

The Stromberg - Carlson Telephone Manufacturing Company : Chicago U S A

Bulletin 1012 covering magneto switchboards
Published 1914



Scanned from an original document furnished by the JKL Museum of Telephony, San Andreas, CA
Wayne Merit, Curator

www.jklmuseum.com

Adobe Document copyright 2009 by Mike Neale, Midland TX
Optimized for viewing with Adobe Reader 7.0 or better and web loading.
The Stromberg-Carlson word mark is owned by Siemens Corporation, Boca Raton, FL

Downloaded from www.strombergcarlsontelephone.com and subject to the terms of the website.

John LaRue, Wayne Merit and Mike Neale are members of:



2 December 2009

STROMBERG-CARLSON TEL. MFG. CO.

ROCHESTER, NEW YORK, U.S.A.

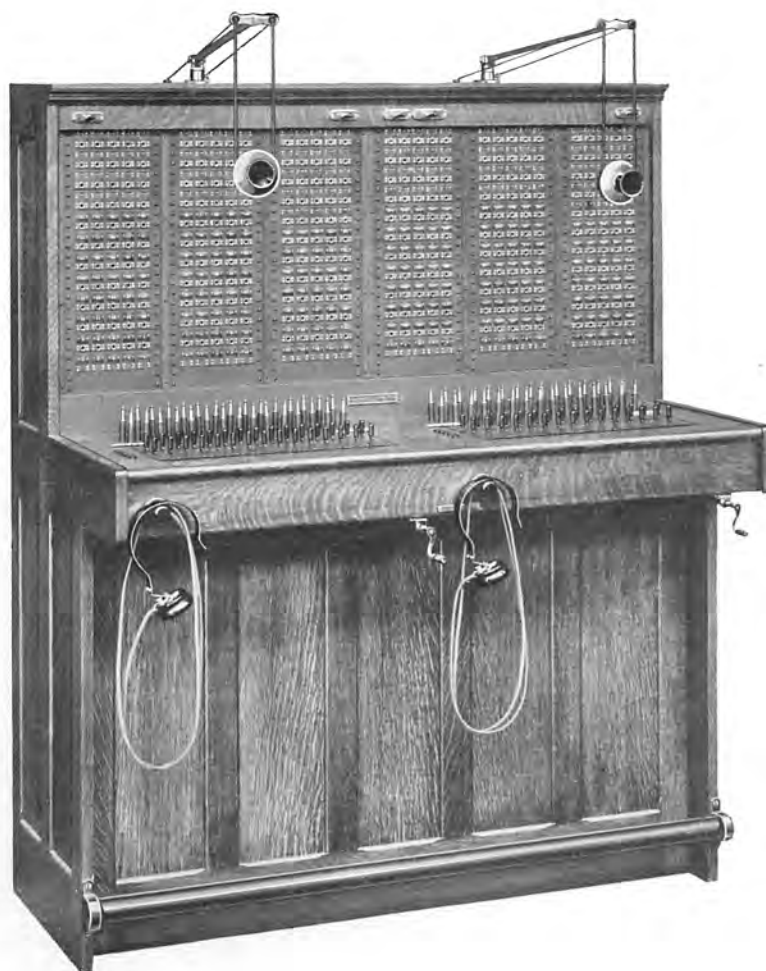
CHICAGO, ILL.

TORONTO, ONT.

BULLETIN No. 1012

EDITION D-A

Local Battery Switchboards



General Information

Cabinet Work

All switchboard cabinets are constructed in our own woodworking and cabinet department under the constant supervision of experts who know how to get the best out of materials. The lumber is carefully selected, thoroughly seasoned and kiln dried to preclude the possibility of warping and splitting. Lumber of ample thickness is used to insure the strength and rigidity required to withstand the effects of continuous hard service. In each cabinet a special effort is made to match all of the adjacent pieces as to grain and color to avoid the displeasing appearance of light and dark woods in the same surface. All joints are carefully tongued, grooved and glued to render the cabinet as strong and dustproof as possible. The standard woodwork is of quarter sawed oak, although special woods can be supplied at additional cost and subject to delay in delivery.

Design of Cabinets

In the development of these switchboard cabinets we have eliminated all unnecessary mouldings or other dust catching ornamentations. Practically all surfaces are plane which makes it very easy to keep the switchboard clean and neat appearing.

Special attention has been given to make the interior of the cabinets accessible and convenient for the inspection of all apparatus for testing purposes. To this end, hinged keyboards are used on all switchboards and removable panels are provided wherever the design of the cabinet permits. Locks and keys are furnished so that unauthorized persons cannot tamper with the equipment.

All plug shelves and pilot rails are protected from injury due to falling plugs by an inlay of "Formica," an insulating material which resembles hard rubber. It is non-absorbent and will neither warp, crack nor discolor.

Standard Finish

All switchboards, unless otherwise specified, are given a hand rubbed dull golden oak finish which penetrates deeply into the grain of the wood. It is a very pleasing finish and will not readily show slight scratches or the effects of ordinary wear. The

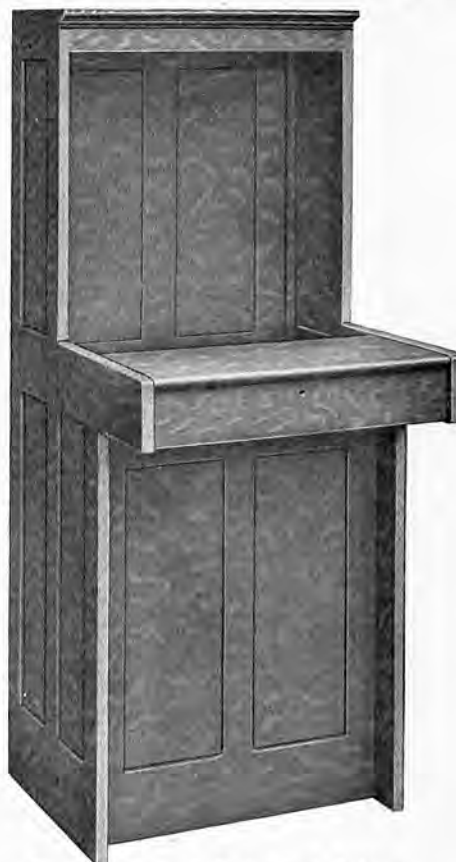


Fig. 1—View of Unfinished Cabinet

Local Battery Switchboards

interior surfaces of the cabinet are protected by a shellac finish. Special finishes to harmonize with office furniture and trimmings can be furnished on order at additional cost.

Wiring and Cabling

Our local battery switchboards may be used in connection with metallic, grounded or common return telephone lines without change in the wiring. Lines using push button telephones for signalling other parties on the same line without throwing the drop at the switchboard may also be served if this condition is specified at the time of ordering the switchboard. The wiring in standard local battery switchboards is full metallic and the circuits are electrically of even balance to avoid the possibility of "cross-talk" between adjacent lines or connecting cord circuits. As a further precaution against induced noises from the ringing generator wiring, we place such wiring in a separate cable form which is made up of individual wires having heavier insulation.

The main cables and cable forms are made up of No. 22 B & S gauge pure copper wire covered with silk and cotton insulation. The cable forms are thoroughly impregnated with beeswax to make them moisture-proof. All wiring is systematic and any pair of wires may be readily identified wherever it appears in the main cable or cable forms by means of a color code in the outer layer of the wire insulation. Key cables are made with terminal wires long enough to allow the keys to be drawn up through the key shelves for inspection and tests. No strap wires extend across the key terminals as the common wires are looped in and out of the cable form. This avoids the necessity of using a soldering copper when a key is removed for inspection.

Switchboards are wired to the capacity specified in the following pages. Unless otherwise specified, all switchboards are furnished with 12 feet of line cable attached. We will supply longer cables when required at slight additional cost. In order that the cable will not be subject to either mechanical injury or poor insulation due to damp floors, we regularly arrange our Nos. A-11664, A-5629 and A-5631 switchboards with the cable extending from the top instead of from the bottom of the cabinet. A much neater installation can be made when the cable is brought out in this manner and carried on an iron cable rack to the arrester or terminal frame.

Terminal Boards

Some purchasers prefer to have the various line equipments wired by means of a local cable directly to a terminal board in the rear of the cabinet. This is not a standard feature in our local battery switchboards but we are prepared to supply switchboards wired in this manner at an additional cost. We regularly equip each cabinet with a small terminal board upon which are terminated the operator's battery, night alarm battery, and power generator circuits. All terminals are numbered and lettered for identification purposes. The common wire of the continuous ringing night alarm circuit is equipped with test connections so that in case of a short circuit in the night alarm contacts of any drop, the trouble may be quickly localized in any bank of drops to the exclusion of the other banks.

Line Circuit Equipment

No. 11 Plug-Restoring Drop

The No. 11 plug-restoring drop is a complete line equipment including in its assembly as a unit both the shutter drop and the corresponding line jack. These parts are linked mechanically so that the action of inserting a plug in the jack, when a call is answered, restores the drop shutter to its normal position. This type of line equipment is preferred for use in all local battery switchboards as it permits of the most rapid and positive operation. With this apparatus the operator does not waste valuable moments in either restoring the shutters by hand or in looking for the proper line jack when a call is received. As less movements are required on the part of the operator in handling a call, it follows that a greater number of calls may be handled per hour with this form of equipment.



Fig. 2—Side View, No. 11 Drop

When in the operated position the shutter of this drop displays one curved and two plane surfaces as shown in Figure 3. This is of great advantage since it is possible for the operator to readily observe the signal from any angle in front of the switchboard. To assist in compelling the attention of the operator, the indicating surfaces of the shutter are given an aluminum sand blast finish, which form a striking contrast with the dead black finish of the surrounding switchboard face. In their normal position the drop shutters rest nearly flush with the mounting plates. Each shutter is provided with a removable and interchangeable number plate which is engraved with any desired numbering or lettering.



Fig. 3—Front View, Bank of No. 11 Drops

The operation of the drop is not wholly dependent upon the force of gravity as is the case with many other kinds of signals. When the coil winding is energized by ringing current from the line, the trip rod not only releases the shutter but strikes a beveled piece on the shutter which throws it downward at a much faster rate than if actuated by the force of gravity alone. This action is so

strong that the drop will operate satisfactorily even though inclined at an angle of twenty-five (25) degrees. Drops of this type are arranged to mount in the switchboard upon steel mounting plates. The front and rear perspective views of a bank of five drops mounted on a standard strip are given by Figures 3 and 4. Each drop may be removed from the strip by removing four small screws without disturbing the adjacent apparatus or wiring.

Local Battery Switchboards

This method of mounting is a distinct advantage as it provides for the addition of extra line equipments in a switchboard, individually or in groups of five, as required. The mounting is rigid and the shutters will not jar down when the plug is inserted in any other jack.

