

GETTING THE MOST OUT OF TIME



The **SELECT-O-PHONE**

This Catalog is
IN TWO PARTS

Part I. Descriptive Catalog
Pages 1 to 23

Part II. Installation and
Maintenance
Pages 25 to 40



GETTING THE MOST OUT OF
TIME

WITH THE

SELECT-O-PHONE
AUTOMATIC INTERIOR TELEPHONE



SELECT-O-PHONE COMPANY
PROVIDENCE, RHODE ISLAND

A Division of
THE SCREW MACHINE PRODUCTS CORPORATION



THE SELECT-O-PHONE

What It Is

The Select-O-Phone is a full automatic telephone system, especially developed to serve organizations requiring from five to fifty-five telephone stations, all within one building, or distributed among several buildings.

It functions entirely without an operator and supplies special service features of utmost value to the organization.

How It Increases Business Efficiency

A Select-O-Phone System increases valuable inter-office communication, by making it so easy. It is often hard to get inter-office calls promptly through a manually operated switchboard. Because of the delay, people hesitate to call. They make judgments and express opinions without the adequate knowledge which can be gotten only through inter-office calls.

But executives and employees know that with a Select-O-Phone they can reach each other in four seconds at their desks or less than 15 seconds on the General Call. There is now no time-consuming manual switchboard to act as psychological barrier to finding the man and finishing matters as they arise. Select-O-Phone gives wings to thoughts and ideas. It builds a "Do it now" spirit as compared with the habit of "talking it over when I see him."

The Service It Gives

1
**Unlimited
simultaneous
service**

All stations in a Select-O-Phone system can be in use at the same time—in pairs, or in conferences; each party carrying on its business secretly, independently and without interfering with the others. This feature is of utmost importance; you can ALWAYS get service.

2
**The Conference
Feature**

Parties at any three or more stations may engage in a secret general conference or discussion by proceeding as follows: The first party calls a second, the second calls a third, etc., until all those desired are parties to the connection. The conference is carried on privately, secure from being overheard by persons outside the group; the last called party alone can add a new member. Of value in calling an impromptu conference between widely separated offices to quickly dispose of pending business matters without the necessity of the parties leaving their desks.

3
**Lockout and
Busy Feature**

Stations in use, both calling and called, are automatically isolated from the remainder, and may converse as on a private line. A third party calling either station is "locked out," a hum in his receiver denoting that the called station is "busy." Replacing the receivers at the stations in use instantly restores them to service.

4
Executive
Right-of-Way

In some organizations it is essential that calls from certain stations take precedence over all other calls, thus giving executive business right of way over routine business. Any one or more stations may be equipped with a "master selector," permitting such stations to connect at any time with any other station regardless of whether it is talking or not.

5
General Call

The General Call or "Paging" service provides a ready means for quickly finding a party who may be away from his usual station. Communication is at once established with him wherever he may be and much valuable time saved which is otherwise lost in fruitless search.

A signal for the wanted party may be sent from any Select-O-Phone and is sounded on an auxiliary signalling system throughout the premises. The wanted party, upon hearing his signal, replies from the telephone nearest him, completes his business on the spot, and proceeds on his way without loss of time.

To illustrate its use—The manager in walking through the plant discovers a condition he wishes to bring to the immediate attention of the superintendent. Not knowing where the superintendent may be, he steps to the nearest Select-O-Phone, turns the dial to "Call" and rings the proper code—say three short rings on the General Call. The superintendent, upon hearing his call, answers from the nearest Select-O-Phone by turning his dial to "Ans.," pressing the button, and the business is disposed of at once, although neither party knows where the other is located.

General Call service may or may not be included in the original installation, but provision is made in every standard switchboard for its installation at any time (see page 20).

6
Watchman's
Call

Through special code signals on the General Call, a watchman or caretaker can quickly locate and secure help from others in case of fire, burglary, or other emergency.

7
Fire Alarm

The General Call signals may be employed for sounding a special alarm code in case of fire. Where it is not desirable to use the General Call circuit for this purpose, a separate circuit similar to the General Call may be used to operate signals differing from those on the General Call circuit, such as steam or air whistles, etc.

8
Party Line
Service

Extension telephones may be connected to any or all lines, making two party lines, and doubling the telephone capacity of the system selected. To ring a station on your own party line, merely press the ringing button; the dial need not be operated. Conversations between stations on a party line are as private as between stations on single station lines.

9
Extension
Signal Service

If a telephone is located in a noisy place, the regular bell may not be loud enough. For loud extension signals see Section 1, General Call Signals (Page 21). Any of these, from small bells to motor driven horns, may be used, but must be specified for "Extension Signal Service."

SUMMARY OF SELECT-O-PHONE SERVICE FEATURES

Select-O-Phone users composed the following list of features which they consider most helpful and valuable. Many of these features will have important results in your organization.

Select-O-Phone Service—

Is always alive and available at all hours of night or day, every minute of the year, without a switchboard operator.

Is automatic, man-to-man service and is not hampered by manual supervision.

Connects you to a wanted station in four seconds.

Is unlimited as to the number of calls which can be made simultaneously. Everybody served the instant the service is wanted.

Permits of direct successive calls from a station without waiting for an operator to change connections.

Permits of secret conversations.

Provides a conference service permitting any three or more parties to hold a general secret conversation.

Permits simultaneous connections from many stations without interference, each securing connection to the party called unless the called station is busy.

In many cases saves an operator's salary.

Provides clear, distinct, amply loud transmission of speech, of a purity of tone unexcelled by any system in existence.

Prevents all stations (except those having executive right-of-way service) from obtaining connection to a line in use, and notifies the calling party by an audible buzz that the called line is busy.

Combined with the General Call, enables you to locate a party who may be away from his usual station, in the shortest possible time, wherever he may be on the premises, and to establish a private talking connection with him.

Enables your watchman or caretakers to quickly find and converse with each other directly, without time-wasting search,—added protection in case of fire, burglary or accident.

Can be used as an auxiliary fire alarm system, or for special signalling purposes.

Operates equally well whether stations are all in one building or in many buildings scattered about the premises.

Permits of code signalling, to call a particular one of several who may answer an individual station call.

Permits of ringing between stations on a party line, as between an executive and his clerk or stenographer, by merely pressing the ringing button and without operating the dial.

Enables you to call at any time without waiting your turn, regardless of the fact that many others may be calling at the same time.

A BRIEF DESCRIPTION OF SELECT-O-PHONE APPARATUS

The Select-O-Phone could not give the many services described on the opposite page, were it not for certain exclusive features which make for extreme simplicity of installation, operation and maintenance.

To win and hold a market, Select-O-Phone had to be built far better than is usual with such apparatus. We were fully aware of this. As a result, our apparatus is capable of being shipped to any part of the world, installed by an ordinary electrician, used under every conceivable disadvantage—and yet give good service with a minimum of attention.

Units Are Interchangeable

Trouble may exist at times in a Select-O-Phone (as it will in any apparatus). But we have practically nullified bad effects by making units interchangeable. This makes it easy to locate the fault by a few simple tests. The faulty unit can be replaced by a spare unit, and sent for reconditioning to our nearest service station where adjustments can be made at less cost than by inexperienced hands.

Flexibility of Apparatus

The flexibility of the Select-O-Phone apparatus is such that you need not be put to the initial expense of anticipating your possible future requirements. This has been anticipated for you fundamentally in the Select-O-Phone apparatus. You may install as few as five Select-O-Phones, and by our unit system of expansion increase your system a single station at a time up to fifty-five stations, and the addition of party lines permits of still further increase. Moreover, so simple is the apparatus that your own electrician, or a local electrician or contractor, by following our printed instructions, can easily install and maintain the system, add extensions and the like, without special knowledge of telephony.

Simplicity of Line Wiring

The telephone line wiring from each Select-O-Phone to the automatic switchboard is of the simplest character: merely a single strand of standard triple conductor telephone wire. All complications such as cable, junction boxes, etc., usually encountered in interior telephone systems have been eliminated in the Select-O-Phone system. This makes the Select-O-Phone preferred by all organizations who anticipate growth, moving of desks or offices, new buildings, etc.

At negligible expense additional stations may be added, stations moved, or the entire system re-installed in new quarters.

PATENTS

United States	Great Britain	France	Canada	Argentina
1,280,096	118,691	486,970	179,339	14,326
1,280,097	118,478	486,971	179,454	14,327
1,265,398	118,805	486,972	179,814	14,328
	118,889			

THE ELEMENTS OF A SELECT-O-PHONE SYSTEM

The simplicity of the apparatus will be evident from the following:

Each Station Comprises Three Elements:

1. *The telephone*, having a calling dial.
2. *The line*, a single three-strand telephone wire.
3. *The automatic selector*, in the switchboard.

To install an additional station, purchase a telephone of the desired type and a selector. Slide the selector unit into the next vacant position in the switchboard; run your line from adjacent connectors to the new telephone location, mount the telephone where wanted, and connect in your line, and the telephone is ready for use. Each station is a duplicate of every other station.

A Complete Select-O-Phone System is made up of Five Necessary Factors:

1. *The automatic central switchboard.*
Made in three sizes, illustrated on pages 12 and 13.
2. *The telephone instruments.*
Five standard types are illustrated on pages 9, 10 and 11.
3. *The telephone line wiring.*
The wiring is done by your electrician or local contractor. (See page 14. Also schematic wiring plan, page 7.)
4. *The storage battery.*
To supply current for operating the system (see page 15).
5. *The battery charging outfit.*
To keep the storage battery charged.
(See pages 16, 17 18, and 19.)

