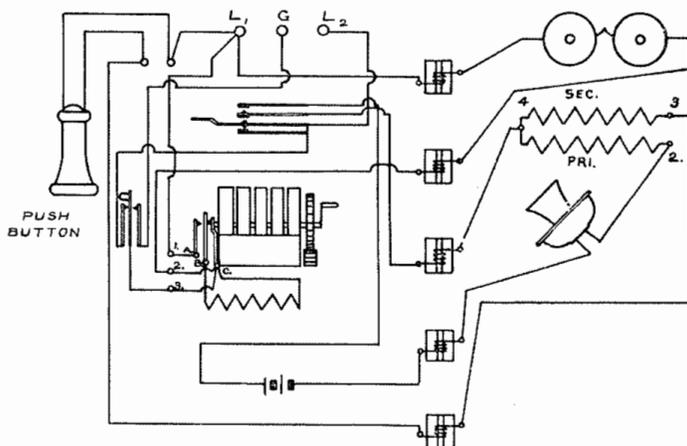


Fig. 45

only, using the ground as a return circuit. The switch board drop at central is connected to the same wire and grounded.

When the push button is in its normal position, while the generator is being operated, an alternating current will be sent out on the two wires of the metallic circuit.

This enables the user to call central by pressing the button and

turning the generator crank without disturbing any of the other parties on the line, or, vice versa, any party on the line can be

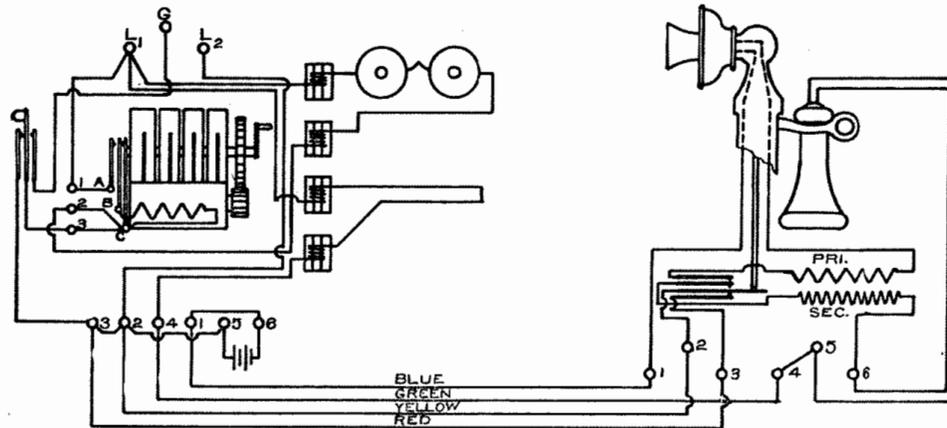


Fig. 46

called without disturbing central if the push button is left in its normal position.

**SELECTIVE CALL CENTRAL TELEPHONE  
FOR GROUNDED LINES.**

Our Selective Call Central Telephone partially accomplishes

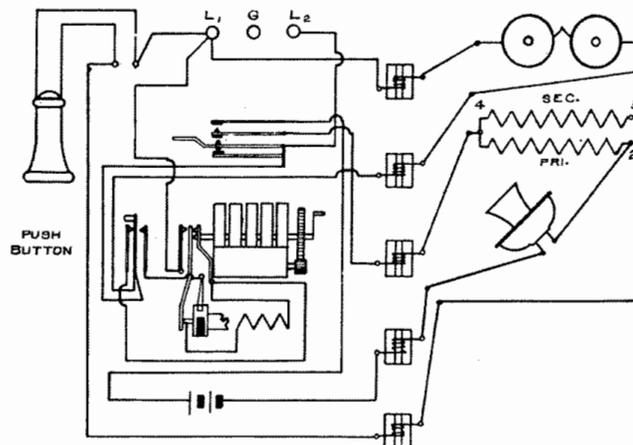


Fig. 47

the same results as our Subscriber's Intersignalling Telephones for Metallic Lines.

These telephones are equipped with a push button and a pul-

sating and alternating current generator as shown in our circuit figures (47) and (48).

When the push button is in its normal position, an alternating current will be sent out on the line when the generator is being operated. This will ring the other bells on the line, as well as the drop at central, unless a special drop that will not respond to an alternating current is used.

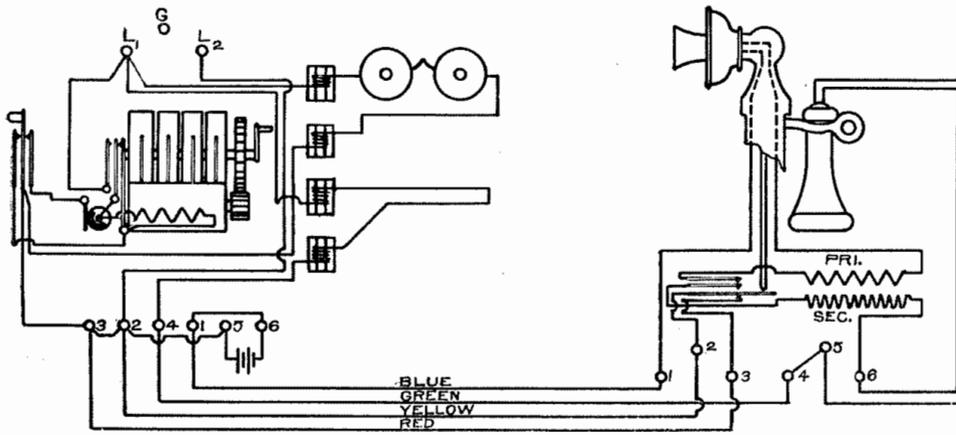


Fig. 48

By pressing the button and turning the generator crank, a pulsating current will be sent out on the line. This will throw the drop at central, but will not disturb any of the other bells on the line.