The spring assembly and the arrangement of the contacts in the jack of the No. 11 drop is of the "double cut-off" type, which provides for the disconnection of both leads to the drop coil when a plug is inserted in the associated jack. The springs are made of heavy German silver and are sufficiently long to insure even tension under the most severe operating conditions. All con-



Fig. 4—Rear View, Bank of No. 11 Drops

tacts are non-corrosive and securely riveted in place. The screw type terminals are provided with small removable lugs so that any wire may be readily disconnected without the use of a soldering copper. All insulating separators and bushings are made of hard rubber to avoid leakage and the resulting losses in transmission.

Reference to Figure 5 will show how easily a drop coil may be replaced. Loosening two screws and giving the coil a slight twist to the left allows removal of the entire coil. When a coil is replaced the original adjustment is maintained as all coils are interchangeable.

This drop is exceedingly sensitive to weak ringing currents and will operate positively on long lines carrying many telephones. Some idea of its efficiency can be gained from our standard factory inspection test, which calls for the operation of the signal by a hand generator through a resistance of 10,000 ohms. The drop is so designed that the coil has a very high impedance to voice currents in comparison with its actual ohmic resistance so that low wound coils may be used without sacrificing any of the transmitting qualities of the line with which the drop is used. This refers to the clearing out drop bridged across the cord circuit as the line drop is cut off the line when the cord plug is inserted in the line jack. Our drop coil windings are correctly proportioned and wound with silk insulated pure copper magnet wire. The winding is thoroughly insulated from the core, thereby reducing the possibility of the coils burning out, due to static disturbances on the lines, to a minimum.



Fig. 5—Coil Removed and Leads Disconnected

The night alarm contacts of the drop are located on the inside surface of the mounting plate where they are not liable to damage through careless handling of the plugs. The contact points are non-corrosive and are mounted on substantial contact springs which seldom, if ever, require adjustment.

Code Ringing Night Alarm Bell

There is a small demand for plug-restoring drop switchboards equipped with code ringing night alarm bell apparatus. For this purpose we furnish our No. 15 Drop which is identical with the No. 11 Drop except that the armature is fitted with a contact which makes and breaks the night alarm bell circuit when the armature is actuated. In this way the night alarm bell repeats the long and short rings of the signalling code instead of the single continuous ring of the regular night alarm bell equipment.

The use of this equipment is neither encouraged nor recommended for several reasons. The efficiency of the drop signal is impaired because of the added weight of the armature. The contacts do not close with a uniform pressure in that some drops operate vigorously while others operate somewhat more weakly, especially those connected to extremely long lines connecting many telephones. When the night alarm contact pressure is weak the contact is unreliable and the night bell does not fully reproduce the proper signals. Furthermore when two simultaneous calls are received the ringing codes are badly confused.

We will furnish code ringing night alarm bell equipment in our standard switchboards when particularly desired but wish to draw the purchasers attention to the fact that the operation of the device is liable to introduce the complications above described.

Ringer Line Signals

In village exchanges, where the small volume of traffic permits the operator to perform duties other than operating the switchboard, ringer line signals will be found advantageous. Through the use of these the operator may be at quite a distance from the switchboard, yet by listening to the number of rings, be able to distinguish between the calls for the exchange and calls for parties on the same line.

Figure 6 shows our standard switchboard ringer which in general construction closely resembles our telephone ringer. We furnish these ringers in all standard resistances and equipped with gongs which give a clear loud ring. Each ringer signal is provided with a drop shutter which is released at the first stroke of the gong. After the call is answered the shutter is restored by hand. Night alarm contacts and wiring are provided for continuous ringing at night.

Switchboard ringers should in all cases be wound to the same resistance as the ringers in the telephones on the lines to which they are connected; otherwise, a satisfactory ring will not be obtained.

We have abandoned the manufacture of switchboards equipped with a combination of plug-restoring drop and ringer signal line equipments because of the very limited



Fig. 6—No. 102 Ringer Signal

Local Battery Switchboards

demand for such switchboards. It will be found more satisfactory and economical to use separate extension bells with gongs of distinctly different tones in connection with any lines which may require the use of a ringer signal. Information regarding special extension bells to be used for this purpose will be furnished upon request to our nearest office or any of our sales representatives.

Standard Line Circuits

Drop Line Circuit--Regular

A schematic diagram of the wiring of our standard No. 11 drop line equipment is given in Figure 7. This circuit may be used with either series or bridging metallic lines

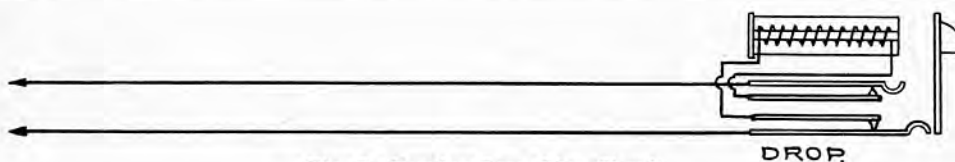


Fig. 7—Regular Drop Line Circuit

and with grounded and common return lines by grounding one side of the respective line terminals at the central office lightning arrester strip. We wire all local battery non-multiple switchboards with this circuit arrangement unless otherwise specified by the purchaser.

The following resistance values for the drop coils used in these circuits are recommended for best results under the average service conditions:

Local and Rural Lines	500 ohms
Long Distance Lines	1000 ohms

Drop Line Circuit -- Non-Interfering

As the use of telephones in which a push button is used to secretly call the exchange is rapidly increasing, we have standardized the circuit arrangement as shown by Figure

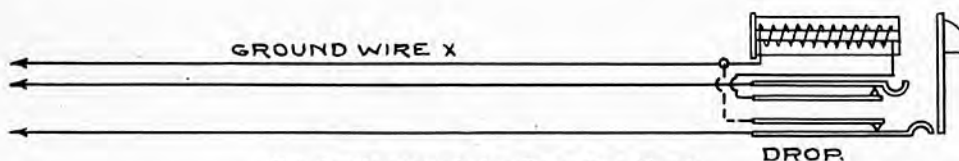


Fig. 8—Non-Interfering Drop Line Circuit

8 to provide for this class of service. This is simply the regular drop line circuit with a common ground wire extending through the line cable forms to provide a ground connection at the drops when it is required. All telephones on lines of this type must be equipped with push buttons as the signalling circuit is open to telephones not so equipped.

The non-interfering line circuit described in the preceding paragraph is unsuitable for use in connection with grounded line systems in which only one line wire is used. To obtain non-interfering service on such systems it is necessary to use the regular line circuit with one line terminal grounded and to equip the lines with our "Secret Call" telephones. The "Secret Call" telephones include a combined pulsating and alternating current generator, together with a push button key having a break contact. A full description of this system is given in our Local Battery Telephone Bulletin.

To convert a regular straight ringing metallic line to one arranged for push button ringing, it is only necessary to remove the connecting strap between one terminal of the drop coil and the sleeve contact spring of the jack (see dotted line) and connect this coil terminal to ground. Care should be exercised in grounding the proper coil terminals on all lines arranged for this kind of signalling, otherwise, trouble will be encountered.

Ringer Signal Line Circuit

Figure 9 illustrates the standard circuit used with all ringer signal line equipments, unless otherwise specified when the order is placed. It is standard practice to provide ringer signals in the switchboard with coil windings of the same resistance as used in the telephones on the line to which they are connected. The circuit shows the ringer perma-

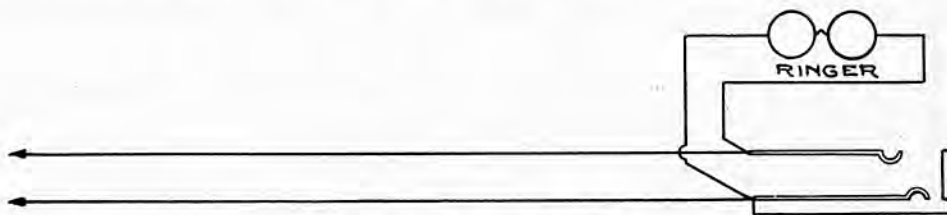


Fig. 9—Ringer Signal Line Circuit

nently bridged on the line; this arrangement, however, does not detract from either the ringing or talking qualities of the line any more than does the addition of another telephone on the line.

When this circuit is used throughout the switchboard, separate clearing-out signals are superfluous. The line ringer remains connected to the line under all conditions and acts as a clearing-out signal when the connected parties ring for a disconnection.

Looping Toll Line Circuit

In many exchanges there are trunk or toll lines which do not terminate in the exchange, but which connect with the exchange apparatus and then pass out to serve other exchanges. Figure 10 shows the wiring of such a Looping Toll Line, or, as it is sometimes termed, a "Waterloo" Line Circuit. Reference to the diagram will show that

Local Battery Switchboards

calls may be received from either direction as the drop is normally connected directly across the circuit. If the code ring indicates that the call is for the local exchange it is

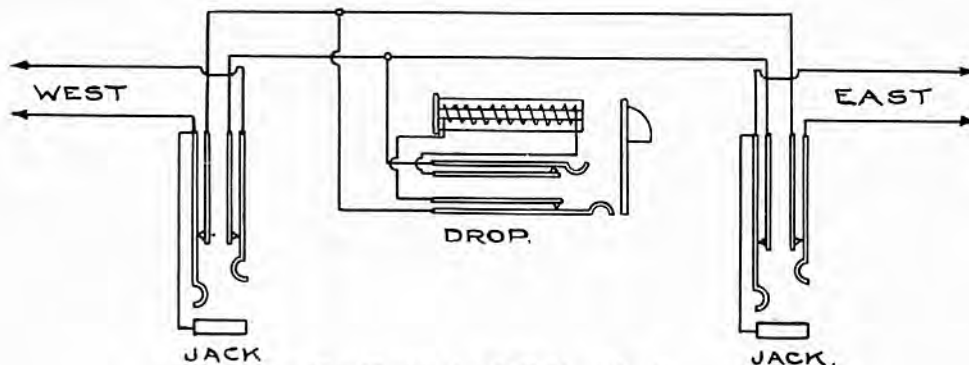


Fig. 10—Looping Toll Line Circuit

answered by means of the central jack. After learning the direction of the incoming call the operator changes the plug to the East or West jack as the case may require. This operation divides the line and leaves the drop connected to the idle section.

Standard Connecting Cord Circuits

The ideal local battery cord circuit has highest transmission efficiency, a clearing-out signal that is positive in its action under all operating conditions and one that will not transmit "ring-offs" or false rings from one temporarily connected line to another.

The circuit having the highest talking efficiency is the simple connecting cord circuit with a single bridged clearing-out signal possessing high impedance. The single clearing-out signal gives the best satisfaction under most conditions. It is furnished as a standard circuit unless otherwise specified and is recommended for use wherever possible. Extra apparatus may be incorporated in the cord circuits to accomplish certain results but the talking transmission will be impaired. The lowered efficiency may not be appreciable for local connections but reduces the range of long distance transmission. In the following diagrams we show the general arrangement of a number of circuits with a brief description of the principal operating features of each.

In order to simplify the diagrams we have omitted the wiring to the ringing and listening keys, since the differences are in the method of supervising the connections between the lines.