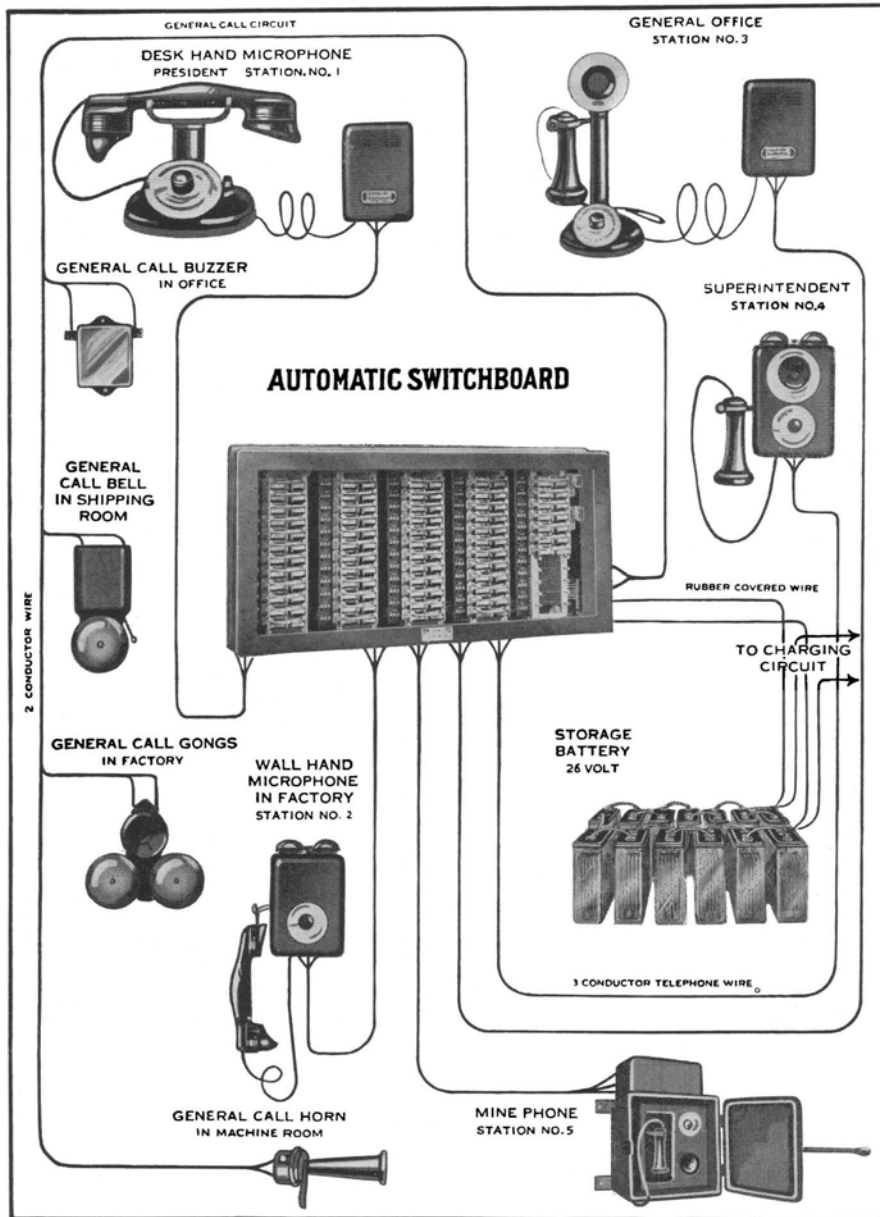
The following items are optional:

All General Call signalling apparatus.
Master Selectors for Executive right-of-way service.
Directory dial plates.
Extension signal apparatus.

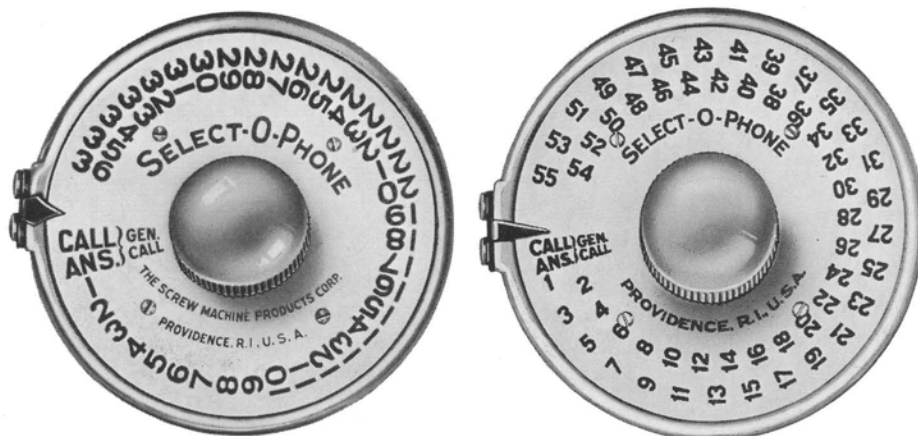
In order to visualize the relation of the above elements to one another, refer to graphic illustration on opposite page.

A MODEL SELECT-O-PHONE LAYOUT

A Model Select-O-Phone Layout illustrating the method of wiring and the relation of the principal units



THE SELECT-O-PHONE DIAL



Standard 36-line dial

(Three-quarter size)

Standard 55-line dial

Each Select-O-Phone instrument is equipped with a dial as illustrated above. Standard dials are made in two capacities; for 36 and 55 stations. All dials are interchangeable in all Select-O-Phone instruments. The numbered dial plate is removable and special directory dial plates may be substituted on the 36-line dials. A sample Directory Plate is shown below.

Operation of Dial

The dial enables the Select-O-Phone user to automatically call any Select-O-Phone station; to signal and to answer on the General Call; to establish a Conference, etc.

To make a call from any Select-O-Phone instrument, turn the dial by means of the knob until the number of the wanted station (or name of wanted party if directory plates are used) is under the indicator, then remove the receiver, whereupon the dial will quickly run back to normal position and automatically establish connection to the station called. Pressing the ringing button on the telephone instrument rings the bell at the called station as many times as desired, and the wanted party replies in the conventional way. Upon replacing the receiver, disconnection is instantaneous.

Party Lines

In calling a station on the same line as your own (party line), the dial is not operated at all; simply press your ringing button, lift your receiver and await a reply. Handy for an executive to signal his clerk or stenographer.

Directory Dial

Directory dial plates are supplied at a reasonable extra charge for systems with 36-line dials. They are preferable in many cases to the dial with numbers only.



STANDARD DESK INSTRUMENTS



Desk or Table Type Select-O-Phone

The standard desk instrument includes a pressed steel bell box (not shown above, but see page 7) containing the bell and terminals to which the line wires are connected, and six feet of flexible desk set cord between the bell box and telephone.

The instrument is finished in dull black enamel and, except for the calling dial, is practically identical with the standard city service telephone.

The operation of the dial is described on the opposite page. The ringing button in the base, besides being used to ring the bell at a called station, is used for code signalling and for sounding General Call signals when the call service is used.

The dials are built in self-contained units and are interchangeable in all types of instruments.

HAND MICROPHONE INSTRUMENTS



Desk Type Hand Microphone

In this type instrument (which is the type most used abroad) the transmitter and receiver are combined in a convenient hand set, which offers many advantages over the ordinary desk telephone. With cord of ample length, a conversation may be carried on while sitting or standing, in a comfortable position, with one hand free for writing, and without moving the base of the instrument. Of value to the busy executive.

The set includes the bell box (not shown) containing the bell and terminals to which the line wires are connected.

The finish is a dull black enamel and the set is of more elegant appearance than the standard desk instrument.

Operation Turn the dial to the number wanted, lift the hand set from the cradle, and push the ringing button. For signalling extension 'phones on your own line (party line), merely push button without dialing.



Wall Type Hand Microphone

The hand set is identical with that supplied with the desk instrument, and its operation is the same.

This set is in many cases preferable to any of the other types, as the steel box containing the dial, bell and line terminals is designed to be mounted on a wall within easy reach of the user, and is therefore off the desk and out of the way.

Preferable to a standard wall set when used by persons of different heights, as its position on a wall is immaterial; and also in places where machinery produces an excessive vibration of walls or partitions, as the hand set containing the receiver and transmitter is in the hand free from vibration when in use.

The finish is dull black enamel.

Dimensions: width $15\frac{3}{16}$ in. — height 7 in. — depth $2\frac{1}{2}$ in.

Dimensions between mounting holes: width $4\frac{1}{8}$ in. — height $5\frac{7}{8}$ in.

STANDARD WALL and MINE TYPE INSTRUMENTS

Wall Type Select-O-Phone

Designed for mounting on a wall or post in the conventional manner. Its operation is the same as the desk instrument.

The telephone box is of pressed steel, finished in dull black enamel and contains the dial, transmitter, bell, and line terminals.

Mine Type Select-O-Phone

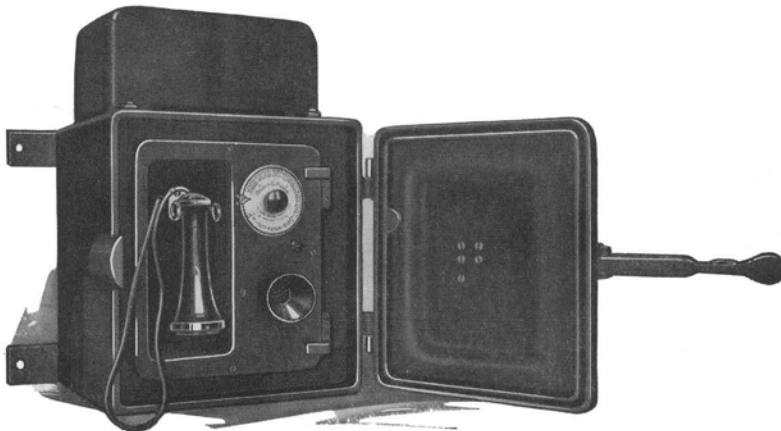
This type is designed especially for use in mines, chemical plants, railroad yards, docks, or wherever a telephone is exposed to weather, extreme dampness or chemical fumes.

All working parts are enclosed in a cast iron moisture proof box with an iron door closing against a gasket, and having an easily operated self-locking latch. All wiring and cords are moisture proof.

The finish is dull black enamel.



Same dimensions as Wall Hand Microphone

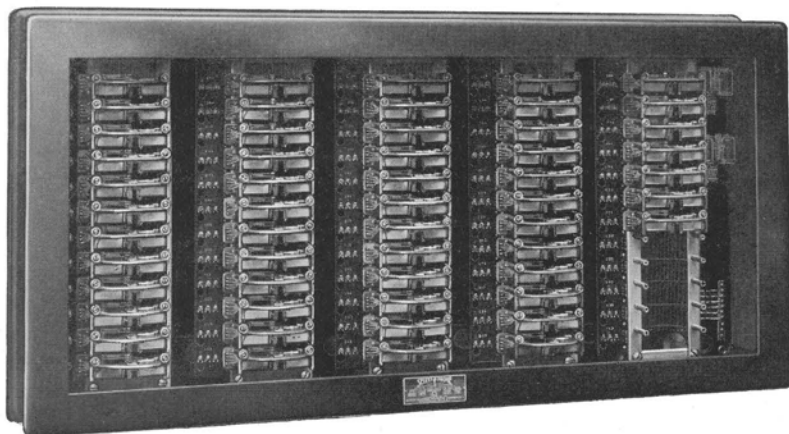


AUTOMATIC SWITCHBOARDS

Type M-55 (55 lines ultimate capacity)

Dimensions: width 45 in.—height $23\frac{1}{4}$ in.—depth 10 in.

Dimensions between mounting holes: width 41 in.—height $19\frac{1}{4}$ in.