## FOUR PARTY SELECTIVE TELEPHONE

### BIASED RINGER FOR METALLIC LINES.

The simplest method of selectively ringing one party of a line upon which two, three or four parties are connected is the so-called pulsating current system.

The circuits of our 4 party line pulsating current telephones are shown in figure (49) and (50). The first being that of the compact wall type and the other that of the desk type.

One side of the ringer is connected to line binding post L2 and the other side of the ringer to the ground binding post as shown in the circuits. By connecting the line binding post L2 of two telephones to the one side of the metallic circuit and line binding post L2 of of the two other telephones to the remaining wire of the

metallic circuit we have a divided circuit ringing system. As electric currents sent out on one side of the line will not effect the bells on the other side, it only remains necessary to provide means for selectively ringing the two bells connected to each one of the wires of the metallic circuit and the ground in order to obtain the selective ringing of four telephones connected to one metallic line.

The selection of the two bells on each side of the line is accomplished by pulsating currents of different directions and are usually termed positive and negative currents.

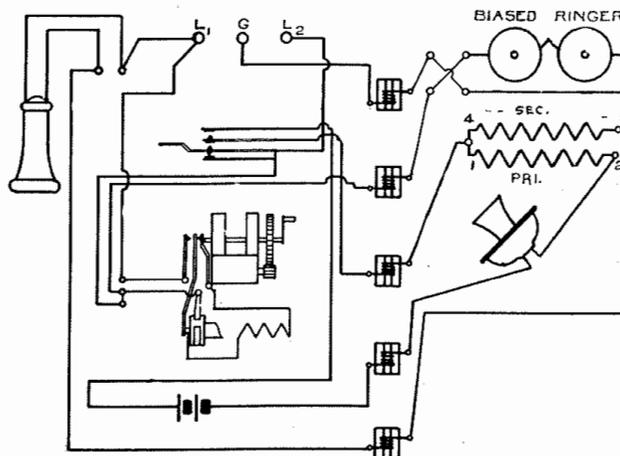


Fig. 49

The armatures are held to one side by means of springs and the ringers are called "biased ringers" on account of the angular position the armatures assume.

It can readily be seen that a polarized ringer with a biased

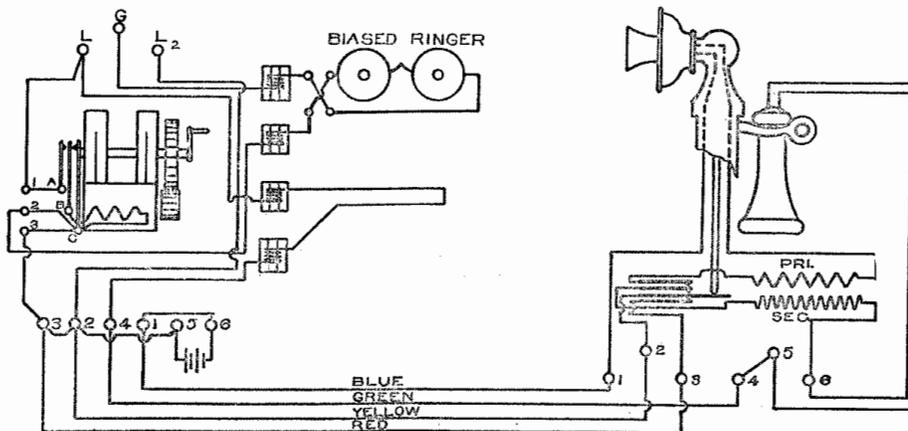


Fig. 50

armature will respond to a current of a certain direction only and as provisions are made in the telephone to connect the ringer in such a way as to have the current pass in the desired direction, two bells may be easily connected to each side of the metallic line and a 4 party line selective ringing made possible.

On account of the spring action on the armature which must naturally be overcome by the magnetic action of the ringer spools while the bell is in operation, this system will not operate on heavily loaded lines and not more than eight such telephones should be connected to one line. With eight bells a semi-selection of bells is only possible, that is, two of the bells of the same character will ring at a time and a code of rings must be adopted.

The ringing of central without interfering with the subscriber's telephones is accomplished by means of a two-bar generator and a low wound drop, a 100 ohm drop will give the best satisfaction.

### CODE LIST

The following list of code numbers covers our line of standard magneto telephones and parts.

The complete telephones coded include two cells of dry battery and the compact type wall telephones are equipped with lightning arresters. If no batteries or lightning arresters are desired the code number may be used to which may simply be added "less batteries" or "less lightning arresters."

The following code numbers of desk telephones are for two piece sets.

These desk telephones are not equipped with lightning arresters and the lightning arrester is therefore not included in the code number. If lightning arresters are desired same must be specified additionally.