Circuit with Single Drop Supervision. Circuit "A"

As previously stated, the circuit "A" illustrated by Figure 11 has the highest talking efficiency of any cord circuit with drop supervision and has been successfully used in local battery switchboards for many years. The single clearing-out drop is bridged per-

manently across the conductors of the cord circuit and will operate when either of two temporarily connected subscribers ring for a disconnection. It is our standard practice to furnish clearing-out drop coils wound to a resistance of 500 ohms. Coils of other resistances will be furnished to meet unusual conditions.

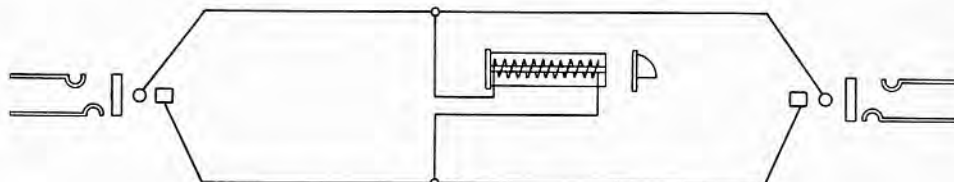


Fig. 11—Circuit "A" Single Drop Supervision

This circuit is furnished with either individual combined ringing and listening keys of the No. 173 type, which provides for ringing on the calling cord only, or with the Nos. 173-178 key combination, which provide a means of ringing subscribers on the answering cord as well as on the calling cord. This "ring-back" feature is of great advantage in long distance business as the calling subscriber may be recalled to the telephone when the long distance connection is ready without the necessity of the operator changing cords. This also applies to rural lines where the operator has occasion to ring back on the same line to get the desired party. The No. 152 key described on Page 14 is also adapted to this circuit as it includes in its assembly the ringing and listening key, ring-back button and clearing-out signal.

Repeating Coil Cord Circuit. Circuit "AA"

In order to establish a connection between a line of the metallic type and one of the grounded type, it is necessary to equip the connecting cord circuit with a repeating coil

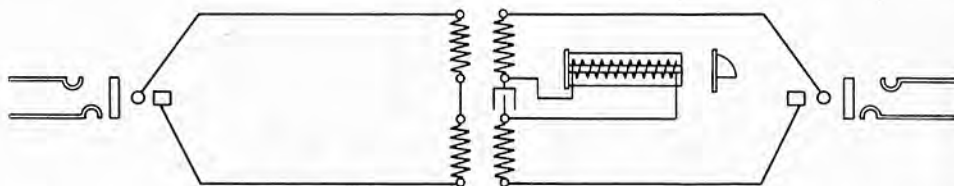


Fig. 12—Repeating Coil Cord Circuit "AA"

and condenser. Figure 12 shows a development of our standard single clearing-out drop cord circuit with the repeating coil equipment added.

As grounded lines are still used to a certain extent in rural sections, it is our practice to wire a number of pairs of cord circuits in each local battery switchboard so that re-

Local Battery Switchboards

peating coil equipment may be installed if required. Unless otherwise specified, the first one, two or three pairs of cords to the left of the operator are wired for repeating coils; the exact number depending on the ultimate capacity of the switchboard. The standard arrangement is to leave the repeating coil and condenser in circuit with all connections but this may be modified by providing a repeating coil key so that they may be cut in only when needed.

Special Cord Circuits

Many modifications of the standard cord circuit have been brought out to insure better supervision but all of these changes are made with a loss of efficiency in transmission.

Special circuits are usually classed as "sure-ring-off," "non-ring-through" or "sure-ring-off, non-ring-through" and aim to accomplish what their names imply.

"Sure Ring Off" Single Clearing-Out Circuit. Circuit "B"

Many telephone systems include both series and bridging lines and difficulty is experienced in securing a positive clearing-out signal with the single bridged clearing-out

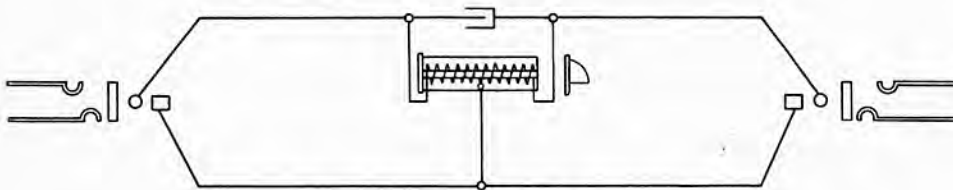


Fig. 13—"Sure Ring Off" Circuit "B"

drop circuit. It is the usual practice to place the series telephones on the short lines about the town and the bridging telephones on the longer lines extending into the outlying rural sections.

Under this condition where a short series line is connected to a bridging line and the subscriber at the bridging instrument rings off, the greater part of the ring off current will pass around through the series line instead of through the clearing-out drop. Upon very short series lines the amount of current diverted from the clearing-out drop becomes so great that a clearing-out signal may not be received with high wound drops.

The cord circuit "B" illustrated by Figure 13 is offered to overcome this difficulty. A double wound clearing-out drop is used with a 1/2 M. F. condenser on one side of the cord circuit. The condenser offers but little opposition to the high frequency voice currents but presents a very much higher resistance to the low frequency ringing currents.

A consideration of the circuit diagram shows that the ringing current is compelled to flow in the drop coil and thereby provide a positive signal. The clearing-out drop will operate even if one connected line is short circuited.

It is not possible to eliminate a certain transformer action in the double wound coil which causes an induced current in the second winding when a ring is received on the connected line of greater or less strength depending on the number of telephones on the line. The use of a condenser on one side of the circuit causes an unbalanced condition, which, while not noticeable on local connections, becomes an undesirable factor in long distance conversations.

We are prepared to furnish this circuit with any of the standard key combinations.

“Sure-Ring-Off,” Double Clearing-Out, Condenser Circuit. Circuit “C”

In circuit “C” shown in Figure 14 the use of two separate clearing-out drops avoids the transformer action, which is an objectionable feature of the double wound drop coil found in the previous circuit and the use of two condensers maintains the electrical

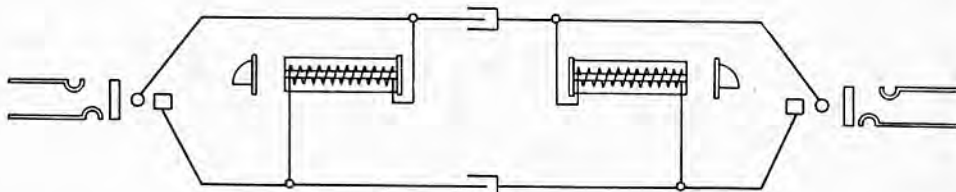


Fig. 14—Double Clearing Out, Condenser Circuit “C”

balance of the circuit. This circuit is used where both series and bridging lines terminate into the switchboard. The ringing currents are confined to the end of the line where they originate and the operator is able to determine which party is signalling for another connection.

Although this circuit provides a “sure ring-off” feature and gives the operator desirable supervision of connections, yet the two condensers and extra drop cut down the transmission efficiency somewhat. This circuit can be made “non-ring-through” by using low capacity condensers. The highest transmission efficiency possible is desirable for long distance connections, and the double supervision is secured only at a sacrifice of talking efficiency.

Either single or double ringing keys may be used with this circuit, but the No. 152 key cannot be used as it provides for but one clearing-out signal. It should also be kept in mind that the use of double clearing-out drops reduces slightly the line capacity of the switchboard as the clearing-out drops mount in space otherwise occupied by line drops.

Local Battery Switchboards

“Sure-Ring-Off” and “Non-Ring-Through,” Double Clearing-Out Repeating Coil Circuit. Circuit “D”

Figure 15 illustrates a circuit which for positive supervision combines the advantages of the circuits shown by Figures 12 and 14, since it includes both the double clearing-out drops and the repeating coil. In addition to the advantages previously stated this circuit is “non-ring-through.” Though not absolutely preventing a ring

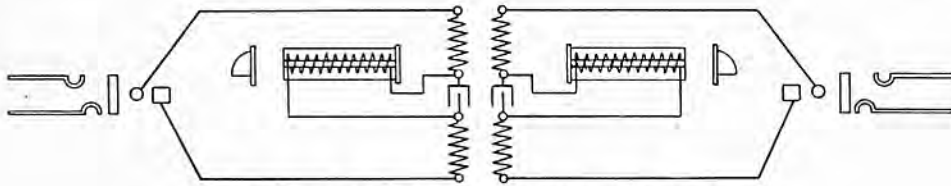


Fig. 15—Double Clearing Out, Repeating Coil Circuit “D”

from passing through the circuit, yet the repeating coil eliminates practically all of it and no trouble is experienced from this source.

This circuit has double supervision, is electrically balanced, has the “sure-ring-off” feature and is “non-ring-through,” and may be used on local to toll connections with greater satisfaction than any of the preceding special cord circuits.

We are prepared to furnish this circuit with any of our standard key equipments with the exception of the No. 152 type, which cannot be employed since it provides for only single supervision.

The transmission losses in this circuit are at a minimum for special circuits, and it is recommended for local use as well as long distance business if a special circuit is considered desirable. The No. 8 Type Repeating Coil illustrated by Figure 24 on Page 17 is the standard which we regularly furnish in our repeating coil cord circuits unless otherwise specified by the purchaser. This type of repeating coil gives entire satisfaction under average operating conditions in the average village and town exchanges. If a repeating coil having still higher transmission efficiency is required for use in connection with extremely long lines we recommend the use of our No. 9-A Repeating Coil in the circuits described above. An additional charge is made for this apparatus which is illustrated and described on page 17 of this bulletin.

We cannot recommend too strongly the use of the simple single bridged clearing-out drop cord circuit for local battery switchboards, especially if any toll or trunk lines terminate in the board. It is the circuit of the highest talking efficiency, and transmission loss occurs whenever apparatus is added to the circuit. Even when conditions make the use of special circuits necessary we recommend that at least two or three pairs of cords be equipped with 1000 ohm single clearing-out drops and repeating coils with key control. When clear metallic circuits are then connected through the switchboard, the repeating coils may be cut out and the circuit left in the highest possible state of efficiency.

Cord Circuit Equipment

Ringling and Listening Keys

We have standardized upon the vertical spring roller cam type of key as shown in Figure 16 for use in connecting cord circuits and other circuits where such keys can be advantageously used. This key has been found to be superior to other types because of the greater length of the contact springs which are more flexible and have a longer life. The vertical spring arrangement permits of a more compact assembly of key combinations for special circuits and takes up less space in the keyboard than keys fitted with horizontal springs. Most key troubles can be traced to improper action of the spring due to worn plungers. In our standard key the wear on the plunger is distributed over the circumference of the cam roller and is not concentrated upon one or two spots as in many other types.

No. 173 Type Keys

This key is made up with a strong pressed brass frame which is uniform and interchangeable with all keys of this general type. The German silver springs are of sufficient length and weight to retain their original adjustment permanently. All springs in the ringing and talking circuits are equipped with securely riveted platinum contact points. Insulating material of high quality is used for separating and bushing the spring assembly to avoid leakage and the resultant troubles.