Made in Three Sizes: 55, 36, and 12 Lines Ultimate Capacity

Cabinets

Cabinet work is of selected, well seasoned hard wood with standard dull black finish, and will harmonize with any surroundings.

The cabinet comprises a strongly built back-board designed to be securely mounted on a convenient wall, and a removable glass front cover. On the back-board is mounted the selector mechanism, busy tone, battery terminals, general call relay, etc. With the cover removed, all the mechanism is readily accessible.

Racks and Selectors

The selector racks are removably mounted in the switchboard and the selectors (one for each line installed) are removably mounted in the selector racks. Each selector rack has a capacity of twelve selectors.

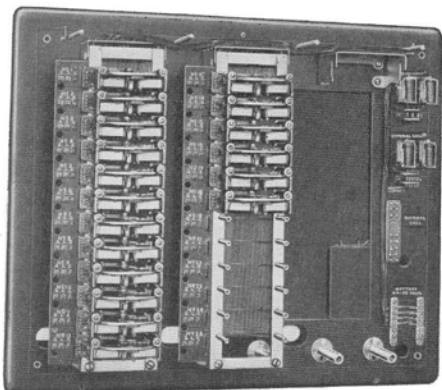
Type M-36 (36 lines ultimate capacity)

Dim.: width 29 in.—height $23\frac{1}{4}$ in.—depth 10 in.

Dimensions between mounting holes: width $25\frac{1}{2}$ in.—height $19\frac{1}{4}$ in.

Flexibility The M-36 switchboard, with cover removed, is shown

equipped with two selector racks and eighteen selectors; six more selectors may be added to the second rack, one by one, as more telephones are needed. If growth beyond this is required, a third rack is purchased and mounted in the third position, now vacant in the switchboard, and twelve more stations may be added as extension of the service demands.



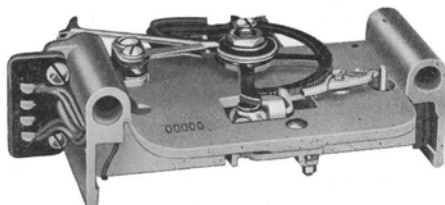
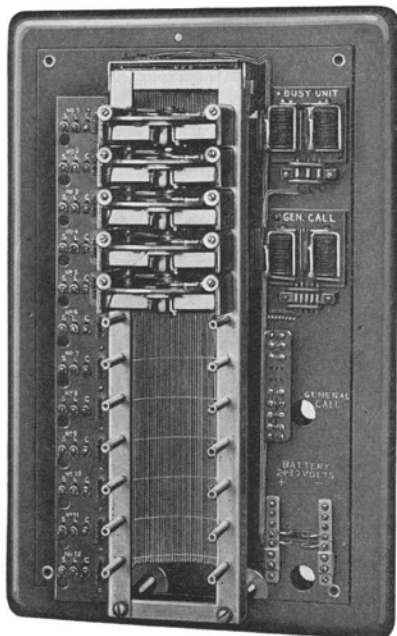
AUTOMATIC SWITCHBOARDS

Type M-12 (12 lines ultimate capacity)

Dimensions: width 14 1/4 in.—height 23 1/4 in.—depth 10 in.

Dimensions between mounting holes: width 10 1/2 in.—height 19 1/4 in.

Type M-12



Standard and interchangeable in all systems.

The Automatic Selector

Each line installed has an individual selector in the switchboard. The selector operation is controlled by electrical impulses sent out over the line wires by the telephone dial, and connects your line to the line whose number you set up on your dial.

The M-12 switchboard shown with cover removed has selectors for five lines installed. To add a sixth telephone, slide a selector over the pair of pins directly below the fifth selector, run your three conductor line wire from the three screw connectors at the immediate left of the new selector to your new telephone, and the station is ready for use. The selector is standard and interchangeable in all systems.

Advantages of Interchangeable Unit Construction

The selector rack shown in the M-12 switchboard above is identical and interchangeable with the first position rack in M-36 and M-55 switchboards. If you outgrow the capacity of your M-12 system, purchase our M-36 switchboard with a rack installed in second position. Remove your rack with its twelve selectors from your old board and slide it into place in the first position in the new board and you have twelve vacant positions in the new second position rack for additions to the service. A third rack may be added when necessary.

If your M-36 switchboard is filled, and expansion is necessary, your three racks of selectors may be installed in an M-55 switchboard, thus permitting growth up to 55 stations.

As all of the electrical connections are made by contact jacks when the various units are slid into place, you have no wiring or soldering to do. The advantage is obvious. You purchase the minimum amount of apparatus necessary for your immediate requirements without limiting or hampering your growth, and you may add a single station at a time up to 55 stations. Even then, by using party lines, the telephone capacity of the system can be doubled.

SELECT-O-PHONE LINE WIRING

The line wiring for each Select-O-Phone station is exceedingly simple, and can readily be installed by your own electrician or handy-man by following our printed instructions; or may be done if preferred by your local electrical contractor.

We carry at all times a large stock of the various kinds of wire used under various conditions, and can almost invariably make more prompt delivery than can the average stock house, and generally at a saving to you, and insure you better quality.

We list below the kinds and sizes of wire to use.

No. 19 Triple Conductor Dry Braid Wire



This is the standard three conductor telephone wire having a rubber insulation and outside braided cover, and is used in residences, offices, and in dry places in general.

Triple Conductor Weatherproof Wire



No. 18 triple conductor weatherproof wire.—We recommend this wire for all mills and factories even when atmospheric conditions are good, and specify its use in any case where dampness exists, as in cellars or where steam or chemical fumes escape.

No. 16 triple conductor weatherproof wire.—We specify this wire for out-of-door work, between buildings, etc., where exposed to the elements; and in many cases for long runs indoors.

No. 14 triple conductor weatherproof wire.—We specify this wire for long runs out-of-doors, as on account of its greater tensile strength, it will stand up longer under severe weather conditions.

Twin Conductor Wire



No. 16 twin wire, weatherproof covering.—We recommend this wire for all ordinary general call circuits.

No. 14 twin wire, weatherproof covering.—We recommend this wire for long out-of-door runs for the general call, or where a circuit is heavily loaded with bells, horns, etc.

Before ordering any wire, however, verify your selection of sizes by reference to tables in our printed specifications, page 26.

STORAGE BATTERIES

Two Sizes— 50 and 100 Ampere Hour Capacities



Sealed Glass Jar Battery

Electric current for the operation of the Select-O-Phone system is supplied by a 13 cell, 26 volt storage battery. We supply two types, the rubber jar type, similar to an automobile battery, 13 cells, 26 volts, or the sealed glass jar type, 13 cells, 26 volts. Size of glass jar cells: height 15 in., width 5 in., depth $8\frac{1}{2}$ in. Where space permits, we recommend the 13 cell, 26 volt, sealed glass jar type.

For systems up to 36 lines, and a medium general call system, we recommend the 50 ampere hour size. For larger systems, the 100 ampere hour battery. We supply full instructions relating to the installation and maintenance of batteries (see page 35).

BATTERY CHARGING PLANTS

To maintain a proper supply of current in the storage battery a charging means must be provided for utilizing your available current supply, usually from a lighting or power circuit, and converting it to direct current, if alternating, of the proper charging voltage.

In selecting a charging plant, first ascertain the characteristics of your lighting or power circuit, and by consulting the table below you can determine which of the charging plants listed on the following pages can be used with your particular current, and your selection thereby simplified.

Current Available for Charging	Use Power Plants
110 volts D. C.	M-1, M-2, D-2
220 to 250 volts D. C.	M-1, M-2
110 volts A. C. 60 cycles	M-1, M-2, T-1 or T-2
220 to 250 volts A. C. 60 cycles	M-1, M-2, T-1-T or T-2-T

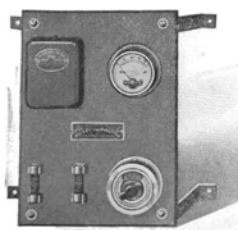
If your voltage or cycle is not listed above, consult us before making your selection.

Each individual charging plant as listed on the following pages is complete, and embraces all the apparatus necessary to charge the storage battery from current supply available.

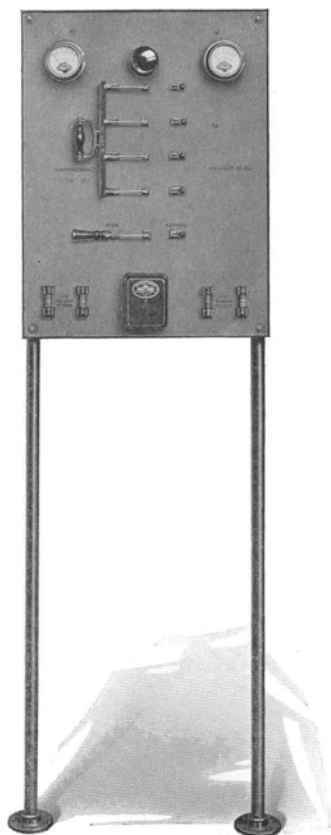
POWER PLANTS



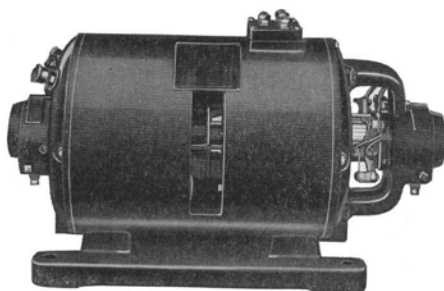
M-1 Board



M-2 Board



D-2 Board



Motor Generator



Sealed Glass Jar Battery

POWER PLANTS

Type M-1 (Automatic) For D. C. or A. C., any voltage or cycle

This is our universal automatic charging plant, designed to automatically maintain a proper charge in the storage battery and operates from any available source of current, usually from a power or lighting circuit. Its operation is controlled by the battery voltage. It starts automatically when the battery voltage drops, the charging switches automatically operate and the battery continues to charge until the voltage is raised sufficiently, when the charging is automatically stopped.

An auxiliary manual charging switch is provided for use in emergencies, or to give the battery an overcharge.

The outfit consists of—

1. One M-1 automatic charging board.
2. One motor generator, 175 watt output.
3. One storage battery.
4. One hydrometer.

IMPORTANT: In ordering the M-1 charging plant, it is absolutely necessary that you specify—1st, the current you propose to operate from (A. C. or D. C.) and the voltage; 2nd, if A. C., the cycle; 3rd, whether a 50 or 100 ampere hour battery, sealed glass jar or rubber jar type.

Type M-2 (Manual) For D. C. or A. C., any voltage or cycle

This is a manually operated motor generator charging plant, designed to operate from any available source of current, usually from a power or electric lighting circuit. To some employe is assigned the duty of turning a switch periodically from two or three times a week to once every two or three weeks, depending upon the amount of use the system gets. The battery voltmeter tells when a charge is necessary.