The system of code numbers as devised are as self explanatory as practical. By referring to the description and circuits on page (37) to (47) under the different headings the code numbers of that type of telephone can be found under the same heading given in the following code list. Under these headings in the code list different standard ringer resistances and size of generators are given for each code number.

The different kinds of apparatus in this code list is of our standard manufacture and carried in stock by us, insuring prompt shipment.

**SERIES TELEPHONES**  
COMPACT WALL TELEPHONES

**Code No.**

3- B 80	3 bar generator	80 ohm ringer
	DESK TELEPHONES	
13- B 80	3 bar generator	80 ohm. ringer

**BRIDGING TELEPHONES****COMPACT WALL TELEPHONES**

3-A 500	3 bar generator	500 ohm ringer
3-A 1000	3 " "	1000 " "
3-A 1600	3 " "	1600 " "
3-A 2000	3 " "	2000 " "
3-A 2500	3 " "	2500 " "
4-A 500	4 " "	500 " "
4-A 1000	4 " "	1000 " "
4-A 1600	4 " "	1600 " "
4-A 2000	4 " "	2000 " "
4-A 2500	4 " "	2500 " "
5-A 500	5 " "	500 " "
5-A 1000	5 " "	1000 " "
5-A 1600	5 " "	1600 " "
5-A 2000	5 " "	2000 " "
5-A 2500	5 " "	2500 " "

**DESK TELEPHONES**

13-A 500	3 bar generator	500 ohm ringer
13-A 1000	3 " "	1000 " "
13-A 1600	3 " "	1600 " "
13-A 2000	3 " "	2000 " "
13-A 2500	3 " "	2500 " "
14-A 500	4 " "	500 " "
14-A 1000	4 " "	1000 " "
14-A 1600	4 " "	1600 " "
14-A 2000	4 " "	2000 " "
14-A 2500	4 " "	2500 " "
15-A 500	5 " "	500 " "
15-A 1000	5 " "	1000 " "
15-A 1600	5 " "	1600 " "
15-A 2000	5 " "	2000 " "
15-A 2500	5 " "	2500 " "

## SURE RING BRIDGING TELEPHONE

### COMPACT WALL TELEPHONES

#### Code No.

3-C 500	3 bar generator	500 ohm ringer
3-C 1000	3 " "	1000 " "
3-C 1600	3 " "	1600 " "
3-C 2000	3 " "	2000 " "
3-C 2500	3 " "	2500 " "
4-C 500	4 " "	500 " "
4-C 1000	4 " "	1000 " "
4-C 1600	4 " "	1600 " "
4-C 2000	4 " "	2000 " "
4-C 2500	4 " "	2500 " "
5-C 500	5 " "	500 " "
5-C 1000	5 " "	1000 " "
5-C 1600	5 " "	1600 " "
5-C 2000	5 " "	2000 " "
5-C 2500	5 " "	2500 " "

### DESK TELEPHONES

13-C 500	3 bar generator	500 ohm ringer
13-C 1000	3 " "	1000 " "
13-C 1600	3 " "	1600 " "
13-C 2000	3 " "	2000 " "
13-C 2500	3 " "	2500 " "
14-C 500	4 " "	500 " "
14-C 1000	4 " "	1000 " "
14-C 1600	4 " "	1600 " "
14-C 2000	4 " "	2000 " "
14-C 2500	4 " "	2500 " "
15-C 500	5 " "	500 " "
15-C 1000	5 " "	1000 " "
15-C 1600	5 " "	1600 " "
15-C 2000	5 " "	2000 " "
15-C 2500	5 " "	2500 " "

**DIVIDED CIRCUIT TELEPHONE****COMPACT WALL TELEPHONES**

Code No.

3-H 500	3 bar generator	500 ohm ringer
3-H 1000	3 " "	1000 " "
3-H 1600	3 " "	1600 " "
3-H 2000	3 " "	2000 " "
3-H 2500	3 " "	2500 " "
4-H 500	4 " "	500 " "
4-H 1000	4 " "	1000 " "
4-H 1600	4 " "	1600 " "
4-H 2000	4 " "	2000 " "
4-H 2500	4 " "	2500 " "
5-H 500	5 " "	500 " "
5-H 1000	5 " "	1000 " "
5-H 1600	5 " "	1600 " "
5-H 2000	5 " "	2000 " "
5-H 2500	5 " "	2500 " "

**DESK TELEPHONES**

13-H 500	3 bar generator	500 ohm ringer
13-H 1000	3 " "	1000 " "
13-H 1600	3 " "	1600 " "
13-H 2000	3 " "	2000 " "
13-H 2500	3 " "	2500 " "
14-H 500	4 " "	500 " "
14-H 1000	4 " "	1000 " "
14-H 1600	4 " "	1600 " "
14-H 2000	4 " "	2000 " "
14-H 2500	4 " "	2500 " "
15-H 500	5 " "	500 " "
15-H 1000	5 " "	1000 " "
15-H 1600	5 " "	1600 " "
15-H 2000	5 " "	2000 " "
15-H 2500	5 " "	2500 " "

**CENTRAL CHECKING TELEPHONE****COMPACT WALL TELEPHONES**

Code No.