Keys of this type are regularly mounted on flush type key mounting plates, 6 inches long and 1 1/8 inches wide, individually or in groups of two or three according to the requirements of the corresponding circuit. Figure 17 shows a combination of one No. 173 ringing and listening key and one No. 178 ring-back key. The key mounting plates will accommodate three keys of this type. When one or two keys are mounted the unused slots are concealed by the top plates. The top plates are made of "Formica" which has a natural dull black finish that harmonizes with the plug boards and also with the black finish of the switchboard face. An entire key or combination of keys may be drawn up and out of the keyboard by removing only two screws.



Fig. 16—No. 173 Key

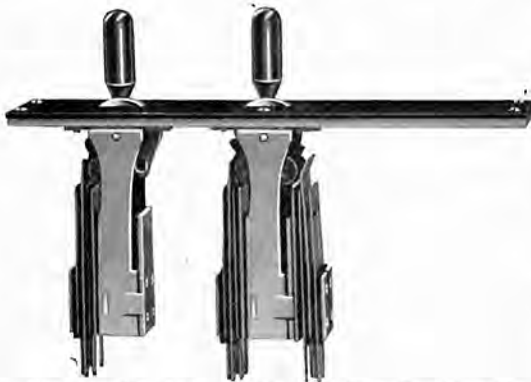


Fig. 17—No. 173 and No. 178 Key Combination

Local Battery Switchboards

No. 152 Type Keys

The No. 152 key as shown in Figure 18 is a combination of ringing and listening key, ring-back key and clearing-out signal. The ringing and listening key details are very similar to the No. 173 type and the key lever is arranged to mechanically restore

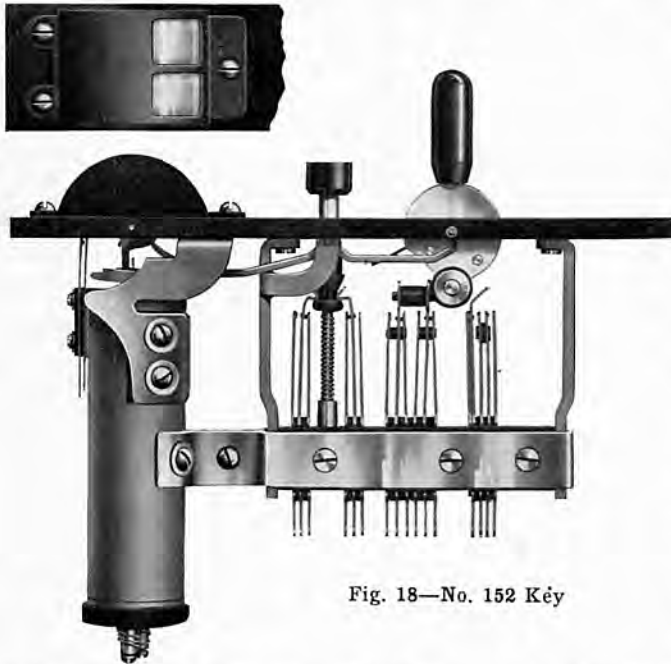


Fig. 18—No. 152 Key

the shutter of the clearing-out signal when the key lever is operated to the listening position. The use of this apparatus obviates the use of clearing-out drops on the face of the switchboard and thereby increases the number of line equipments that can be mounted on the jack frame.

The clearing-out signal is mounted vertically and the shutter is contained within the small housing on the top of the key mounting plate. The signal is very conspicuous and can be readily seen by the operator. The coils are interchangeable with the coils used in our No. 11 type drops and can be removed without the use of a soldering copper. Positive operating

night alarm contacts are provided in connection with the clearing-out signal. It is mounted upon standard 6 inch flush type key mounting plates.

The use of this type of key cuts down the number of movements required in handling a call and therefore provides for faster service. A switchboard equipped with No. 152 keys can be operated very nearly as fast as a "Central Energy" lamp signal switchboard.

Key Arrangement

As before stated our standard key mounting plate measures 6 inches long and 1 1/8 inches wide and is arranged to mount flush with the keyshelf. The key mounting plates are made in two parts—a metal key top plate drilled and slotted for three No. 173 Type Keys and a "Formica" escutcheon plate that fits over the top plate and which is slotted to accommodate the number of keys used. Any unequipped spaces in the underlying key top are covered by the escutcheon plate. This makes a universal key mounting which is easily convertible for use with additional keys by simply changing the inexpensive "Formica" escutcheon for another with additional slots.

Figure 19 illustrates our standard method of arranging the various cord circuit keys on metal frames in keyboards. No. 1 represents the standard position of the Ring-

Local Battery Switchboards

ing and Listening Key when this key is used alone. When either Ring-Back Keys or combined Ring-Back and Repeating Coil Keys are used they are placed on the ends of the mounting plates towards the plug board as shown in No. 2. When Double Listening Keys are specified these additional or third keys are placed on the ends of the mounting plates nearest the operator as in No. 3. The No. 152 Type Keys are arranged as shown in No. 4.

We also manufacture a surface type key mounting plate which provides for mounting No. 173 Type Keys in keyboards where no metal key frame is used and keys of this type which are mounted in the woodwork of other parts of the switchboard cabinet such as night alarm and generator switching keys. These key mounting plates also consist of two parts as illustrated in Figure 20. The top and escutcheon plates measure 2 5/16 inches long by 3/4 inch wide and have semi-circular ends. Two screws that go through both plates fasten the key securely in place.

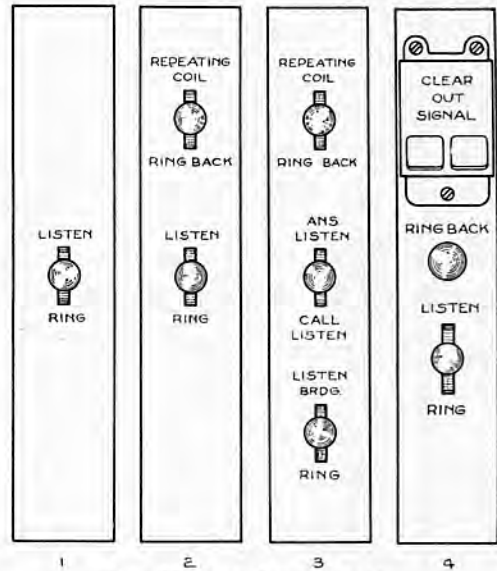


Fig. 19—Key Arrangements

These mounting plates are regularly furnished for mounting individual keys only and are nickel plated.



Fig. 20—Surface Key Escutcheon (Plate Raised)

Battery Contacts

It is the general practice to use gravity cells to furnish the energy required for the operator's telephone set. As this battery is of the closed circuit type, it is unnecessary to cut off supply of current when the telephone set is not in actual use. In fact we equip the operator's jack with local contacts to short circuit the jack in case the operator's receiver plug is withdrawn so that the gravity battery will be kept at work and in good condition. Some telephone companies prefer to use dry cells or some other form of intermittent service cell, such as the Edison BSCO battery. Under such conditions we omit the wiring to the local contacts of the operator's jack and equip the listening keys with two extra contact springs arranged to close the battery circuit only while the listening key is in the listening position. This avoids a continual current drain and prolongs the life of the battery.

All listening keys of our standard types can be fitted with this extra feature when specified.

Local Battery Switchboards

Clearing-Out Drops

The clearing-out drops used in all switchboards equipped with the No. 11 Plug-Restoring Drops, except those employing the No. 152 Key, are of our No. 12 Type as illustrated in Figure 21. These drops are similar to the No. 11 Type in all respects, but, of course, do not include a line jack. The drop coils are interchangeable with those used in the line equipments which avoids the necessity of carrying duplicate stocks of coils.

Each drop is provided with night alarm contacts to provide for an audible disconnect signal at times when required.



Fig. 21—No. 12 Clearing-Out Drops

Plugs

Many types of plugs are mechanically well made, but so small in diameter at the barrel that the operator cannot hold them except with the tips of her fingers. Another fault commonly noticed is the small terminal space allowed inside the plug for terminating the cord. Our No. 42 plug shown in Figure 22 is used on all our local battery non-multiple switchboards. It is of comparatively large diameter and is very accessible for



Fig. 22—No. 42 Plug

changing a cord. The large diameter has a further advantage in allowing greater reinforcement of the cord where it joins the plug, the point of greatest wear. All plugs are turned in semi-automatic machines by skilled plug-makers and are gauged to 1/10000 of an inch. The fibre shells are made from selected hard fibre of sufficient thickness to prevent warping due to excessive humidity or to moisture from the operator's hands.

Our plugs are made with a steel reinforcing pin extending through the contact body which adds greatly to the mechanical strength. The tip and sleeve contacts are heavily insulated one from the other and the insulation in the terminal space is so arranged that short-circuiting at this point is practically impossible.

Cords

Our local battery switchboards are equipped with the "Duratex" cords of our manufacture. This cord has a longer life than steel cords and is moisture-proof.

Our S-23-I "Duratex" cord as shown in Figure 23 is made up of conductors each of which

is composed of three units of six strands of twisted tinsel, the three units twisted together and insulated with two servings of silk. To make the conductor of the cord absolutely moisture-proof the outside serving is impregnated with a compound with such properties that it does not deteriorate with age. The overall covering is a glazed braid containing a marked thread so that each conductor can be easily distinguished at the switchboard end. Two conductors and a dummy are twisted together in the form of a manilla rope with a soft filler thread between each conductor and dummy so that the cord core will be perfectly round. This is the acme of perfection in cord construction because this core will not stretch and the strain of pulling the cord home in the plug seat comes on the cord as a body and not on the tinsel conductors. The cord is covered with a long staple glazed cotton braid with 18 inch reinforcement on the plug end.

With this construction the "Duratex" cord has long life, low resistance, great flexibility and the dry exterior braid insures the maximum speed of operating and is absolutely moisture-proof.

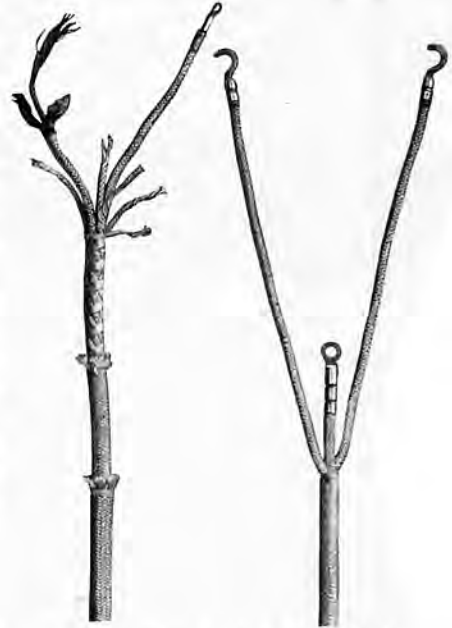
Repeating Coils

The No. 8 Repeating Coil shown in Figure 24 is regularly furnished with the cord circuits previously described. This coil has sufficient iron in the magnetic circuit to be highly efficient at the normal voice frequency on ordinary lines. It is used in connecting grounded lines to metallic lines and for preventing "ringing through."