The outfit consists of—

1. One M-2 charging panel.
2. One motor generator, 175 watt output.
3. One storage battery.
4. One hydrometer.

IMPORTANT: In ordering the M-2 charging plant, it is absolutely necessary that you specify—1st, the current you propose to operate from (A. C. or D. C.) and voltage; 2nd, if A. C., the cycle; 3rd, whether a 50 or 100 ampere hour battery, sealed glass jar or rubber type.

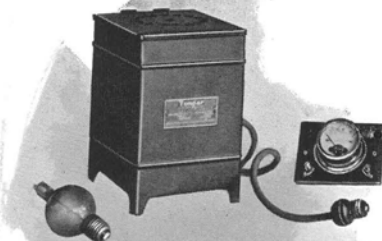
Type D-2 (Manual) For 110 volts D. C. only

This is a manually operated charging plant, designed to utilize the current from a 110 volt D. C. lighting or power circuit, and charge through resistance units. It is designed for two charging rates—a low rate for general use, and a high rate for periodic "flood" charging. The battery charging must be done when system is not in use as the battery is disconnected from the system when on charge. The D-2 power plant cannot be used on an A. C. circuit.

The outfit consists of—

1. One D-2 charging board.
2. One storage battery (specify 50 or 100 ampere hour capacity, sealed glass jar or rubber jar type).
3. One hydrometer.

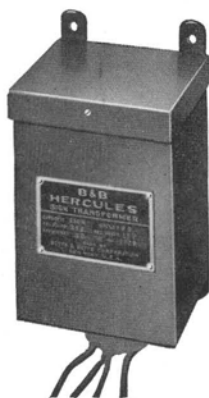
POWER PLANTS



Type T-1
With rubber jar type battery



Type X Dry Battery Box



Transformer



Type T-2
With sealed glass
jar battery



POWER PLANTS

Type T-1 (Manual) For 110 volt, 60 Cycle A. C. only

This is a manually operated plant, employing a single wave Tungar Rectifier of portable type, with cord and plug for screwing into a lamp socket. Used with small systems (5 to 20 stations) and delivers $1\frac{1}{4}$ amperes at 30 volts D. C. While charging, a slight hum can be heard in the telephone, which, if objectionable, can be avoided by charging at night or out of hours. The T-1 outfit cannot be used on a D.C. circuit.

This outfit consists of—

1. One T-1 single wave tungar rectifier.
2. One storage battery, 50 ampere hour capacity.
3. One voltmeter, mounted on slate.
4. One extra tungar bulb.
5. One hydrometer.

NOTE: May be specially wound for other than 60 cycles.

Type T-1-T (Manual) For 220-250 volt, 60 cycle A. C.

This plant is identical with T-1 above, except that a transformer is included for reducing the voltage to 110 volts. In ordering this plant, voltage must be specified. The T-1-T outfit cannot be used on a D. C. circuit.

NOTE: May be specially wound for different voltages and cycles.

Type T-2 (Manual) For 110 volt, 60 cycle A. C. only

This is a manually operated plant employing a double wave tungar rectifier which causes no hum in the telephones while charging. The output is $3\frac{1}{2}$ amperes at 30 volts D. C. This outfit will supply ample charging current for the largest Select-O-Phone system. The charging rate can be varied from a low rate for "floating" to a high rate for periodic "flood" charging. The T-2 outfit cannot be used on a D. C. circuit.

This outfit consists of—

1. One T-2 double wave tungar rectifier, to mount on wall.
2. One storage battery, 50 or 100 ampere hour capacity.
3. One voltmeter, mounted on slate.
4. Two extra tungar bulbs.
5. One hydrometer.

IMPORTANT: In ordering this plant, specify voltage and 50 or 100 ampere hour battery.

NOTE: May be specially wound for other than 60 cycles.

Type T-2-T (Manual) For 220-250 volt, 60 cycle A. C.

This plant is identical with T-2 above, except that it is wound for the higher voltage. It cannot be used on a D. C. circuit.

IMPORTANT: In ordering this plant, specify voltage and 50 or 100 ampere hour battery.

NOTE: May be specially wound for different voltages and cycles.

Type X

Dry cells may be used to operate small Select-O-Phone systems, their economy depending entirely upon the amount the system is used. We supply a Type X battery box to hold 24 cells; 20 cells for normal operation and 4 cells for reinforcement as the battery grows weaker. On the face of the box is mounted a voltmeter, switch and fuse. Instructions are supplied. Dry cells to be supplied by customer.

GENERAL CALL SYSTEM

The General Call

This service is auxiliary to the Select-O-Phone service, and is used to quickly locate persons whose duties take them to all parts of the premises and to establish a talking connection with them. Also for fire alarm or other general signalling purposes (see pages 3 and 4).

The elements of the General Call are as follows:

1. The General Call Relay in the switchboard.
2. The General Call circuit from the switchboard to the various signals.
3. The signalling devices, horns, bells, etc., connected to the circuit.

The Signal Circuit

A pair of wires, usually No. 16 twisted pair weatherproof (see page 14), is run from marked terminals in the switchboard to various parts of the premises, and signalling devices connected in multiple to the circuit, the devices all sounding a signal in unison. The circuit may be branched to various locations, or separate circuits from several directions brought back to a common connecting point.

Selection and Location of Signals

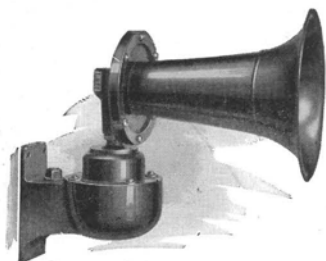
Care should be exercised in the proper selection and location of the signals, the object being to distribute the various horns, bells, etc., so that a signal on the call system may be heard in all parts of the premises. It is obvious that in locations where the signals have to compete with considerable noise, a louder sounding signal must be employed. For weave rooms of mills, and other excessively noisy places, the motor driven horn is most suitable. In less noisy locations the vibrating horn or large bells may be used. In offices or reasonably quiet places, small bells or buzzers. In hospitals it is usual to employ lights that flash the signals.

Sources of Operating Current

Small call systems, of not more than eight vibrating horns, or twenty small bells, or their equivalent, may be operated directly from the General Call Relay in the switchboard, using current from the Select-O-Phone storage battery (specify 24 volt horns or bells).

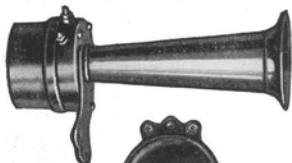
Where motor driven horns, or a large call system requiring considerable current to operate is installed, a separate source of operating current must be used, preferably a 110 volt lighting circuit, in which case 110 volt A. C. or D. C. horns must be specified. Where a 110 volt supply is not available, the call system may be operated from a separate storage battery, which must either have a separate charging plant or a charging board to alternately charge the call system battery and the Select-O-Phone battery. In this case specify 24 volt horns or bells.

In either case, the signals are operated by one or more auxiliary relays which are controlled by the General Call relay. The number of auxiliary relays required depends upon the size of the call system (refer to instructions).



Motor Driven Horn

For 110 volt D. C. or 110 volt 60 cycle A. C. Recommended for use in boiler shops, weave rooms, drop forge plants, in lumber yards and out of doors in general, where a loud and penetrating signal is required.



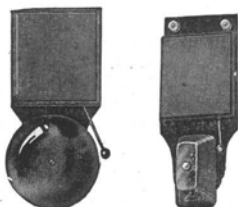
Vibrating Horn

Specify for 24 or 110 volt D. C., or 110 volt A. C. Recommended for general use in industrial plants where noise is not excessive. It gives a clear, distinct signal of moderate intensity, which separates itself well from mechanical noise.



Double Gong Bell

With 6" or 4" gongs, for 24 volt D. C., 110 A. C. or D. C. Gives a loud, clear tone of about the same intensity as the vibrating horn, and used under same conditions. Has more pleasing tone, but is not as easily distinguished from mechanical noise.



Single Gong Bell

With 4" or 2" gongs for 24 volt D. C., 110 A. C. or D. C. Made with round or cow bell gongs. The cow bell is the more penetrating and can be heard above the hum of machinery better than the round gong.



Buzzers

For 24 volt D. C., 110 A. C. or 110 D. C. The buzzer is suitable for general offices, salesrooms or private offices where louder signals are objectionable. We carry these in the heavy duty and medium duty types.

Combination Call System

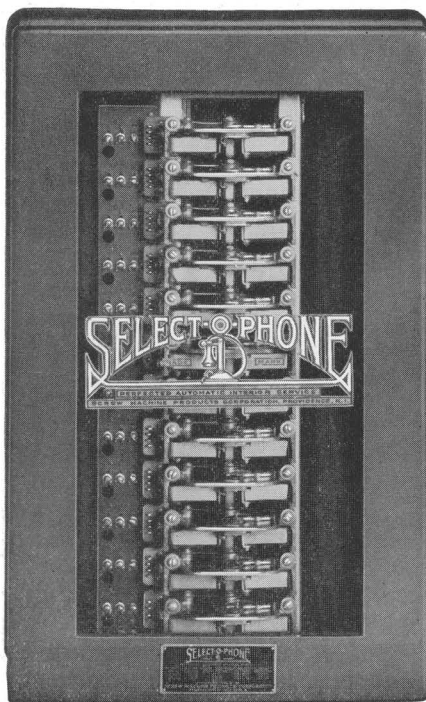
In many cases it is economical to operate the larger signals, as motor driven horns, etc., from the lighting circuit, and the smaller signals from the Select-O-Phone storage battery. The current from which the various signals are to operate must be specified.

Extension Signals

Any of the signalling devices described above can be used as extension or auxiliary signals for individual telephone stations, where the regular telephone bell cannot be heard, but must in every case be specified "for extension use" as the windings differ from the standard call signals, and the larger signals require a relay for their operation. They can be operated from the lighting circuit or in isolated places from dry cells. The smaller sizes operate as an extension and together with the regular bell. The larger sizes require to be operated from a relay cutting out the standard telephone ringer.

THE JUNIOR SELECT-O-PHONE

Made in 12- or 36-station ultimate capacity



12-Station Junior Type Switchboard

Junior Type Desk Set

Dimensions: Width $14\frac{1}{4}$ "—Height $23\frac{1}{4}$ "—Depth 10"

Dimensions between mounting holes: Width $10\frac{1}{2}$ "—Height $19\frac{1}{4}$ "

Dimensions of 36 station Junior switchboard same as Standard Switchboard shown on page 12.

Service

The Junior Select-O-Phone furnishes automatic telephone and conference service between any number of instruments simultaneously up to its 12- or 36-line capacity. It does not provide secret conversations nor general call service, advantages which are found in our standard system only, together with an ultimate capacity up to 55 lines.