3-K 500	3 bar generator	500 ohm ringer
3-K 1000	3 " "	1000 " "
3-K 1600	3 " "	1600 " "
3-K 2000	3 " "	2000 " "
3-K 2500	3 " "	2500 " "
4-K 500	4 " "	500 " "
4-K 1000	4 " "	1000 " "
4-K 1600	4 " "	1600 " "
4-K 2000	4 " "	2000 " "
4-K 2500	4 " "	2500 " "
5-K 500	5 " "	500 " "
5-K 1000	5 " "	1000 " "
5-K 1600	5 " "	1600 " "
5-K 2000	5 " "	2000 " "
5-K 2500	5 " "	2500 " "

**DESK TELEPHONES**

13-K 500	3 bar generator	500 ohm ringer
13-K 1000	3 " "	1000 " "
13-K 1600	3 " "	1600 " "
13-K 2000	3 " "	2000 " "
13-K 2500	3 " "	2500 " "
14-K 500	4 " "	500 " "
14-K 1000	4 " "	1000 " "
14-K 1600	4 " "	1600 " "
14-K 2000	4 " "	2000 " "
14-K 2500	4 " "	2500 " "
15-K 500	5 " "	500 " "
15-K 1000	5 " "	1000 " "
15-K 1600	5 " "	1600 " "
15-K 2000	5 " "	2000 " "
15-K 2500	5 " "	2500 " "

**SILENT RINGING TELEPHONE****COMPACT WALL TELEPHONES**

Code No.

3-L 80	3 bar generator	80 ohm ringer
3-G 500	3 " "	500 " "
3-G 1000	3 " "	1000 " "
3-G 1600	3 " "	1600 " "
3-G 2000	3 " "	2000 " "
3-G 2500	3 " "	2500 " "
4-G 500	4 " "	500 " "
4-G 1000	4 " "	1000 " "
4-G 1600	4 " "	1600 " "
4-G 2000	4 " "	2000 " "
4-G 2500	4 " "	2500 " "
5-G 500	5 " "	500 " "
5-G 1000	5 " "	1000 " "
5-G 1600	5 " "	1600 " "
5-G 2000	5 " "	2000 " "
5-G 2500	5 " "	2500 " "

**DESK TELEPHONES**

13-L 80	3 bar generator	80 ohm ringer
13-G 500	3 " "	500 " "
13-G 1000	3 " "	1000 " "
13-G 1600	3 " "	1600 " "
13-G 2000	3 " "	2000 " "
13-G 2500	3 " "	2500 " "
14-G 500	4 " "	500 " "
14-G 1000	4 " "	1000 " "
14-G 1600	4 " "	1600 " "
14-G 2000	4 " "	2000 " "
14-G 25	4 " "	2500 " "
15-G 500	5 " "	500 " "
15-G 1000	5 " "	1000 " "
15-G 1600	5 " "	1600 " "
15-G 2000	5 " "	2000 " "
15-G 2500	5 " "	2500 " "

## SUBSCRIBER'S INTERSIGNALLING TELEPHONE

## COMPACT WALL TELEPHONES

Code No.

3-D 500	3 bar generator	500 ohm ringer
3-D 1000	3 " "	1000 " "
3-D 1600	3 " "	1600 " "
3-D 2000	3 " "	2000 " "
3-D 2500	3 " "	2500 " "
4-D 500	4 " "	500 " "
4-D 1000	4 " "	1000 " "
4-D 1600	4 " "	1600 " "
4-D 2000	4 " "	2000 " "
4-D 2500	4 " "	2500 " "
5-D 500	5 " "	500 " "
5-D 1000	5 " "	1000 " "
5-D 1600	5 " "	1600 " "
5-D 2000	5 " "	2000 " "
5-D 2500	5 " "	2500 " "

## DESK TELEPHONES

13-D 500	3 bar generator	500 ohm ringer
13-D 1000	3 " "	1000 " "
13-D 1600	3 " "	1600 " "
13-D 2000	3 " "	2000 " "
13-D 2500	3 " "	2500 " "
14-D 500	4 " "	500 " "
14-D 1000	4 " "	1000 " "
14-D 1600	4 " "	1600 " "
14-D 2000	4 " "	2000 " "
14-D 2500	4 " "	2500 " "
15-D 500	5 " "	500 " "
15-D 1000	5 " "	1000 " "
15-D 1600	5 " "	1600 " "
15-D 2000	5 " "	2000 " "
15-D 2500	5 " "	2500 " "

## SELECTIVE CALL CENTRAL TELEPHONE

## COMPACT WALL TELEPHONES

Code No.

3-F 500	3 bar generator	500 ohm ringer
3-F 1000	3 " "	1000 " "
3-F 1600	3 " "	1600 " "
3-F 2000	3 " "	2000 " "
3-F 2500	3 " "	2500 " "
4-F 500	4 " "	500 " "
4-F 1000	4 " "	1000 " "
4-F 1600	4 " "	1600 " "
4-F 2000	4 " "	2000 " "
4-F 2500	4 " "	2500 " "
5-F 500	5 " "	500 " "
5-F 1000	5 " "	1000 " "
5-F 1600	5 " "	1600 " "
5-F 2000	5 " "	2000 " "
5-F 2500	5 " "	2500 " "

## DESK TELEPHONES

13-F 500	3 bar generator	500 ohm ringer
13-F 1000	3 " "	1000 " "
13-F 1600	3 " "	1600 " "
13-F 2000	3 " "	2000 " "
13-F 2500	3 " "	2500 " "
14-F 500	4 " "	500 " "
14-F 1000	4 " "	1000 " "
14-F 1600	4 " "	1600 " "
14-F 2000	4 " "	2000 " "
14-F 2500	4 " "	2500 " "
15-F 500	5 " "	500 " "
15-F 1000	5 " "	1000 " "
15-F 1600	5 " "	1600 " "
15-F 2000	5 " "	2000 " "
15-F 2500	5 " "	2500 " "