Fig. 24—No. 8
Repeating Coil

connecting toll lines, etc., the No. 9-A Repeating Coil shown in Figure 25 should be used. This coil has a loss equivalent to only 0.4 of a mile of No. 19 gauge standard cable. This loss is so small that it is practically negligible and can be noticed only by an expert. The ohmic resistance of the windings of this coil is lower than that of any other on the market; only 10 ohms per quarter on one side and 15 ohms per quarter on the other.



No. 23—No. S-23—Duratex Cord

The entire coil is enclosed in a seamless drawn iron case only 2 inches long and 1 3/8 inches in diameter. The small size and method of mounting enable us to place an entire equipment of repeating coils in remarkably small space in the switchboard cabinet. Four windings, two primary and two secondary, are brought out to carefully insulated terminals which are numbered to facilitate installations or testing.

Where the transmission requirements demand repeating coils of the highest talking efficiency, such as trunk circuits, cord circuits



Fig. 25—No. 9-A Repeating Coil

Local Battery Switchboards

Transfer and Order Wire Equipment

When there are but two operator's positions to a switchboard, either operator may easily reach any line jack in the adjacent position. However, if three or more positions are used it is obvious that there are some positions of the switchboard that certain operators cannot reach. For example, in a three position board, Operator No. 1 could not reach line jacks in Position No. 3, conversely, Operator No. 3 is unable to reach line jacks in Position No. 1. To relieve this condition it becomes necessary to provide a means of communication between such positions.



Fig. 26—5 Transfer Jacks

This is done by means of transfer and order wire circuits which extend between distant positions. It is our usual practice to furnish wiring only or wiring and equipment for an ultimate of 15 transfer and 5 order wire circuits, which is a sufficient number to serve switchboards of three to five positions. The operation is quite simple, a call originating on a line terminal on Position No. 1 to be connected to a line terminal on Position No. 3 would be handled as follows: Operator No. 1 answers call in the usual manner and after obtaining the desired number presses the proper order wire key which places her in direct talking connection with Operator No. 3. Operator No. 3 is given the number of the desired line and the transfer circuit to be used, then Operator No. 1 places the calling cord in that transfer circuit jack. This action extends the calling line to Position No. 3 where the connection is completed in the same manner as a regular call. Figure 26 shows a strip of five transfer jacks.

We are also prepared to furnish transfer circuits with lamp disconnect signals. With this circuit as soon as one operator takes down the connection, both lamps glow until the other operator completes the disconnection. Better supervision is obtained in this way and there is less chance for a subscriber to be cut off. When this equipment is used, the transfer jacks and lamps are arranged as shown in Figure 27.

Any form of transfer jack equipment involves the repetition of line numbers and the services of two operators in establishing connections between lines terminating in non-adjacent positions, and usually adds several seconds to the time required to set up the connection than with smaller switchboards in which one operator makes the connection. In exchanges where the volume of traffic is heavy and the system is gradually becoming larger it is often more desirable to install a local battery multiple switchboard of the sectional type described on Page 33. Our salesmen and engineers will gladly make a study of your problem and give you their recommendations.



Fig. 27—Transfer Jacks and Lamps

Operator's Equipment

Our local battery switchboards will be regularly equipped with a suspended transmitter type, although a breast plate transmitter type operator's telephone equipment will be furnished at the option of the purchaser. When the traffic is light and the operator is not at the switchboard constantly the suspended transmitter type of equipment should be specified since it is much easier to put on and take off the headband receiver. In exchanges where heavy traffic exists and operators are constantly on duty the breastplate transmitter set will be found more convenient to use. Both types of operator's equipment are described hereinafter.

Transmitter

Figure 28 illustrates our standard No. 16-L switchboard transmitter suspended by flexible cords from our No. 15 transmitter arm. The transmitter may be easily adjusted to any position in front of the operator as the arm is telescopic and is provided with knuckle joint mounting to allow adjustment for height. This method of mounting the transmitter eliminates the possibility of noise due to the operation of keys and generator as vibrations in the switchboard framework cannot reach the transmitter. This noise is frequently noticed in the switchboards that employ a rigid transmitter mounting bracket.

The No. 16-L Transmitter contains the same standard assembly of parts as used in our local battery telephone transmitters and gives excellent articulation as well as large volume of speech in connection with either local or long distance circuits.

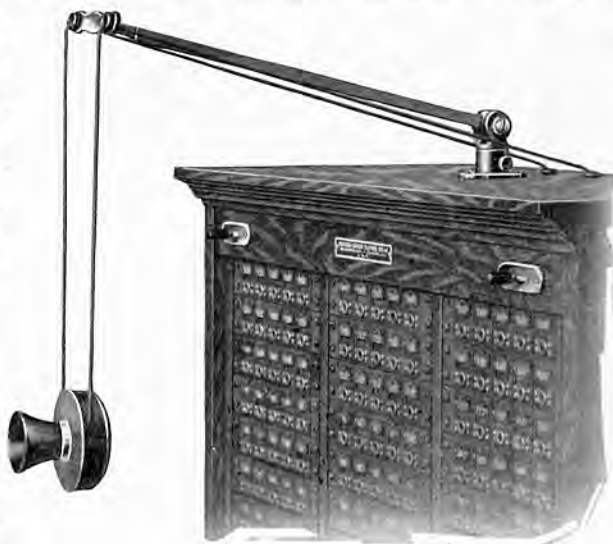


Fig. 28—No. 16-L Transmitter and Arm



Fig. 29—No. 20-A Receiver

Receiver

The No. 20-A Operator's Receiver as shown in Figure 29 includes many desirable features of exceptional value. The sanitary headband is made of flexible steel wire having no sharp edges or projections to entangle the operator's hair. The wires are covered with a highly polished black enamel which will not chip or peel off. This kind of headband can be readily cleaned and is, therefore, more sanitary than

Local Battery Switchboards

other kinds formerly used. It is preferred by some operators because of its extreme light weight and the ease with which it may be adjusted to conform with the shape of the user's head.

Each receiver is furnished complete with a No. 02F 6-foot green silk covered flexible conducting cord which terminates in a No. 40 plug. This plug fits the No. 58 jack mounted in the key shelf rail.

Breast Plate Operator's Set

Some purchasers prefer the breast plate type of operator's telephone set. The No. 1-L operator's set shown in Figure 30 is equipped with our No. 15-L transmitter which is unequalled for transmission efficiency. Aluminum is used for the front and back of the transmitter and reduces the weight of the breast plate transmitter to 8 ounces. The mouthpiece is made of semi-vulcanized rubber and is accurately designed to insure proper concentration of voice waves of maximum intensity directly upon the diaphragm. The process of vulcanizing the rubber is stopped before all elasticity disappears thus insuring a tough and resilient material that is practically unbreakable. The transmitter is fastened to the breast plate by a brass hinge with tension adjustment. This arrangement keeps the mouthpiece and diaphragm properly aligned and the carbon chamber of the transmitter always in a most efficient position.

The receiver used with the No. 1-L operator's set is the No. 20-A described above and is regularly equipped with a sanitary double wire headband. The wire headband readily adapts itself to the contour of the operator's head and is light and comfortable to wear. The small pad on the end of the band is adjustable and serves to balance the



Fig. 30—No. 1-L Operator's Set

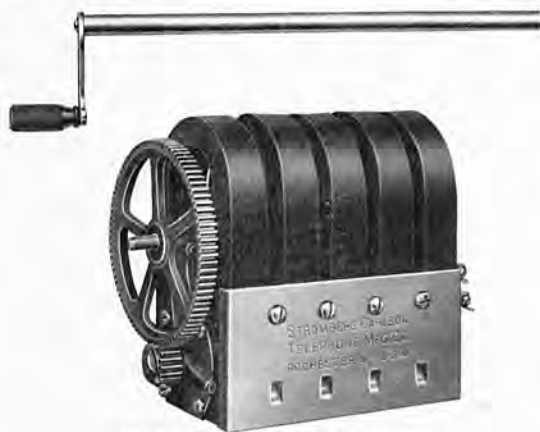


Fig. 31—5 Bar Hand Generator

apparatus and to distribute the fit with a gentle even pressure. Each set is equipped with a No. 04C "Duratex" cord which will not kink or stretch. The rope form of cord body protects the tinsel and prolongs the life of the conductor. Each conductor of the cord is impregnated with a moisture-proofing compound which preserves high insulation and prevents corrosion through the tinsel. When the breast plate operator's set is used we mount a No. 93 four-point jack in the key shelf rail of the switchboard instead of the No. 58 jack.

Generator

For ringing purposes each switchboard is provided with a 5-bar hand generator as shown in Figure 31. This generator has a large current output and maintains its voltage well under load. The

magnets are of special magnet steel and of liberal cross-section so as to permanently retain a field of maximum magnetic intensity. The armature is driven by machine cut gears which intermesh properly and run quietly. The armature core is built up of imported soft iron laminations and is wound with silk insulated pure copper magnet wire. This generator will run for years without other attention than an occasional few drops of oil. It is our standard practice to mount generators in the rear of the switchboard with crank shaft extending through the front of the cabinet convenient to the operator's right hand.

It is recommended that all exchanges serving 50 lines or more be equipped with a pole changer or power driven ringing generator to relieve the operator of crank turning which impedes fast service. We equip each switchboard with a generator switching key to provide a means of changing over from hand to power ringing or vice versa. A pilot buzzer is also furnished in the ringing circuit so that the operator may quickly detect an open circuit when ringing on a line.

Night Alarm Bell

Each switchboard is equipped with a 3 inch vibrating night alarm bell to indicate the fall of line or clearing-out signals at night or at other times when the operator is not at the switchboard. This night alarm bell will continue to ring as long as any calls remain unanswered. A switching key is provided for switching the night alarm bell in or out of service as desired.

When especially desired we furnish our No. 15 plug-restoring drops in which provision is made for code ringing night alarm bell contacts in addition to the continuous ringing night alarm bell contacts. The two night alarm circuits are separate and distinct and are controlled by individual switching keys. We suggest that persons interested in code ringing night alarm bell equipment read the description under paragraph headed "Code Ringing Night Alarm Bells" on Page 5 of this bulletin.

Position Switching Key

When two or more operators' positions are used it is necessary to provide a means of switching the positions together so that one operator can attend the entire switchboard at night or during other periods of light traffic. This is accomplished with position switching keys which connect together the ringing and operator's leads of adjacent positions.

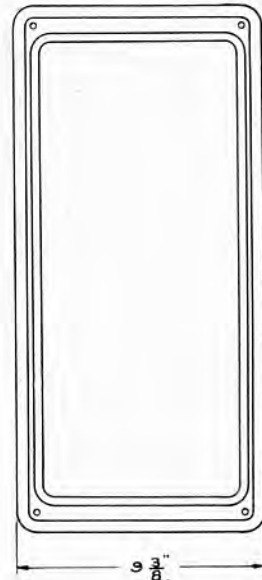
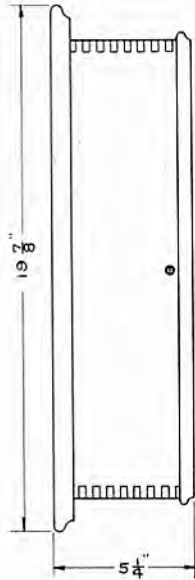
Batteries

As the operator's transmitters usually operate continuously while the switchboard is in service a closed circuit type of battery is required which will deliver a fairly uniform current at a constant voltage. For this purpose we regularly supply, with each switchboard three cells of 6 inch by 8 inch Gravity Battery commonly known as "Crowfoot" or "Blue-Stone" batteries.