Party Lines

The actual telephone capacity of the Junior system may be increased by the use of party lines. Two Select-O-Phones may be connected to any one or all lines. Customers are privileged to order from three stations upward.

Instruments

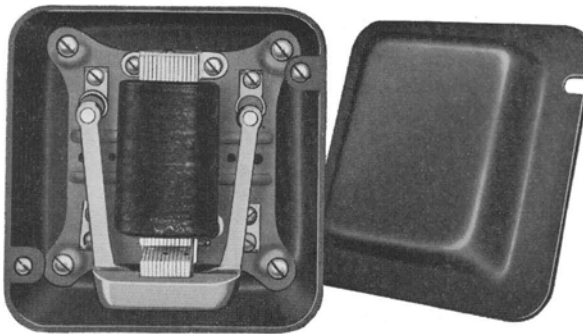
Junior type instruments are made in four styles, the desk type illustrated above, the wall type, the desk hand microphone, and the wall hand microphone.

Prices on Junior equipment are less than those for standard equipment.



Test Jack and Cord

A test Jack and Flexible Cord should be included with every order for a Select-O-Phone System. This is used in testing and trouble-shooting. It is a great time saver and is more than worth its small cost. Complete details of its use in testing are found in Section II, Page 29.



Standard Relay

This Relay is used where extra current is needed to operate numerous extension or General Call signals. It will handle up to 10 amperes, 250 volts. Diagrams for its use are to be found on page 32.

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Part II.

Installation Manual and Maintenance

Instructions

PLANNING THE SYSTEM

Instruments

Selection of the type of instrument for each station may be made from illustrations and descriptions of instruments on pages 9 to 11. Locate the instruments in places as free as possible from excessive vibration, heat or dampness.

Switchboard

The size of the switchboard is determined by the present size (and anticipated growth) of the system, see pages 12 and 13. The location selected for the switchboard should be dry, light, and free from dust, and not subject to extremes of temperature or excessive vibration. If several locations are suitable, select the one nearest the majority of telephones as this will effect economy in wiring. If you are not already provided with a portable voltmeter, see that they are included in your order, as they will be necessary when setting up and testing the switchboard.

Power Plant

The type of battery and charging plant is determined by referring to pages 15 to 19. It should be located as near the switchboard as convenient, but not over 25 feet away.

General Call

It is simpler to defer the ordering and installing of General Call signals and extension signals (if same are to be installed) until the telephone service is first put into operation.

The object of the General Call signal system is to produce an audible signal that may be heard in any part of the premises, and a diversity of signal devices is offered so that a choice of signals for various locations and conditions may be had. They should be selected and distributed so that the signals for noisy places will be of such character that they can be heard above the noise, and for quiet places not harsh nor loud enough to be objectionable.

The distribution of signals is analogous to placing lights to properly light a premises; if lights are not properly placed, or if not enough lights are provided, there will be some dark places. In the same manner, enough signals of the proper character should be installed to properly cover the premises. In many cases it is desirable to test extensions and General Call signals to determine upon the signal with the correct volume of sound for the particular location in which it is to be used.

Personal preference often enters into the selection of signals, and this preference can best be consulted if the telephone service is first installed and a means thereby provided for the customer to make his own test and selection. The company engineers will make recommendations and submit sample signals for the customer's approval. See pages 20 and 21 for description of General Call apparatus.

Wire

See page 14 for description of wire. WITH NO RUN OVER 950 FEET FROM ANY TELEPHONE INSTRUMENT TO THE CENTRAL SWITCHBOARD, approximate the distance from each telephone to the central switchboard, and by adding the several lengths together the total amount of wire needed can be arrived at. Wire comes in approximately 500 foot bundles and it is well to be sure and order enough, as return of full bundles will be accepted.

IF ANY LINE IS OVER 950 FEET LONG, CONSULT THE INSTRUCTIONS BELOW BEFORE ORDERING THE WIRE.

Table of Maximum Lengths of Runs Permissible with Various Sizes of Wire

Size of Wire	SCHEDULE No. 1 Single Party Line Systems Only	SCHEDULE No. 2 One and Two Party Line Systems Only
No. 19	1200 feet from Switchboard	950 feet from Switchboard
No. 18	1500 " " " "	1200 " " " "
No. 16	2400 " " " "	1900 " " " "
No. 14	3800 " " " "	3000 " " " "
No. 12	6000 " " " "	4800 " " " "
No. 10	9600 " " " "	7600 " " " "

It is especially important in selecting the size of wire for a long run that you anticipate future requirements. The line with the largest number of stations (or ringers) determines the schedule to be followed. It is not permissible to apply one schedule for a part of the installation and another schedule for the rest of it.

A ringer connected directly to the line as an extension signal is considered as a station under the wiring schedule but not if a relay is utilized. Auxiliary relays may always be applied under either schedule to control one or more signals of various kinds.

The length of any line is the distance measured along the conductor wire from the switchboard to the farthest ringer, extension telephones and direct connected ringers included.

INSTALLING THE SYSTEM

Receiving Shipments

Immediately upon arrival of the apparatus, unpack carefully and check items against shipping list, notifying us at once of any discrepancy. Do not receive damaged cases from Transportation Company without notifying condition on carrier's invoice at the time of receipt, and have condition acknowledged by delivery agent. If goods are damaged, report to us immediately, and file claim with the Transportation Company. Keep the storage battery cells right side up, and be sure the solution is well above the top of the plates. Give the storage battery especial care and connect it to the power plant as soon as possible. Consult Page 35 "Care of the Storage Battery."

Installing The Power Plant

The power plant should be set up immediately upon arrival, as the battery can then be put on charge and kept in good condition until needed. The battery and charging board should be as near the switchboard as possible, the combined lengths of wire connecting

battery, charging board and switchboard not exceeding 25 feet. Use No. 10 Rubber Covered Wire or larger for these connections. Follow the diagram closely in making connections and check them up carefully before attempting to operate.

If in doubt as to the polarity of the leads of generator or rectifier, test with voltmeter, or immerse the ends of the wires in a weak solution of salt and water with the current on. The wire around which the greater number of bubbles gather is the negative.

Before connecting the leads to the battery be sure that all contacting surfaces on wires and terminals are bright and clean. After final connections have been made and checked, smear the battery terminals and threads of filler caps with vaseline to prevent corrosion and creepage.

If connections are properly made the voltmeter should register 26 volts or slightly over when the battery is not charging. When the battery is charging, the voltmeter should register from 26 to 30 volts.

Do not attach or electrically connect any apparatus other than what our specifications call for to a Select-O-Phone system. Such practice is sure to prove unsatisfactory.

Installing the Switchboard

Attach the switchboard securely to the wall or partition with the bottom about 3½ feet from the floor, for convenience in inspection. Run a pair of wires, No. 10 or larger, from the battery terminals at the lower right hand corner of the switchboard, marked + (positive) and — (negative) to the charging board, as shown in the wiring diagram. The switchboard is now ready for the telephone lines.

Do not remove the cover of the switchboard except when necessary and replace as soon as possible. Always leave the cover in place at night.

Avoid connecting any wires except through the holes provided in the back, as otherwise the cover will not seat properly.

Wiring for Select-O-Phone

All Select-O-Phone wiring must conform to methods commonly used in general telephone practice.

Leave enough wire at both telephone and switchboard ends to connect without splicing. Usually 6 to 10 feet will be sufficient. Short splices at either end of the line are not approved except when larger than No. 16 wire is used for the line and a short run of smaller wire into the switchboard seems advisable. Wires should be properly insulated from pipes or other conducting mediums. Wires must be kept away from lighting and power circuits, particularly high tension circuits.

Wires of over 100 feet running between buildings require approved lightning arresters at both ends. Wires of less than 100 feet require an arrester on only one end.

Wires may be run along walls and ceilings or concealed within the walls as standard wiring practice may dictate.

Care must be taken to prevent injury to insulation through sharp bends and dragging across sharp edges, etc.

Where wires are exposed to mechanical injury, protect them with conduit or moulding.

Use porcelain tubes or conduit where wires pass through walls or floors, and in the latter case, it is good practice to let the conduit extend upward at least a foot above floor

level to offer protection from washing and sweeping operations. If it comes through floor next to wall, extend conduit well up on wall.

Porcelain cleats and insulated staples and nails are used to support wires indoors.

The No. 5 staples are recommended for interior wiring in hard wood, and the No. 7 staples for weatherproof wire, and for stapling in soft wood.

Wires running outside of buildings must be supported on insulating knobs or other approved insulators.

The use of bridle rings and messenger wires is approved.

It is inadvisable to run wires together for more than 500 feet, or to run them parallel to, or close to high tension circuits for any considerable distance because of induction.

If splices become necessary, observe the markers and join only those wires with similar markers.

The splices should be staggered or made a few inches apart and in all cases well soldered and taped.

When wires are to be run in conduit, the following table showing the number of lines or triple conductor wire which may be drawn into conduit of various sizes will be useful:

Conduit Size	$\frac{3}{4}$ "	1"	1 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "	1 $\frac{3}{4}$ "	2"	2 $\frac{1}{4}$ "	2 $\frac{1}{2}$ "	2 $\frac{3}{4}$ "	3"
19 Int. Wire	4	7	12	17	22	28	35	43	52	55
18 Weather	3	5	9	13	18	23	28	35	44	50
16 Weather	2	3	6	10	13	17	23	25	30	36

Instructions for wiring Party Lines, Extension Signals, and General Call are given under their respective headings.

Connecting the Wires to Switchboard

We recommend that the battery, the charging plant and the switchboard be installed and all connections made, according to the diagram, and the line wiring completed before any telephones are placed. Note that at the left side of each rack on which selectors are mounted is a long vertical strip of insulating material, and adjacent to each selector is a series of three screw connectors marked respectively, S, L, and C.

Each series of three connectors is numbered, the numbers corresponding to the call number of the telephone using the adjacent selector.

Having installed the wiring according to the paragraph "Wiring for Select-O-Phone," bring the line wires through the holes in the switchboard back directly behind the proper terminal strip, and through the holes in the terminal strip below the connectors marked with the number which has been assigned as a calling number for that line. After removing the insulation from the ends of the three wires and scraping them clean, secure first one wire, under the screw of the connector marked C, and then touch another wire to the S connector.

If the selector does not click, connect the wire in and proceed in the same manner with the third wire to L connector. If the selector does click, the wires are probably together at the telephone end and must be separated before being connected in. Proceed in the above manner with the remaining lines until all are connected in.

Note that each of the three wires has a different marker in the outside braid to identify any wire at each end. Place wires of each line in the same order in regard to the markers

in each series of connectors. In other words, establish a code such as—red on S, plain on L, yellow on C, and follow this throughout the installation.