**4-PARTY SELECTIVE TELEPHONES****COMPACT WALL TELEPHONES**

Code No

6-J 1000	2 bar generator	1000 ohm ringer (biased)
6-J 1600	2 " "	1600 " " "
6-J 2000	2 " "	2000 " " "
6-J 2500	2 " "	2500 " " "

**DESK TELEPHONES**

16-J 1000	2 bar generator	1000 ohm ringer (biased)
16-J 1600	2 " "	1600 " " "
16-J 2000	2 " "	2000 " " "
16-J 2500	2 " "	2500 " " "

**PRIVATE LINE TELEPHONES**

42-A	Battery call	5 ohm vibrating ringer
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**CRACRAFT, LEICH DESK STAND**

1-L	Local battery stand including transmitter, receiver, induction coil, and terminal cord.	
-----	---	--

**CRACRAFT, LEICH GENERATOR BELL BOX**

## SERIES

23-B	80	3 bar generator	80 ohm ringer
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## BRIDGING

23-A	500	3 bar generator	500 ohm ringer
23-A	1000	3 " "	1000 " "
24-A	500	4 " "	500 " "
24-A	1000	4 " "	1000 " "
24-A	1600	4 " "	1600 " "
25-A	1000	5 " "	1000 " "
25-A	1600	5 " "	1600 " "
25-A	2000	5 " "	2000 " "
25-A	2500	5 " "	2500 " "

**CRACRAFT, LEICH EXTENSION BELL BOX****LOCAL BATTERY**

Code No.

1-L 80	80 ohm ringer
1-L 500	500 " "
1-L 1000	1000 " "
1-L 1600	1600 " "
1-L 2000	2000 " "
1-L 2500	2500 " "

**CRACRAFT, LEICH GENERATOR BOX**

3-A	3 bar generator
4-A	4 " "
5-A	5 " "

**TRANSMITTER**

1-L	Local battery transmitter
-----	---------------------------

**RECEIVER**

1-A	Receiver with 36 inch cord
-----	----------------------------

**INDUCTION COIL**

1-A	Local battery coil
-----	--------------------

**SURE RING CONDENSER**

3-A	Condenser
-----	-----------

**TELEPHONE PUSH BUTTON**

1-A	Push button
-----	-------------

**HOKSWITCH**

1-A	Hookswitch (series or bridging)
-----	---------------------------------

**GENERATORS**

Code No.

3-A	3 bar generator
4-A	4 " "
5-A	5 " "

**RINGER**

1-A 500	500 ohm bridging ringer
1-A 1000	1000 " " "
1-A 1600	1600 " " "
1-A 2000	2000 " " "
1-A 2500	2500 " " "

**BIASED RINGER**

2-B 500	500 ohm bridging biased ringer
2-B 1000	1000 " " " "
2-B 1600	1600 " " " "
2-B 2000	2000 " " " "
2-B 2500	2500 " " " "

**SERIES RINGER**

3-A 80	80 ohm series ringer
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**LIGHTNING ARRESTER**

1-A	Lightning arrester
-----	--------------------

**TRANSMITTER ARMS**

1-A	Transmitter arm	Fig. (29) Page (23)
2-A	" "	" (30) " (23)
3-A	" "	" (31) " (23)

**CORD TERMINAL BLOCKS**

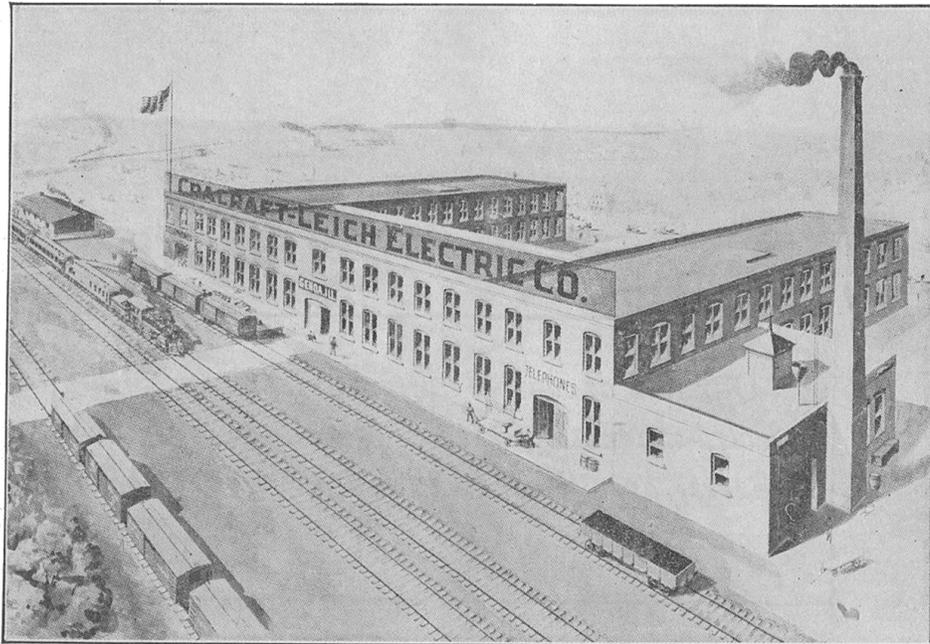
2-A	4 Terminals	Fig. (32) Page (24)
1-A	6 "	" (33) " (25)