When specified we will furnish in lieu of the above three cells of Edison BSCO Battery. This type of battery is suitable for either continuous or intermittent service and is superior to the Gravity Battery in that it does not deteriorate when idle and require attention between renewal periods. A slight additional charge is made for this equipment.

Local Battery Switchboards

5-Line Wall Type Switchboard No. A-11740



This type of switchboard is arranged for use in connection with one of our No. 896 Type Wall Telephones to form a complete exchange equipment for small systems which do not consist of more than five lines. It is a very serviceable and economical equipment for overloaded party lines which require division into separate lines because the telephone at the

switching station can be used as the operator's instrument.

The cabinet is made of oak and is furnished with a dull golden oak finish. All of the apparatus is mounted upon the door of the cabinet convenient for inspection purposes. Each line equipment consists of a No. 102 Type Ringer Signal and a line jack wired as shown in Fig. 9, Page 7. The various lines are terminated in 12 feet of switchboard cable which is furnished with each switchboard. Two pairs of connecting cords are provided for making connections between the various lines. An extra cord and plug is connected to the operator's telephone for answering and calling any line. Each connecting cord circuit is equipped with a listening jack for supervisory purposes.

The resistance of the switchboard ringers should be uniform with the resistance of the ringers in the telephones on the various lines. The standard equipment of this type of switchboard is as follows:

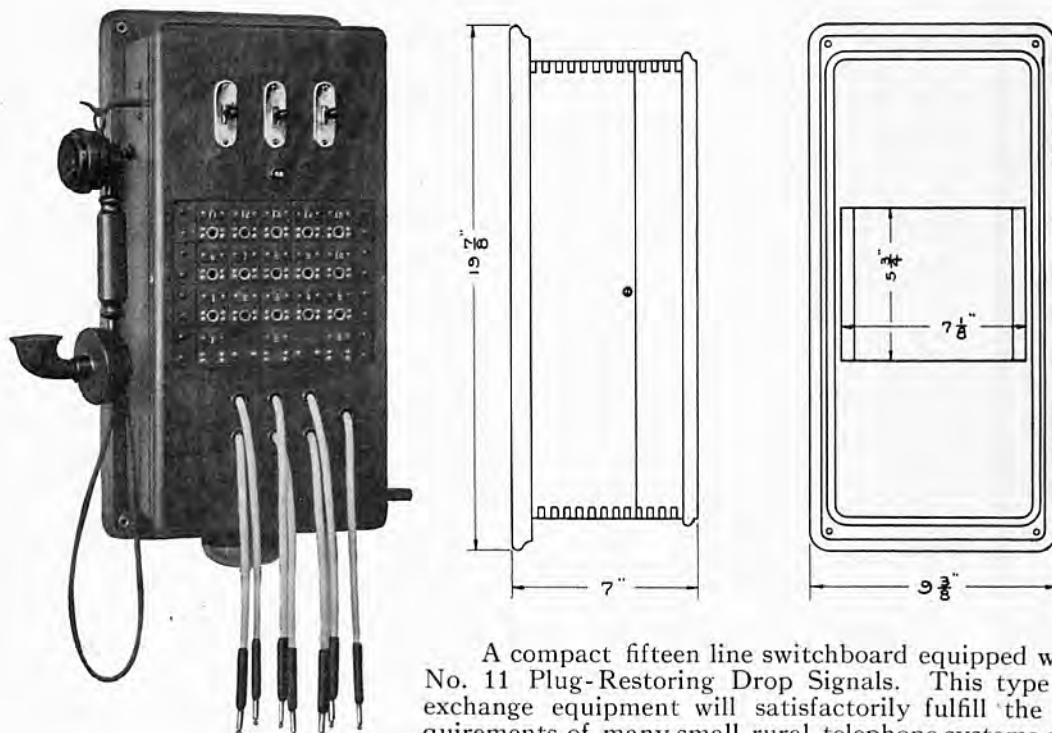
Standard Equipment

- 5 No. 102 Ringer Signal Line Equipments. (1600 ohms)
- 2 Connecting Cord Equipments.
- 1 Operator's Telephone Cord
- 1 Night Alarm Bell Equipment.

Price completely equipped as above, including 12 feet of switchboard cable attached, \$35.00 F. O. B. Factory, Rochester, New York.

The approximate weight of this switchboard (fully equipped) when packed for shipment is 35 pounds.

15-Line Wall Type Switchboard No. A-11741



A compact fifteen line switchboard equipped with No. 11 Plug-Restoring Drop Signals. This type of exchange equipment will satisfactorily fulfill the requirements of many small rural telephone systems and factories in which Local Battery Private Systems are used.

The illustration and dimension diagram shows the design and size of the switchboard cabinet which is made up throughout of quarter-sawed oak. The cabinet is divided into halves which are hinged together. The front section contains the line and clearing-out signals, ringing and listening keys, connecting cords, cord terminals and night alarm bell switch. The rear section of the cabinet which is fastened to the backboard contains a 5-bar hand generator, hookswitch and induction coil for the operator's combination telephone set.

This type of switchboard is regularly carried in stock with the following equipment:

Switchboard Equipment

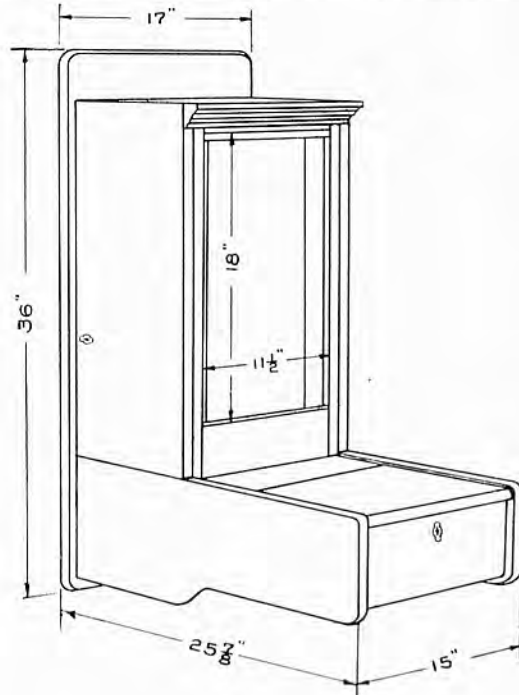
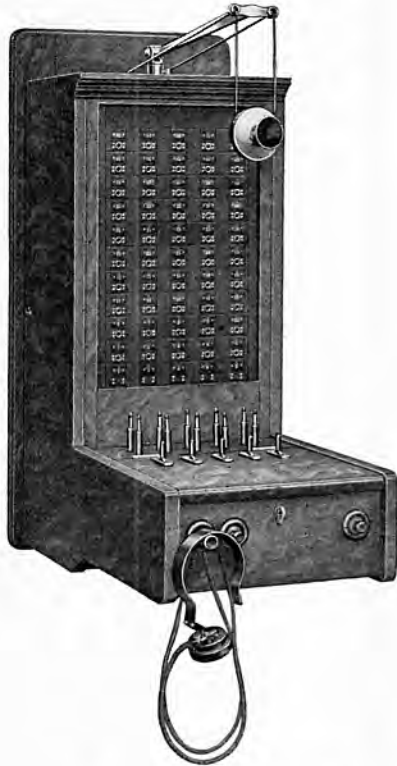
- 15 No. 11 Plug-Restoring Drop Line Equipments (500 ohms)
- 3 Connecting Cord Equipments (Circuit "A")
- 1 Answering Cord Equipment
- 1 Operator's Telephone Set
- 1 Hand Generator Equipment
- 1 Night Alarm Bell Equipment

Price completely equipped as above including 12 feet of switchboard cable attached, \$75.00 F.O.B. Factory, Rochester, New York.

Approximate weight (fully equipped) packed for shipment 60 pounds.

Local Battery Switchboards

40-Line Wall Switchboard No. A-5442



An excellent equipment for small exchanges in which the traffic to be handled by the switchboard does not require an operator in constant attendance. Although this style of cabinet will accommodate forty No. 11 Plug-Restoring Drops, we do not recommend the use of more than twenty-five unless the lines with which they are used are of the individual or two party type. The limited number of connecting cord equipments would not be adequate to carry the traffic originated by more than twenty-five heavily loaded party lines.

Standard Equipments

Wired for	No. of Lines Equipped	No. of Cord Prs. Type "A"	No. of Cord Prs. Type "AA"	Total No. of Cord Pairs	Approx. Wgt. Packed	Price
40 Lines 5 Pairs Cords	10	2	1	3	100 lbs.	\$ 94.50
	15	3	1	4	105 "	110.25
	20	3	1	4	110 "	126.00
	25	4	1	5	115 "	136.75
	30	4	1	5	125 "	147.75
	40	4	1	5	130 "	169.25

Prices of switchboards listed above include 12 feet of switchboard cable attached and are F.O.B. Factory, Rochester, N. Y.

100-Line Single Position Switchboard No. A-11664

Low Type Key Shelf

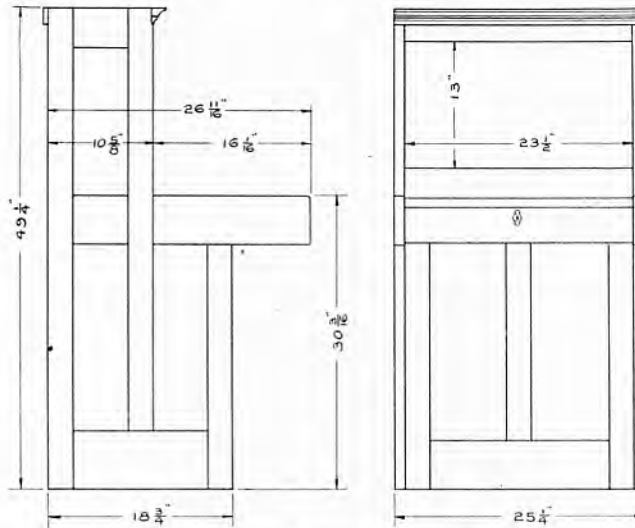


We strongly recommend our new No. A-11664 Switchboard, illustrated above, for exchanges that require a floor type equipment for handling from 10 to 100 subscribers' lines. The general construction of this switchboard is the same as our larger No. A-5629-150 line type but the cabinet is not so high and the keyboard is only 30-3/16 inches above the floor so that the operator can sit at work in an ordinary chair. The sides of the cabinet are flush to allow the alignment of additional sections of cabinet to obtain increased equipment facilities when the system outgrows the capacity of a single cabinet.