Installing a Test Telephone

When the wiring has been completed at the switchboard, a test instrument should next be installed. This test instrument is connected by the Test Jack with Flexible Cord which is described on Page 23 to the Test Selector, by plugging into the terminal strip beside the test selector.

If a test selector has not been ordered, plug in preferably to the last selector in the switchboard.

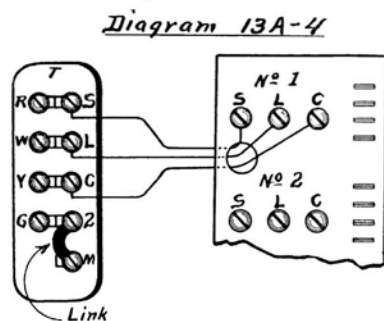
Refer to diagram 13A-4 below. If the jack has been plugged in correctly, you will get a buzz in the receiver of your test telephone denoting a busy line when you call your own number, except on a Junior System. On a Junior System omit busy test; substitute calling another line wherever this test is mentioned. The number of your test telephone will be the number appearing just above the connector on the terminal strip directly to the left of your test selector in the switchboard.

It is possible, but not nearly as convenient to use a regular telephone and selectors and an ordinary wire.

See the booklet "It's Mighty Important What He Mustn't Do," which explains the advantages of a test instrument.

Although the marker on the outside braid of the wire is a sure way of identifying a wire at both ends if it is continuous,—sometimes, through carelessness in splicing, the wires having the same markers are not spliced together, and the markers thereupon become misleading. A sure way to find the proper wires at the telephone end is by "Flash" test, and we would suggest that this method be used if any difficulty is encountered with line connection. It is as follows:—

With battery and line wires connected into the switchboard, one wire of the three at



the telephone end will give a flash or spark when touched to either of the others. This is the C wire. Connect this wire to the C connector in your telephone, and connect the other two wires to S & L at random, and call your own number. If you hear a buzz in your receiver, the wires are connected in right. If you do not hear a buzz, reverse the wires connected to S and L and call your own number and, unless there is trouble in the line, you should hear the buzz, except on a Junior system.

Installing Telephone Instruments

Select places free from excessive vibration for standard wall sets. In cases where vibration cannot be avoided, wall hand microphones are preferable. Mount desk set ringer boxes where they can be readily inspected and be free from excessive heat, dust and moisture. Protect cords from floor washing operations and steam pipes. Keep away from light-ning and power circuits.

With a helper stationed at the test telephone, proceed to connect the line wires into the telephones, preferably taking them in order, beginning with No. 1. In connecting the wires, follow the marker code if desired, but the flash test is more certain.

After the wires are connected, call your own number for busy signal. Then call the test telephone for selection and voice transmission. Then have the helper call your station to test the ringing of your bell.

If General Call service has been installed, this should be tested by turning the dial to "Call," lifting the receiver, and when the dial has stopped rotating, ringing a code call with the ringing button. The helper, hearing the signal on the General Call, turns his dial to "Ans.," lifts his receiver and presses his button once and a conversation may now be carried on. Then reverse the operation, have the helper call, and answer his call from the telephone being installed.

This constitutes all the testing necessary, although it is advisable to call the test telephone several times to make sure of the operation. If you do not know the number of the station you are installing, connect the wires in and call the test telephone. If you receive no answer, reverse S and L wires and try again. The helper at the test telephone can tell you your number by noting the number of the selector you are operating. If any trouble develops, proceed to clear it in accordance with maintenance instructions, page 36.

IMPORTANT: As a measure of safety, after all stations are connected in and with receivers on all telephones hung up, disconnect one battery wire from its connector in the switchboard and connect the wire to a separate voltmeter and the other side of the voltmeter to the connector from which you removed the wire. If no deflection of the pointer is noticed, the wire may be connected back to the battery connector. If, however, deflection is shown, it denotes a cross or leak on some one or more of your telephone circuits which must be cleared before the system is put into operation.

To locate the faulty line or lines, disconnect the lines one at a time from the connectors in the switchboard, leaving them off until the line or lines causing the deflection are found. Connect back the free lines and clear the ones in trouble.

PARTY LINES

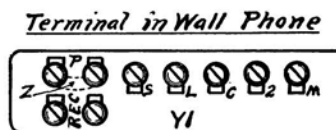
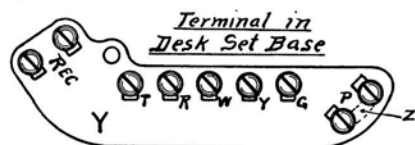
When planning for the installation of Party Lines, pay close attention to the Wiring Table on page 26 and the following Line Connecting Diagrams.

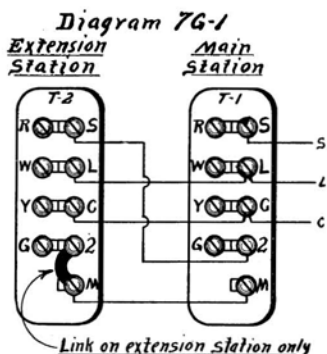
When the wiring distance to the most distant ringer does not exceed 950 feet, wire of minimum size No. 19 may be used throughout, but for distances in excess of 950 feet the stipulations of the Wiring Table must apply.

Note that the table permits the addition of one extension station to any line wired according to Schedule No. 2.

The following diagrams illustrate the proper connections for a party line:

In the base of the desk sets, or on the terminal strip in wall phones, connect terminals P, as shown. Z shows this connection.





Connect line wires between ringer boxes of desk sets, or between wall telephones as shown in diagram 7G-1, removing link between 2 and M at main station only. Note four wire connection between party phones.

EXTENSION SIGNALS

Do not attach any apparatus or device other than that furnished by this company to a Select-O-Phone system. Otherwise the guarantee is forfeited and the service is liable to be impaired.

A station with one directly connected extension bell has the status of a two-party line. The wiring schedule is adhered to as in wiring for party lines.

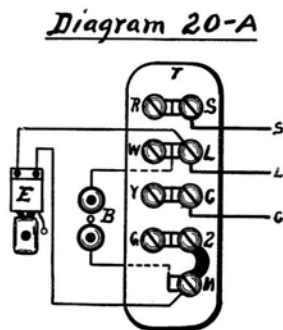
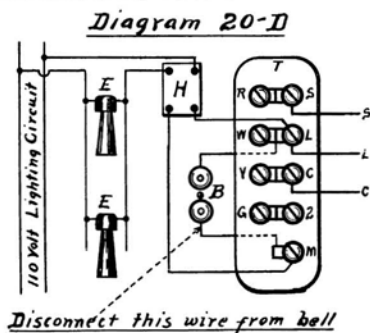
Directly connected bells are limited to two types, viz:

Two-inch single cow gong and four-inch single round gong.

Through the use of our standard relay, however, illustrated on page 23, any number, size or kind of signals may be added to any line up to the 10 ampere capacity of the relay.

A relay is sometimes necessary when subsequently adding signals for which the original wiring schedule did not provide or to permit the use of one or more extra loud signals, such as motor driven horns, etc. (Diagram 20-D).

Diagram 20-A should be used where a signal of moderate intensity is required, such as a two-inch cow gong bell, or a four-inch round gong bell.



General Call or Paging Service

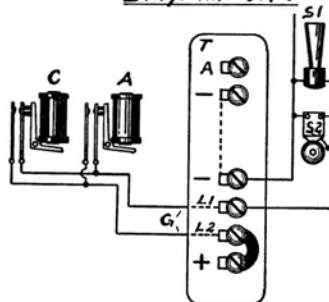
To insure the largest measure of satisfaction, General Call circuits operating through the Select-O-Phone should be installed in accordance with our instructions and all apparatus should be furnished by us.

- 2 Exception is made when the calling system is already installed and means are sought to connect it to the Select-O-Phone system. This can usually be satisfactorily done provided our special instructions are followed.
- 3 A wide variety of signals is available for use in Select-O-Phone General Call systems and the most common types are carried in stock together with relays.
- 4 All General Call systems used with Select-O-Phone come under one of the following classes, and after the number of signals and type have been decided upon, the diagrams and tables A and B will make plain the matter of connecting.

CLASS A

- 5 A General Call system of 24 volts and consuming not over 3 amperes to operate the combined signals is wired according to Diagram 9A-1, using the Select-O-Phone battery. The terminal strip is located on the Select-O-Phone switchboard and in this diagram are shown the connections to the calling and answering relays. All Senior Select-O-Phone switchboards come equipped with the terminal strip. In this system a connecting link between the L-2 and + terminals is necessary.

Diagram 9A-1



CLASS B

- 6 A General Call system with separate battery of 24 volts and consuming not over 3 amperes to operate the combined signals is wired according to Diagram 9B-1. There is no connecting link between terminals L-2 and +.

Diagram 9B-1

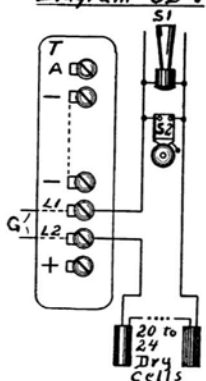
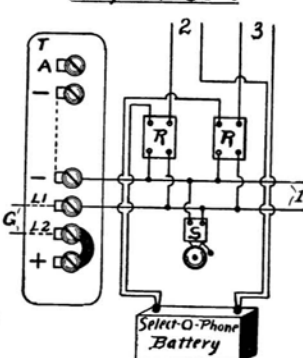


Diagram 9C-1



CLASS C

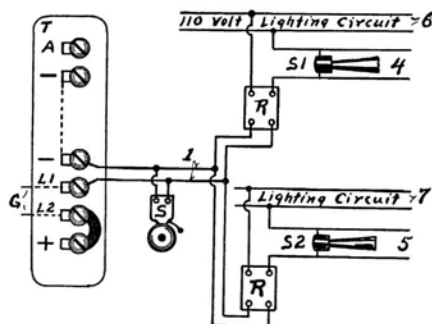
- 7 A General Call system of large capacity operated by either the Select-O-Phone battery or a separate 24-volt storage battery, is wired according to Diagram 9C-1.

One or more relays may be utilized as shown.

CLASS D

- 8 A General Call system of large capacity operated by 110-volt lighting current is wired in accordance with Diagram 9D-1. The relays operate by Select-O-Phone battery current, while the various signals are made to take 110, 220, or 250 volt current.

Diagram 9D-1



The following tables, A and B, are used in planning General Call circuits and show the current consumption of signals and premissible lengths of runs for the two sizes of wire.