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**BINDING POST**

Code No.		Page
2	Line binding post	(25)
3	Line and cord terminal binding post	“ (25)
4	Cord terminal binding post	“ (25)
5	Line and battery “ “	“ (25)
6	Line binding post	“ (25)

*Our line of central battery telephones with electro-magnetic receivers, also our harmonic ringers, are illustrated and fully described in our Bulletin No. 2.*



# CRACRAFT-LEICH MAGNETO TELEPHONES

ALL PRICES subject to change without notice. All previous prices are hereby cancelled.

IN ORDERING always give the catalogue CODE NUMBER and state whether goods are to be shipped by freight or express and what line. If postoffice address and shipping point are different, always give names of both.

TERMS. Two per cent, cash ten days, thirty days net on approved credit, payable in New York or Chicago funds. If you have no account with us it will avoid delay if you will send us references or remittance with order.

LIABILITY. Care is taken in packing and receipts are obtained from the railroad or express company for goods in "good condition." Our responsibility ceases here, and we will not hold ourselves liable for breakage or loss in transit.

CLAIMS on account of shortage must be made within TEN DAYS after receipt of goods, or they will not be allowed.

GOODS RETURNED for credit without our consent will be held subject to the shipper's orders.

MAIL, EXPRESS or FREIGHT transportation charges are to be paid by the purchasers.

**ALL PRICES F. O. B. GENOA, ILL.**

(Genoa freight rate same as Chicago)

## ELECTRIC APPLIANCE COMPANY

CHICAGO  
SAN FRANCISCO

DALLAS  
NEW ORLEANS

THE following prices on telephones include two batteries and lightning arrester.

FOR telephones less batteries, deduct 30c.

FOR telephones less lightning arresters, deduct 15c.

PRICES of "Sure Ring" telephones include condensers. For condensers in other types of telephones, add 25c.

THE following code numbers of desk telephones are for two piece sets.

THESE desk telephones are not equipped with lightning arresters and the lightning arrester is therefore not included in the code number. If lightning arresters are desired same must be specified additionally and 25c added to price.

### Cracraft-Leich Series Telephones

Generator	Ringer	Code No.	Price	Code No.	Price
		Wall Type		Desk Type	
3 bar	80 ohm	3-B-80	\$ 8 00	13-B-80	\$ 9 00

### Cracraft-Leich Bridging Telephones

Generator	Ringer	Code No.	Price	Code No.	Price
		Wall Type		Desk Type	
3 bar	500 ohm	3-A 500	\$ 8 90	13-A 500	\$ 9 90
3 "	1000 "	3-A 1000	9 00	13-A 1000	10 00
3 "	1600 "	3-A 1600	9 25	13-A 1600	10 25
3 "	2000 "	3-A 2000	9 30	13-A 2000	10 30
3 "	2500 "	3-A 2500	9 50	13-A 2500	10 50
4 "	500 "	4-A 500	9 15	14-A 500	10 15
4 "	1000 "	4-A 1000	9 25	14-A 1000	10 25
4 "	1600 "	4-A 1600	9 50	14-A 1600	10 50
4 "	2000 "	4-A 2000	9 55	14-A 2000	10 55
4 "	2500 "	4-A 2500	9 75	14-A 2500	10 75
5 "	500 "	5-A 500	9 65	15-A 500	10 65
5 "	1000 "	5-A 1000	9 75	15-A 1000	10 75
5 "	1600 "	5-A 1600	10 00	15-A 1600	11 00
5 "	2000 "	5-A 2000	10 05	15-A 2000	11 05
5 "	2500 "	5-A 2500	10 25	15-A 2500	11 25

### Cracraft-Leich Sure Ring Bridging Telephone

Generator	Ringer	Code No.	Price	Code No.	Price
		Wall Type		Desk Type	
3 bar	500 ohm	3-C 500	\$ 9 15	13-C 500	\$10 15
3 "	1000 "	3-C 1000	9 25	13-C 1000	10 25
3 "	1600 "	3-C 1600	9 50	13-C 1600	10 50
3 "	2000 "	3-C 2000	9 55	13-C 2000	10 55
3 "	2500 "	3-C 2500	9 75	13-C 2500	10 75
4 "	500 "	4-C 500	9 40	14-C 500	10 40
4 "	1000 "	4-C 1000	9 50	14-C 1000	10 50
4 "	1600 "	4-C 1600	9 75	14-C 1600	10 75
4 "	2000 "	4-C 2000	9 80	14-C 2000	10 80
4 "	2500 "	4-C 2500	10 00	14-C 2500	11 00
5 "	500 "	5-C 500	9 90	15-C 500	10 90
5 "	1000 "	5-C 1000	10 00	15-C 1000	11 00
5 "	1600 "	5-C 1600	10 25	15-C 1600	11 25
5 "	2000 "	5-C 2000	10 30	15-C 2000	11 30
5 "	2500 "	5-C 2500	10 50	15-C 2500	11 50