The dimension diagrams of the No. 11664 Switchboard and a list showing the standard equipments with prices applying thereto will be found on the following page. The standard equipments are based upon the average requirements and will satisfy most local conditions. If the desired equipment is not included in the list, kindly write us fully regarding the necessary modifications and we will prepare a special quotation. Switchboards with standard equipment can be delivered more promptly than those with special circuits and apparatus.

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY

Local Battery Switchboards



The following table lists the standard equipments regularly furnished in this type of switchboard which is carried in stock with wiring and cables for ultimate capacities of 50 lines and 10 cord pairs and 100 lines and 12 cord pairs. To order any of the standard equipments in the table it is only necessary to specify the switchboard number and the number of lines equipped.

Standard Equipments

Wired for	No. of Lines Equipped	No. of Cord Prs. Type "A"	No. of Cord Prs. Type "AA"	Total No. of Cord Pairs	Approx. Wgt. Packed	Price
50 Lines 10 Pairs Cords	10	3	1	4	280 lbs.	\$135.00
	20	3	1	4	285 "	156.50
	25	4	1	5	300 "	173.50
	30	4	1	5	305 "	184.25
	40	4	2	6	315 "	214.25
	50	5	2	7	330 "	242.50
100 Lines 12 Pairs Cords	60	6	2	8	340 "	279.75
	70	6	2	8	350 "	301.25
	75	8	2	10	360 "	324.50
	80	8	2	10	365 "	335.25
	90	8	2	10	375 "	356.75
	100	9	3	12	385 "	393.00
For each additional Type "A" Cord Pair equipped add					\$6.25	
" " " " " " " " " " " "					\$8.50	
For wiring for an additional 50 lines with its associated increase in cord pair capacity					\$10.00	

Equipment Notes

A Connecting Cord Circuit "B," "C" and "D" can be used either in combination with Circuits "A" and "AA" or in place thereof without altering the balance of the equipment schedule. An additional charge is made for such special circuits.

"B" The above equipment schedule and prices shown are based upon the use of a No. 173 Ringing and Listening Key and No. 178 Ringback Key in each cord circuit. The No. 152 Key will be supplied in lieu thereof at the option of the purchaser, and at the same prices.

Prices are F.O.B. Factory, Rochester, New York, and include 12 feet of switchboard cable.

Standard Single Position Switchboard No. A-5629

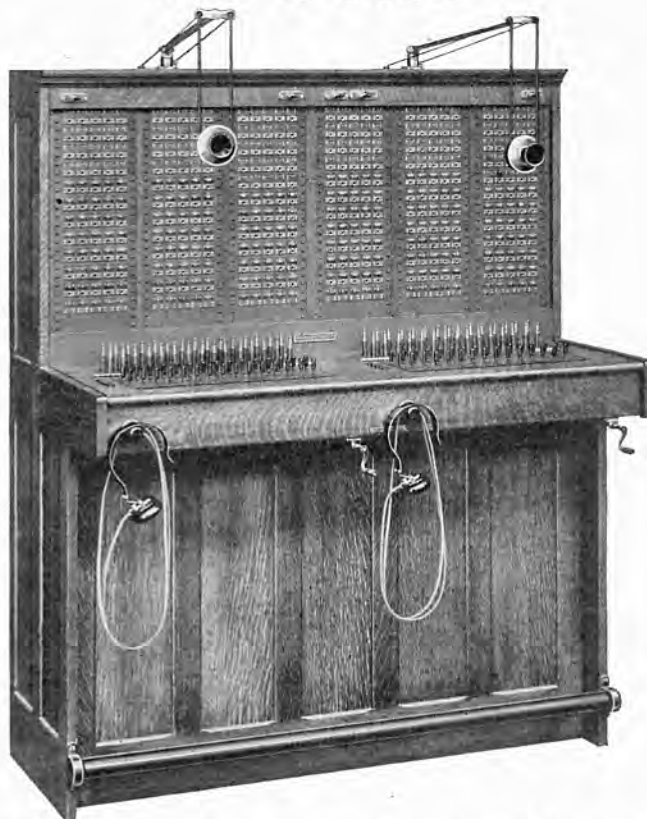


This type of switchboard is most economical and advantageous for rural exchanges which consist of more than seventy five lines. The cabinet is made with flush sides so additional sections of switchboard can be easily installed alongside of the original section when the growth of the system overtakes the capacity of the initial installation.

The equipment capacity of this type of switchboard is determined largely by the equipment of the connecting cord circuits. On the succeeding page we list the standard equipments that can be furnished in this switchboard and offer suggestions which should be carefully considered before making up either quotation requests or switchboard orders.

To aid our customers in placing orders for switchboards of this type we have standardized upon four cabinet wirings so that it is only necessary to specify the number of line equipments required for immediate operation to obtain the proper equipment complete. These standards have been worked out from the average demand and will be found applicable to most local conditions. When the local conditions are abnormal or some special circuit arrangements are required we will gladly lay out a special switchboard.

Standard Two Position Switchboard No. A-5631



When the initial equipment of an exchange exceeds two hundred lines or when a worn-out and fully equipped single position switchboard is to be replaced it is generally more advantageous and economical to purchase the No. A-5631 Two-Position Switchboard than two sections of the No. A-5629 Single Position Switchboard. The cost is lower and there is an advantage that no woodwork division appears between the operators' positions.

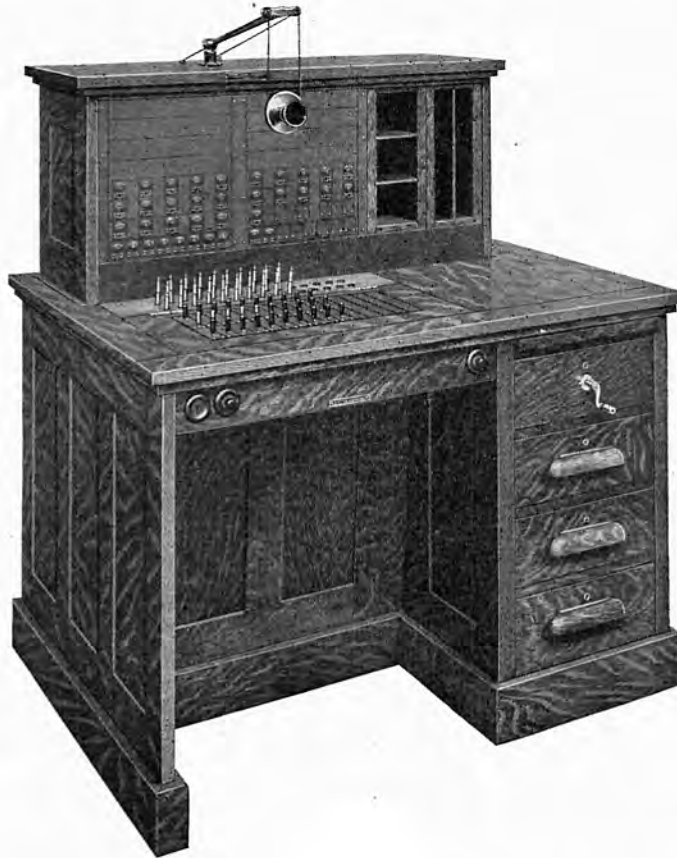
The switchboard is the equivalent of two separate switchboards which can be operated either independently of each other during the busy hours of the day or together as single switchboard under the control of one operator at night or other times when the number of calls is low. The change in operation is made by throwing over a single lever-key, known as the Position Switching Key.

Dimension diagrams, list of standard equipments and prices applying to this type of switchboard will be found on the following page.

Switchboards of this type are furnished with wiring and cables for 100 Lines and 20 Cord Pairs, 200 Lines and 24 Cord Pairs, 300 Lines and 30 Cord Pairs or 360 Lines and 30 Cord Pairs.

In placing orders it is only necessary to specify the number of line equipments required for immediate operation to obtain the proper equipment complete. In case the following table does not show the desired equipment kindly advise us of your requirements and we will submit a special quotation.

70-Line Desk Type Switchboard No. A-5620



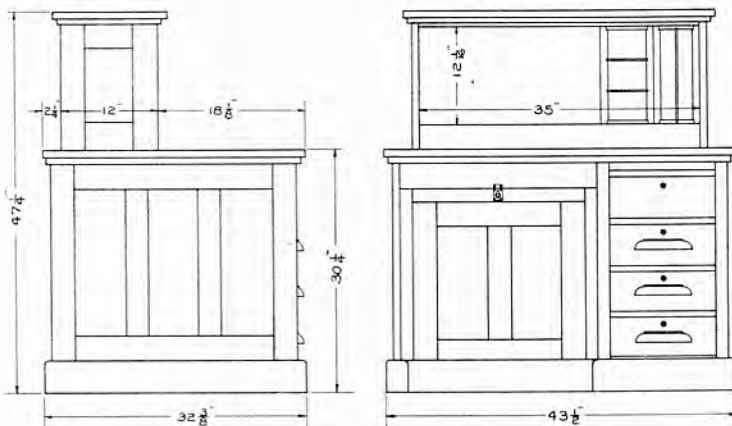
A type of switchboard that provides a greater amount of writing surface for the operator and space for storage of papers, books, etc. It is recommended for exchanges in which a comparatively large amount of long distance traffic is handled and for use as a separate toll switchboard when such equipment is required.

The cabinet consists of a standard flat top desk with a single tier of drawers. The back of the desk is arranged to accommodate the cords, weights and other associated apparatus. A removable back panel gives access to that space. The turret contains the line circuit apparatus and cord terminal board and is likewise provided with a removable back panel.

The following page shows the dimension diagrams of the switchboard and standard equipment tables with list prices. This type of cabinet can also be furnished with wire chief's or chief operator's equipment. Prices upon such special equipment will be quoted upon request.

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY

Local Battery Switchboards



The following table lists the standard equipment regularly furnished in this type of switchboard which has an ultimate capacity for 70 lines and 10 cord pairs. In placing orders for any of the specified standard equipments it is only necessary to give the switchboard number and the number of lines equipped.