TABLE A
Current Consumption of 24 or 110 Volt
General Call Signals

SIZE	DESCRIPTION	Amperes Required for Operation	One is Operative	
			Using 16 Wire	Using 14 Wire
	Auxiliary Relays	$\frac{1}{10}$ Amp.	7500 ft.	12000 ft.
	Buzzers	$\frac{1}{10}$ "	7500 ft.	12000 ft.
2 inch	Cow Gong Bell	$\frac{1}{10}$ "	7500 ft.	12000 ft.
3 inch	Cow Gong Bell	$\frac{1}{10}$ "	7500 ft.	12000 ft.
4 inch	Single Gong Bell	$\frac{1}{10}$ "	7500 ft.	12000 ft.
6 inch	Single Gong Bell	$\frac{1}{4}$ "	3000 ft.	4800 ft.
4 inch	Double Gong Bell	$\frac{1}{4}$ "	3000 ft.	4800 ft.
6 inch	Double Gong Bell	$\frac{1}{4}$ "	3000 ft.	4800 ft.
	Vibrating Horn	$\frac{1}{4}$ "	3000 ft.	4800 ft.
	Motor Driven Horn	2 "	375 ft.	600 ft.

TABLE B
Signal Capacity of 24 Volt Circuits

Signal Am- peres	Length of Run		NOTE
	Using 16 Wire	Using 14 Wire	
6 Amps.	125 ft.	200 ft.	When the distance to the far- thest signal on a proposed cir- cuit is greater than the distance listed for amperage required, either use heavier wire or split the circuit.
5 "	150 ft.	240 ft.	
4 "	185 ft.	300 ft.	
3 "	250 ft.	400 ft.	
2 "	375 ft.	600 ft.	
1 "	750 ft.	1200 ft.	
This table is approximately correct for practical use when mixed signals, (horns, bells and buzzers), are operated on one circuit which is generally desired. We advise, however, separate cir- cuits for <i>motor driven</i> horns.			
Special circuits to meet special con- ditions will be planned upon request.			

The General Call relay in the Select-O-Phone switchboard is limited to a 3 ampere capacity. In other words, the total current consumption of the devices directly connected to the switchboard, including both relays and signals, must never exceed 3 amperes. When the current consumption of the planned system exceeds 3 amperes, relays must be utilized.

There is opportunity for ingenuity in planning a General Call system to insure simplicity and economy.

Our high tension relays, which are used to control signals using 110 volt current, are limited to a maximum capacity of 10 amperes.

The principal precautions to be taken in planning General Call circuits are against exceeding the 3 ampere capacity of the small General Call relay in the switchboard and the 10 ampere capacity of the high tension auxiliary relays.

The following examples illustrate the general procedure.

EXAMPLE No. 1

Signals directly connected to Select-O-Phone switchboard.

(See Diagram 9A-1)

5 Four-inch Single Gong Bells	24 volts at $\frac{1}{10}$ ampere	— $\frac{1}{2}$ ampere
2 Six-inch Gong Bells	24 volts at $\frac{1}{4}$ ampere	— $\frac{1}{2}$ ampere
6 Vibrating Horns	24 volts at $\frac{1}{4}$ ampere	—1 $\frac{1}{2}$ amperes
TOTAL		2 $\frac{1}{2}$ amperes

EXAMPLE No. 2

- 1 A battery system having some signals directly connected to the switchboard and some through a relay.

(See Diagram 9C-1)

1 24-volt Auxiliary Relay	24 volts at $\frac{1}{10}$ ampere	— $\frac{1}{10}$ ampere
9 Buzzers	24 volts at $\frac{1}{10}$ ampere	— $\frac{9}{10}$ ampere
4 Four-inch Double Gong Bells	24 volts at $\frac{1}{4}$ ampere	—1 ampere
4 Vibrating Horns	24 volts at $\frac{1}{4}$ ampere	—1 ampere
TOTAL	3 amperes

AUXILIARY CIRCUIT

16 Vibrating Horns	24 volts at $\frac{1}{4}$ ampere	—4 amperes
5 Two-inch Cow Gong Bells	24 volts at $\frac{1}{10}$ ampere	— $\frac{1}{2}$ ampere
TOTAL	4 $\frac{1}{2}$ amperes

EXAMPLE No. 3

- 2 A system having some signals directly connected to the switchboard and some operating on lighting current.

(See Diagram 9D-1)

1 High Tension Relay	24 volts at $\frac{1}{10}$ ampere	— $\frac{1}{10}$ ampere
9 Buzzers	24 volts at $\frac{1}{10}$ ampere	— $\frac{9}{10}$ ampere
4 Four-inch Double Gong Bells	24 volts at $\frac{1}{4}$ ampere	—1 ampere
4 Vibrating Horns	24 volts at $\frac{1}{4}$ ampere	—1 ampere
TOTAL	3 amperes

AUXILIARY HIGH TENSION CIRCUIT

16 Vibrating Horns	110 volts at $\frac{1}{4}$ ampere	—4 amperes
1 Motor Driven Horn	110 volts at 2 amperes	—2 amperes
TOTAL	6 amperes

The need for relays on each run is determined by:

- 3
1. The current consumption of the signals on the run.
 2. The length and size of wire.

Care of Storage Battery

Consult battery manufacturer's instructions accompanying battery. If pamphlet is not with shipment, procure it from our office or a battery service station. 1

Two types of storage batteries, namely Sealed Rubber Jar Type and Sealed Glass Jar Type, are furnished at the option of the customer and while the maintenance instructions apply in general to both, certain specific instructions must be observed with respect to the type of battery used. 2

The Sealed Rubber Jar Type is a portable battery and as the space for electrolyte is limited and the battery may encounter low temperature, the specific gravity of the electrolyte is comparatively high. 3

The Sealed Glass Jar Type is built for permanent installation and the above considerations do not apply. 4

The electrolyte in each type is of a certain specific gravity and it is very important that the hydrometer readings be read in actual figures; do not use arbitrary lines on hydrometer float, reading "Empty," "Half," "Full," or similar markings. 5

The following table shows hydrometer readings corresponding to states of charge for both types. 6

HYDROMETER READINGS

Type	Full Charge	Two-Thirds Discharged	Discharged Or Empty
Sealed Rubber Jar	1.275	1.200	1.150
Sealed Glass Jar	1.215	1.171	1.149

The electrolyte in the Rubber Jar Type should always cover the plates and in the Glass Jar Type should be well above the plates and to within a half inch or so below the lower edge of the glass cover. 7

Evaporation lowers the liquid level, but as only the water content of the electrolyte evaporates, water is all that is added to raise the level. 8

Use only pure distilled water to compensate for evaporation, but never water from the faucet. 9

Readings taken immediately after water has been added to a cell are unreliable. Wait until a half hour of charging mixes the water and acid. 10

In using the hydrometer syringe, the electrolyte must always be returned to the cell from which it was taken. 11

The Sealed Rubber Jar Type of battery is affected by evaporation much more than the Sealed Glass Jar Type and should be inspected every two weeks. The height of the electrolyte in the latter type may readily be seen without removing the plugs. 12

In inspecting a battery, never permit a flame to come near the vent, as hydrogen gas is always present and is liable to cause an explosion of sufficient force to crack a jar. 13

For detailed instructions on adjusting the specific gravity of the electrolyte and other important information, consult manufacturer's instruction pamphlet for the type of battery installed. 14

Maintenance Instructions

If trouble exists, the cause is most likely to be in the battery; therefore, do not attempt any change whatever in the apparatus until the battery is proven to be in proper condition.

FIRST:—To determine if the battery is at fault:

With charging current off storage battery, note the reading of your voltmeter, which should not be less than 26 or more than 30 volts.

With a pair of pliers or piece of metal, short circuit the two terminals marked C and S on the line terminal located at the left of any selector. If battery current is flowing to the switchboard the selector will click.

Now, with at least two telephones calling two other telephones, note voltmeter reading. If it has dropped over one volt, all battery wire connections and the battery itself should be thoroughly inspected, following closely our printed instructions on storage battery maintenance. Dry cells should be renewed immediately.

SECOND:—If the battery is not at fault and an individual line is in trouble, proceed to localize the trouble in either the telephone, selector, or line wires, by a process of elimination, as follows:

Provide a known good telephone to be used as a test phone, and connect to it a test jack and cord. (See page 23.)

Disconnect the three line wires from the terminals in the switchboard directly to the left of the selector on the line giving trouble. Plug in the test jack from the test phone. Operate test instrument, watching the selector. If the selector now works properly, the trouble is not in the selector but in either the instrument disconnected or the line wires. If the selector does not operate satisfactorily in calling out, etc., after reading page 38, substitute a known good selector for the one on the line in trouble. Remove test jack, connect regular line wires and make calls from the regular instrument. If the station now works properly, the selector only was at fault. It should be returned to the factory immediately. If, after proving the instrument and selector to be faultless, trouble still exists, it is in the line wires from instrument to switchboard.

THIRD:—A selector or telephone giving trouble should be returned complete to the manufacturer for adjustment. Line trouble may be cleared in the usual manner by a local electrician.

To make line wire connections at terminal strips in telephone instrument without reference to color code of markers on wire, see that line wires are connected to the S, L and C terminals at the switchboard.

At the telephone instrument the wire which is connected to C at the switchboard may be identified by the fact that it sparks when it touches either of the other two wires, whereas the wires connected to S and L at the switchboard will not spark when touched together. Connect the C wire to C terminal in the instrument and the other two at random to S and L terminals. Test circuit by calling your own line number. If correct, busy will be heard. If not, transpose wires connected to S and L terminals and test again.

NOTE: In following above instructions, in place of a test phone equipped with test jack and cord, any Select-O-Phone instrument known to be in good operating condition may be used, with a line of regular line wire. It is not nearly as convenient, however, and we strongly advise that a test phone be kept at the switchboard and used for testing only.

It is recommended that a selector should not be removed until proved at fault and is to be returned for repair.

It is recommended that dials alone should not be substituted when locating trouble, but rather a complete instrument.