### Cracraft-Leich Divided Circuit Telephone

Generator	Ringer	Code No.	Price	Code No.	Price
		Wall Type		Desk Type	
3 bar	500 ohm	3-H 500	\$ 9 00	13-H 500	\$10 00
3 "	1000 "	3-H 1000	9 10	13-H 1000	10 10
3 "	1600 "	3-H 1600	9 35	13-H 1600	10 35
3 "	2000 "	3-H 2000	9 40	13-H 2000	10 40
3 "	2500 "	3-H 2500	9 60	13-H 2500	10 60
4 "	500 "	4-H 500	9 25	14-H 500	10 25
4 "	1000 "	4-H 1000	9 35	14-H 1000	10 35
4 "	1600 "	4-H 1600	9 60	14-H 1600	10 60
4 "	2000 "	4-H 2000	9 65	14-H 2000	10 65
4 "	2500 "	4-H 2500	9 85	14-H 2500	10 85
5 "	500 "	5-H 500	9 75	15-H 500	10 75
5 "	1000 "	5-H 1000	9 85	15-H 1000	10 85
5 "	1600 "	5-H 1600	10 10	15-H 1600	11 10
5 "	2000 "	5-H 2000	10 15	15-H 2000	11 15
5 "	2500 "	5-H 2500	10 35	15-H 2500	11 35

### Cracraft-Leich Central Checking Telephone

Generator	Ringer	Code No.	Price	Code No.	Price
		Wall Type		Desk Type	
3 bar	500 ohm	3-K 500	\$ 9 00	13-K 500	\$10 00
3 "	1000 "	3-K 1000	9 10	13-K 1000	10 10
3 "	1600 "	3-K 1600	9 35	13-K 1600	10 35
3 "	2000 "	3-K 2000	9 40	13-K 2000	10 40
3 "	2500 "	3-K 2500	9 60	13-K 2500	10 60
4 "	500 "	4-K 500	9 25	14-K 500	10 25
4 "	1000 "	4-K 1000	9 35	14-K 1000	10 35
4 "	1600 "	4-K 1600	9 60	14-K 1600	10 60
4 "	2000 "	4-K 2000	9 65	14-K 2000	10 65
4 "	2500 "	4-K 2500	9 85	14-K 2500	10 85
5 "	500 "	5-K 500	9 75	15-K 500	10 75
5 "	1000 "	5-K 1000	9 85	15-K 1000	10 85
5 "	1600 "	5-K 1600	10 10	15-K 1600	11 10
5 "	2000 "	5-K 2000	10 15	15-K 2000	11 15
5 "	2500 "	5-K 2500	10 35	15-K 2500	11 35

### Cracraft-Leich Silent Ringing Telephone

Generator	Ringer	Code No.	Price	Code No.	Price
		Wall Type		Desk Type	
3 bar	80 ohm	3-L 80	\$ 8 00	13-L 80	\$ 9 00
3 "	500 "	3-G 500	8 90	13-G 500	9 90
3 "	1000 "	3-G 1000	9 00	13-G 1000	10 00
3 "	1600 "	3-G 1600	9 25	13-G 1600	10 25
3 "	2000 "	3-G 2000	9 30	13-G 2000	10 30
3 "	2500 "	3-G 2500	9 50	13-G 2500	10 50
4 "	500 "	4-G 500	9 15	14-G 500	10 15
4 "	1000 "	4-G 1000	9 25	14-G 1000	10 25
4 "	1600 "	4-G 1600	9 50	14-G 1600	10 50
4 "	2000 "	4-G 2000	9 55	14-G 2000	10 55
4 "	2500 "	4-G 2500	9 75	14-G 2500	10 75
5 "	500 "	5-G 500	9 65	15-G 500	10 65
5 "	1000 "	5-G 1000	9 75	15-G 1000	10 75
5 "	1600 "	5-G 1600	10 00	15-G 1600	11 00
5 "	2000 "	5-G 2000	10 05	15-G 2000	11 05
5 "	2500 "	5-G 2500	10 25	15-G 2500	11 25

### Cracraft-Leich Subscribers Intersignalling Telephone

Generator	Ringer	Code No.	Price	Code No.	Price
		Wall Type		Desk Type	
3 bar	500 ohm	3-D 500	\$ 9 15	13-D 500	\$10 15
3 "	1000 "	3-D 1000	9 25	13-D 1000	10 25
3 "	1600 "	3-D 1600	9 50	13-D 1600	10 50
3 "	2000 "	3-D 2000	9 55	13-D 2000	10 55
3 "	2500 "	3-D 2500	9 75	13-D 2500	10 75
4 "	500 "	4-D 500	9 40	14-D 500	10 40
4 "	1000 "	4-D 1000	9 50	14-D 1000	10 50
4 "	1600 "	4-D 1600	9 75	14-D 1600	10 75
4 "	2000 "	4-D 2000	9 80	14-D 2000	10 80
4 "	2500 "	4-D 2500	10 00	14-D 2500	11 00
5 "	500 "	5-D 500	9 90	15-D 500	10 90
5 "	1000 "	5-D 1000	10 00	15-D 1000	11 00
5 "	1600 "	5-D 1600	10 25	15-D 1600	11 25
5 "	2000 "	5-D 2000	10 30	15-D 2000	11 30
5 "	2500 "	5-D 2500	10 50	15-D 2500	11 50