Standard Equipments

Wired for	No. of Lines Equipped	No. of Cord Prs. Type "A"	No. of Cord Prs. Type "AA"	Total No. of Cord Pairs	Approx. Wgt. Packed	Price
70 Lines 10 Pairs Cords	10	3	1	4	375 lbs.	\$165.00
	20	3	1	4	390 "	186.50
	25	4	1	5	400 "	203.50
	30	4	1	5	410 "	214.25
	40	4	2	6	425 "	244.25
	50	5	2	7	440 "	271.00
	60	6	2	8	450 "	299.75
	70	6	2	8	460 "	321.25

For each additional Type "A" Cord Pair equipped add \$6.25
 " " " Type "AA" " " " add 8.50

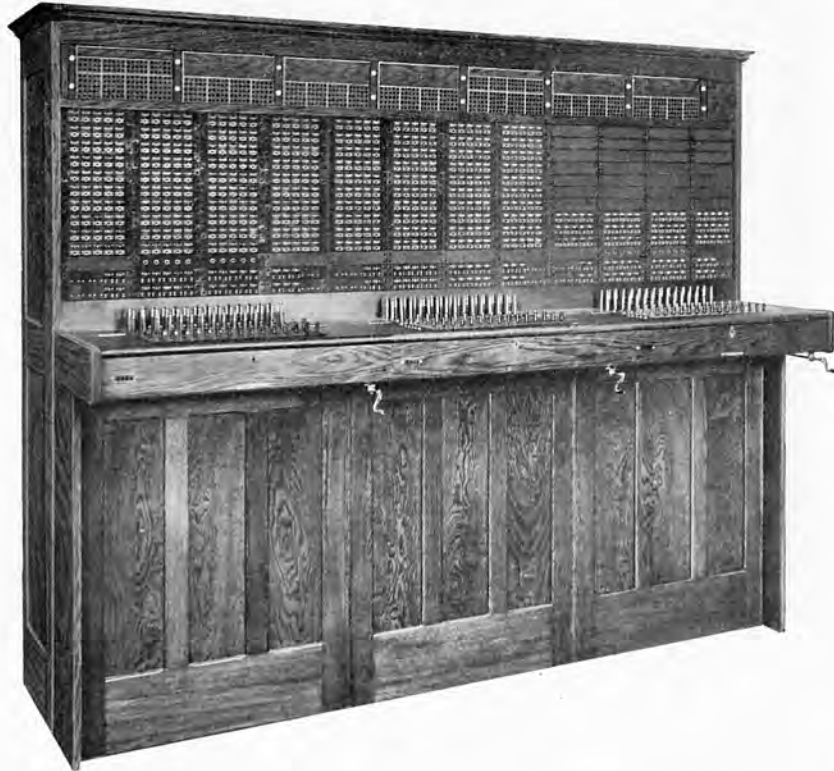
Equipment Notes

"A" Connecting Cord Circuits "B", "C" and "D" can be used either in combination with Circuits "A" and "AA" or in place thereof without altering the balance of the equipment schedule. An additional charge is made for such special circuits.

"B" The above equipment schedule and prices shown are based upon the use of a No. 173 Ringing and Listening Key and No. 178 Ringback Key in each cord circuit. The No. 152 Key will be supplied in lieu thereof at the option of the purchaser, and at the same prices.

Prices are F.O.B. Factory, Rochester, New York, and include 12 feet of switchboard cable.

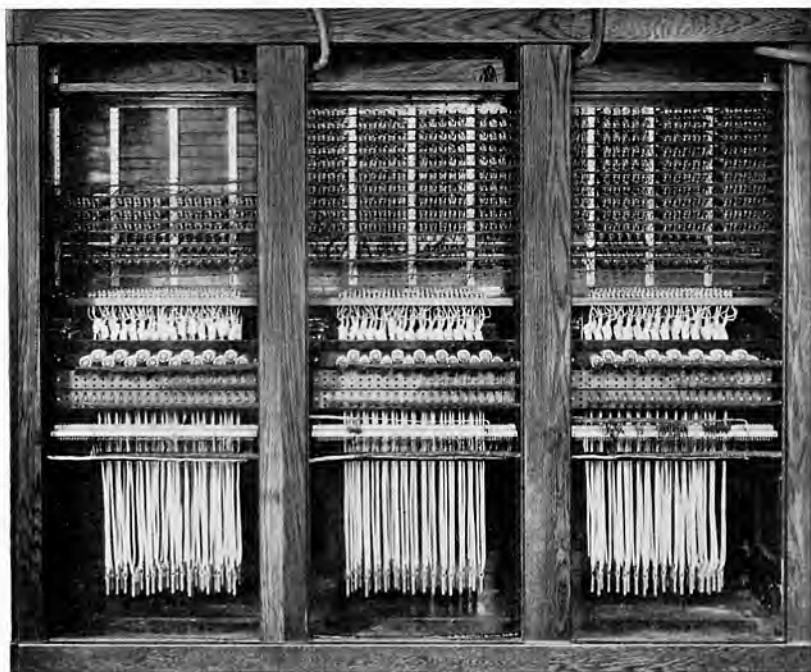
Unit Type Switchboard No. A-5642



The switchboard shown above is made up of three unit type No. A-5642 switchboard sections and two end panel sections. The individual sections are made without sides to avoid woodwork separations between adjacent operators positions. This construction is particularly advantageous in that it brings more jacks and signals within the reach of each operator and none of the signals are partially concealed from the end operators—a common occurrence when the switchboard face equipment is broken up by woodwork divisions. Switchboards composed of these sections are more convenient to install as the sections are easier to handle than one large two or three position type switchboard.

The management of rapidly growing telephone companies should consider the equipment advantages of this style of switchboard. The framework and apparatus is arranged so that additional sections can be added as required. When three or more sections are needed either transfer jack or multiple jack equipment can be installed to provide facilities for connections between lines terminating on non-adjacent sections. The illustration shows the multiple jack equipment installed in the space above the plug-restoring drops. This equipment is superior to the usual method of using transfer

Local Battery Switchboards



Rear View No. A-5642 Switchboard (Transfer Jack Equipment)

circuits between positions in that one operator receives and completes the connection whereas the use of transfer circuits necessitates repetition of the called number to the operator who completes the connection. Although multiple jack equipment is more expensive than transfer jack equipment it clips several seconds on each connection and eliminates the possibility of "wrong number" connections on the part of the second operator.

The individual sections each have an ultimate capacity for 200 subscribers' line equipments, 15 cord pair equipments with either single or double cleaning-out drops and 500 multiple jacks for a 1000 line multiple jack arrangement extending over two operators' positions. Estimate and specifications based upon the use of this type of switchboard equipment will be furnished upon request.

We are also prepared to furnish local battery lamp signal multiple switchboards with the equipment arranged so that the switchboard can be converted to the "Central Energy" system at some future time if desired. The conversion of the line equipments from Local Battery to "Central Energy" operation involves only a slight change in the wiring of the relays associated with each subscribers' line. Send for specifications and full information regarding lamp signal convertible switchboards.

Standard Keyboard Arrangements

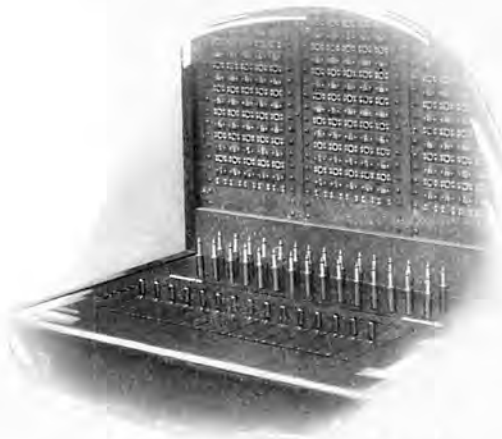


Fig. 31—Key Arrangement No. 1



Fig. 32—Key Arrangement No. 2

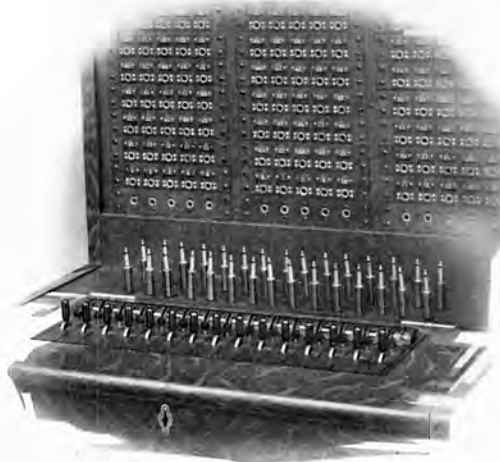


Fig. 33—Key Arrangement No. 4

The accompanying illustrations show some of our standard local battery switchboard keyboard arrangements in which the plan described on Page 15 has been carried out.

Figure 31 shows the standard method of mounting single No. 170 Type Keys. The plate beneath the escutcheon is drilled so that two additional keys can be added at some future time if desired. Figure 32 illustrates the standard arrangement of sets of two keys on one key mounting plate. This plan does not decrease the writing space on the keyboard. Figure 33 shows the arrangement of the keyboard when the No. 152 Type Key is installed. In this illustration the space

usually assigned to the clearing-out drops has been utilized for transfer jacks but could have been used for additional line equipment if transfer jacks had not been specified.

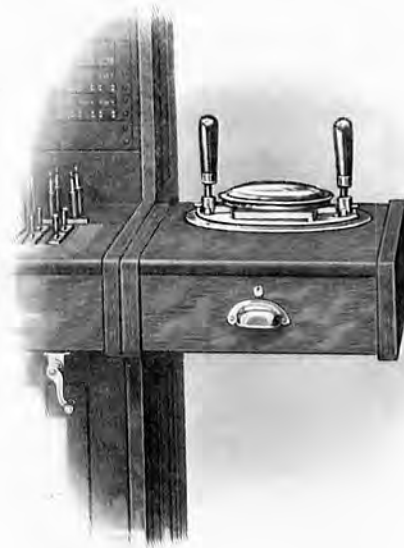
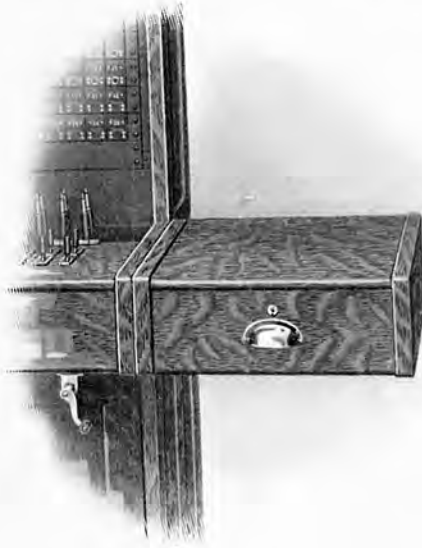
Our keyboards in which the keys are mounted flush with the woodwork present a much neater appearance than other kinds in which surface type key mountings are used. Dust can be wiped off easily and quickly and there are no projecting sharp edges to injure the operators' hands and clothing.

Local Battery Switchboards

Accessories

Extension Key Shelves

The extension key shelves shown on this page form useful additions to our Nos. A-11664, A-5629 and A-5631 type switchboards. We manufacture two types; one with a full length plain drawer and the other for mounting a Calculagraph and fitted with a half-length plain drawer. Both types are furnished to match our standard switchboards and are provided with lock and key. Prices will be quoted upon application.



Pigeon Holes

Our Nos. A-11664, A-5629 and A-5631 type switchboard cabinets may be furnished with pigeon holes when the switchboard is partially equipped with apparatus. We are prepared to supply these pigeon holes made in 1, 2 or 3 compartment sizes. These are very convenient for filing toll tickets, rate circulars, list of new subscribers, etc. Further information and prices will be furnished upon request.

Calculagraph

The Calculagraph is an instrument whose function is to calculate and record by mechanical means the time, in minutes and quarter minutes, which elapse during a toll or long distance conversation. It definitely fixes the charge for the message and effectively stops a leak in the revenue of the telephone company employing it. In a busy exchange, or one where a considerable amount of long distance business is handled, the increase in the receipts from tolls due to elimination of errors in timing is sufficient to repay the cost of the Calculagraph in a short time.