Desk Set Cord Diagrams

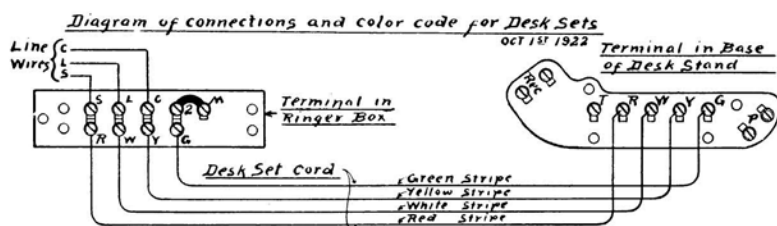
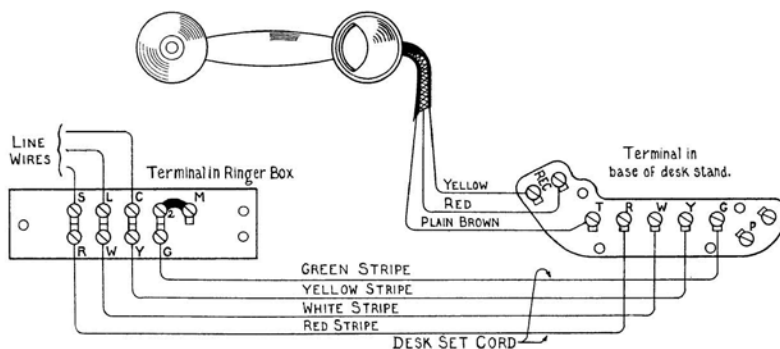
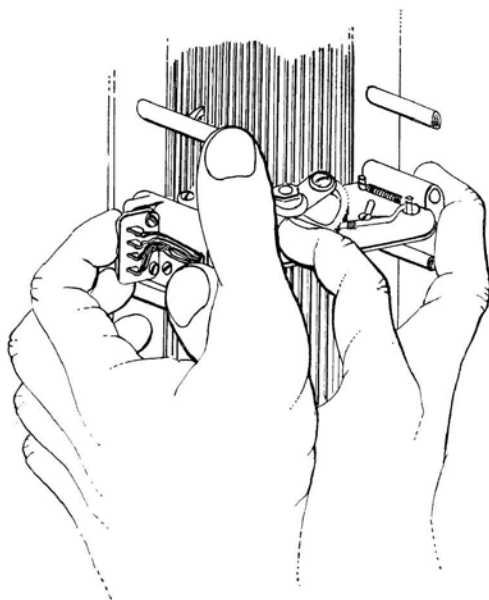


Diagram of Connections and Color Code for Desk Handmicrophone





To Remove Selector

To remove a Selector, take out the two screws which secure the Selector to the rack pins. Turn the ratchet until the end of the wiper-arm will clear the rack frame as the selector is being withdrawn. Retain the ratchet in this position with the forefinger of the right hand and grasp the selector with the thumb and second finger as shown in the cut.

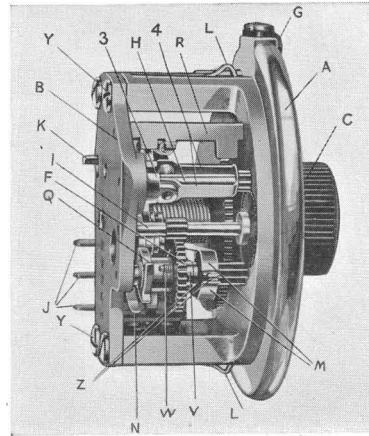
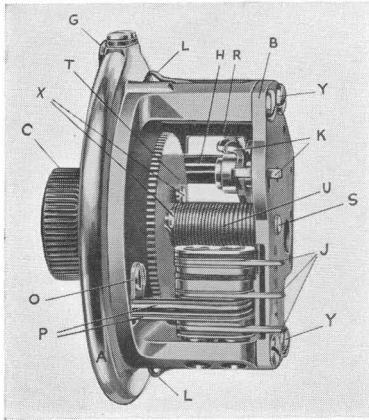
With the first and second fingers of the left hand under the jack base and the thumb pivoted above, as shown,

draw the selector evenly from the pins and jacks.

To replace a Selector, grasp it in the right hand retaining the ratchet with the forefinger to clear the rack frame and slide it on to the pins.

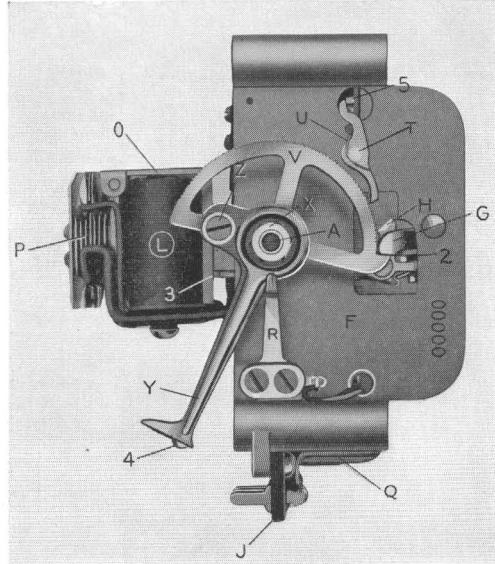
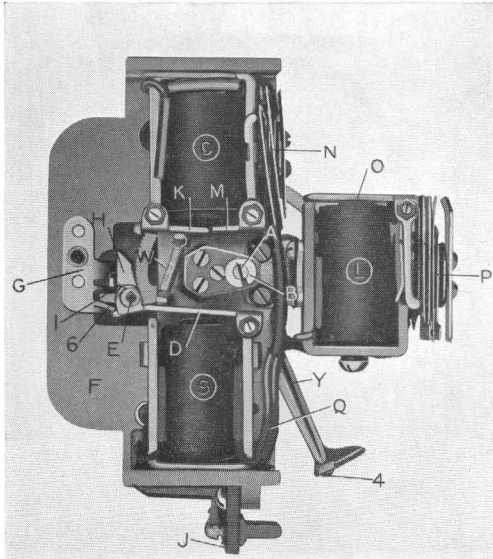
Be very careful to see that the jacks engage properly. Press the thumb of the left hand against the jack base to assist the right hand in seating the Selector down against the frame. Replace the screws.

Descriptive Terms of Select-O-Phone Mechanism



Select-O-Phone Dial

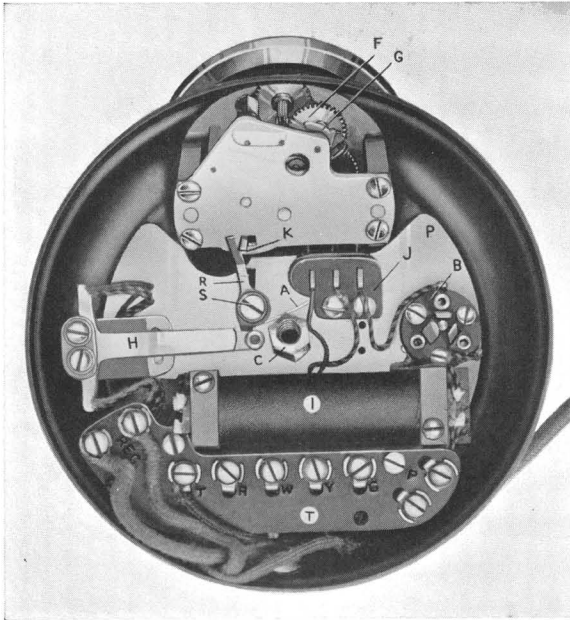
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|-----------------|---------------------|--------------------------|----------------------------------|
| A—Dial Frame | I—Intermediate Gear | O—Dial Stop | V—Slip Ratchet Pawl |
| B—Dial Bridge | J—Dial Jack Plugs | P—Button Control Springs | W—Slip Ratchet Pawl Spring |
| C—Dial Knob | K—Escape Lever | Q—Escape Ratchet | X—Main Spring Tension Catch |
| F—Impulse Gear | L—Dial Latches | R—Dial Lock | Y—Dial Bridge Screws |
| G—Dial Gauge | M—Impulse Springs | S—Dial Shaft | Z—Impulse Spring Contact Points |
| H—Dial Governor | N—Escape Pawl | T—Main Gear | 3—Governor Brake |
| | | U—Main Spring | 4—Governor Speed Control Springs |



Selector

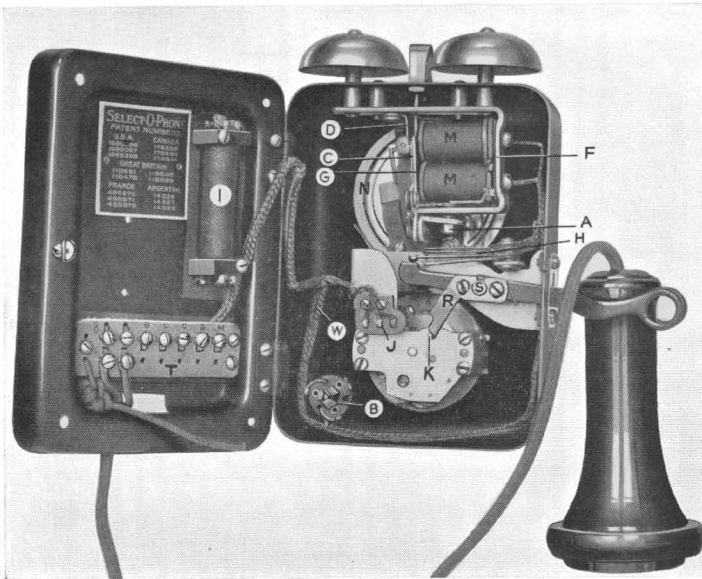
- | | | |
|------------------------|-----------------------|------------------------|
| A—Ratchet Shaft | L—Lockout Magnet | W—Armature Spring |
| B—Shaft Locking Washer | M—Connecting Armature | X—Wiper Lock Nut |
| C—Connecting Magnet | N—Connecting Buildup | Y—Wiper Arm |
| D—Selecting Armature | O—Lockout Armature | Z—Wiper Lock Screw |
| E—Selecting Pawl Pivot | P—Lockout Buildup | 2—Pawl Motion Stop |
| F—Selector Frame | Q—Cable | 3—Ratchet Limit Stop |
| G—Main Stop | R—Commutator Spring | 4—Wiper Shoe |
| H—Selecting Pawl | S—Selecting Magnet | 5—Detent Release Stud |
| I—Pawl Spring | T—Detent | 6—Armature Motion Stop |
| J—Jack | U—Detent Spring | |
| K—Release Armature | V—Ratchet | |

Descriptive Terms of Select-O-Phone Mechanism



Desk Set Base

- A—Release Lever Spring
- B—Ringing Button
- C—Binding Nut
- F—Impulse Gear
- G—Escape Ratchet
- H—Receiver Hook Springs
- I—Induction Coil
- J—Desk Set Connecting Jack
- K—Escape Lever with receiver off
- P—Desk Set Plate
- R—Release Lever with receiver on
- S—Release Lever Screw
- T—Terminal Strip



Wall Set

- A—Ringer Adjusting Screw
- B—Ringing Button
- C—Ringer Spring
- D—Ringer Anvil
- F—Ringer Frame
- G—Ringer Armature
- H—Receiver Hook Springs
- I—Induction Coil
- J—Dial Connecting Jack
- K—Escape Lever
- M—Ringer Magnets
- N—Transmitter Back
- R—Release Arm with receiver on
- S—Receiver Hook Shaft
- T—Terminal Strip
- W—Cable