### Cracraft-Leich Selective Call Central Telephone

Generator	Ringer	Code No.	Price	Code No.	Price
		Wall Type		Desk Type	
3 bar	500 ohm	3-F 500	\$ 9 25	13-F 500	\$10 25
3 "	1000 "	3-F 1000	9 35	13-F 1000	10 35
3 "	1600 "	3-F 1600	9 60	13-F 1600	10 60
3 "	2000 "	3-F 2000	9 65	13-F 2000	10 65
3 "	2500 "	3-F 2500	9 85	13-F 2500	10 85
4 "	500 "	4-F 500	9 50	14-F 500	10 50
4 "	1000 "	4-F 1000	9 60	14-F 1000	10 60
4 "	1600 "	4-F 1600	9 85	14-F 1600	10 85
4 "	2000 "	4-F 2000	9 90	14-F 2000	10 90
4 "	2500 "	4-F 2500	10 10	14-F 2500	11 10
5 "	500 "	5-F 500	10 00	15-F 500	11 00
5 "	1000 "	5-F 1000	10 10	15-F 1000	11 10
5 "	1600 "	5-F 1600	10 35	15-F 1600	11 35
5 "	2000 "	5-F 2000	10 40	15-F 2000	11 40
5 "	2500 "	5-F 2500	10 60	15-F 2500	11 60

### Cracraft-Leich 4-Party Selective Telephones

Generator	Ringer	Code No.	Price	Code No.	Price
		Wall Type		Desk Type	
2 bar	1000 ohm	6-J 1000	\$ 9 00	16-J 1000	\$10 00
2 "	1600 " x	6-J 1600	9 25	16-J 1600	10 25
2 "	2000 " x	6-J 2000	9 30	16-J 2000	10 30
2 "	2500 " x	6-J 2500	9 50	16-J 2500	10 50

x Biased Ringer

### Cracraft-Leich Private Line Telephones

Code No.		Price
42-A	Battery call (less batteries) 5 ohm vibrating ringer	\$ 5 00

### Cracraft-Leich Desk Stand

1-L	Local battery stand including transmitter, receiver, induction coil, cord and terminal	5 00
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### Cracraft-Leich Generator Bell Box

SERIES					
23-B	80	3-bar generator	80 ohm ringer		4 75
BRIDGING					
23-A	500	3-bar generator	500 ohm ringer		4 90
23-A	1000	3	1000		5 00
24-A	500	4	500		5 15
24-A	1000	4	1000		5 25
24-A	1600	4	1600		5 50
25-A	1000	5	1000		5 50
25-A	1600	5	1600		5 75
25-A	2000	5	2000		5 80
25-A	2500	5	2500		6 00

## Cracraft-Leich Extension Bell Box

CODE NO.	LOCAL BATTERY	PRICE
1-L 80	.....	80 ohm ringer 1 95
1-L 500	.....	500 " " 2 10
1-L 1000	.....	1000 " " 2 20
1-L 1500	.....	1500 " " 2 45
1-L 2000	.....	2000 " " 2 50
1-L 2500	.....	2500 " " 2 70

## Cracraft-Leich Generator Box

3-A	.....	3-bar generator 3 40
4-A	.....	4 " " 3 65
5-A	.....	5 " " 3 90
	Generator equipped with pulsating current attachment, extra.....10	

## Cracraft-Leich Transmitter

1-L	Local battery transmitter.....	1 00
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## Cracraft-Leich Receiver

1-A	Receiver with 36 inch cord.....	80
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## Cracraft-Leich Induction Coil

1-A	Local battery coil.....	35
-----	-------------------------	----

## Cracraft-Leich Sure Ring Condenser

3-A	Condenser.....	25
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## Cracraft-Leich Telephone Push Button

1-A	Push button.....	25
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## Cracraft-Leich Hookswitch

1-A	Hookswitch (series or bridging).....	55
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## Cracraft-Leich Generators

3-A	3-bar generator.....	2 25
4-A	4 " ".....	2 50
5-A	5 " ".....	2 75
	Generator equipped with pulsating current attachment, extra..... 10	

## Cracraft-Leich Ringer

1-A 500	500 ohm bridging ringer.....	1 15
1-A 1000	1000 " " " ".....	1 25
1-A 1600	1600 " " " ".....	1 50
1-A 2000	2000 " " " ".....	1 55
1-A 2500	2500 " " " ".....	1 75

## Cracraft-Leich Biased Ringer

2-B 500	500 ohm bridging biased ringer.....	1 25
2-B 1000	1000 " " " ".....	1 35
2-B 1600	1600 " " " ".....	1 60
2-B 2000	2000 " " " ".....	1 65
2-B 2500	2500 " " " ".....	1 85

## Cracraft-Leich Series Ringer

3-A 80	80 ohm series ringer.....	1 00
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## Cracraft-Leich Lightning Arrester

1-A	Lightning arrester.....	25
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## Cracraft-Leich Transmitter Arms

1-A	Transmitter arm.....	25
2-A	" ".....	35
3-A	" ".....	25

## Cracraft-Leich Cord Terminal Blocks

2-A	4 Terminals.....	15
1-A	6 ".....	25

## Cracraft-Leich Binding Post

2	Line binding post.....	05
3	Line and cord terminal binding post.....	025
4	Cord terminal binding post.....	025
5	Line and battery ".....	025
6	Line binding post.....	025

These prices are based on orders for ten or more binding posts.