

STROMBERG-CARLSON TELEPHONE MFG. CO.

ROCHESTER, N.Y. CHICAGO, ILL.
KANSAS CITY, MO. TORONTO, ONT.

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The Value of Mine Telephones

THE following is an excerpt taken from Bulletin No. 57 issued by the Department of the Interior, Bureau of Mines.

"Although it has been repeatedly stated in newspapers, engineering periodicals, and even by State legislatures, that every mine should be provided with a telephone system, the importance of telephones in tunnel work can not be too often reiterated, not alone because of the greater safety they insure but on the ground of efficiency and economy as well. The sources of accident in tunnel work are too numerous to mention—falls of roof, caves, premature or delayed explosions, flooding, and noxious gases being some of the more common.

When an accident occurs in a tunnel that is equipped with a telephone system, not only can assistance be summoned quickly, but provision can be made beforehand for the care of injured men upon reaching the surface; if professional help can be summoned and due preparation made while the men are still on the way from the heading, invaluable time is saved for there are many instances where prompt medical attention has decided the question of life or death. Then, too, failure to obtain a proper round of holes in the given time, difficulty in blasting them to the full depth, or any of the many problems that commonly arise in tunnel driving call for a decision on the part of the foreman as to the method of procedure. Ordinarily the man intrusted with this position is capable of meeting such conditions as they arise, but it stands to reason that the work of the shift will be more efficient if the foreman can be in touch constantly with the superintendent and when in doubt receive suggestions and advice from the more experienced man's better judgement.

Delay can be avoided in good part if the tunnel is equipped with a telephone, because the necessity that involves sending for fresh materials, tools, power, etc., can either be foreseen and provided for promptly from the outside without the loss of a man from the heading crew, or when unexpected emergencies arise only half the usual time is necessary to obtain the needed supplies. Causes of accident and delay can not always be foreseen, it is true, but they can be met promptly and further damage to men and property can be prevented by the use of the telephone; that these advantages are appreciated is shown by the fact that most of the tunnels and adits examined in the field were equipped with telephones.

The type of telephone equipment should be carefully chosen because every telephone is not suited for underground use. For use in tunnels the instru-

ment must be waterproof, dustproof, and to be useful, it must be placed as near the heading as possible; it must be designed to withstand the frequently recurring concussions of blasting. In the most successful types of mine telephones the mechanism is placed in a heavy steel casing in such a way that the essential parts are instantly accessible upon opening the outer door, but are tightly sealed when it is closed. The more delicate mechanism is guarded further by an inner door, also of iron, and the wires are protected so that water cannot enter the casing. The bells must necessarily be placed outside, but they are protected by a metal hood, which, however, does not prevent their being heard for a considerable distance."



No. 890 Mine-A-Phones

In the designing of our No. 890 Mine-A-Phone we took into consideration the unusually severe conditions under which instruments for this class of service are required to operate and made provisions to withstand these conditions with a large factor of safety. The instrument not only includes the best ideas of our designers but also embodies many suggestions of exceptional merit from our customers' mining engineers in all parts of the world. The principal hazards in the operation of mine telephones are mechanical injuries and chemical action. Some of the mechanical sources of injury are falling roof materials, cave-ins, concussions of blasting and rough handling by careless workmen. Equally serious, although slower in their destructive action, are the effects of acid waters and gases which are frequently encountered in coal and copper mining. All of these adverse conditions have been adequately guarded against in our No. 890 Mine-A-Phone. Each part receives special treatment to insure faithful performance of the whole at all times.

The complete apparatus as shown in Fig. 1 is housed within a black enameled cast iron box having walls of ample thickness reinforced at corners and edges to give adequate protection against injury. The box is provided with two doors which effectively seal the equipment under all operating conditions. The outer door is fitted with a tubular rubber gasket, extending around its inside bearing surface.

When the door is closed this gasket is compressed by the lever handle mechanism and the apparatus is made absolutely air and watertight. When the outer door is opened it exposes the inner door and the talking equipment as shown in Fig. 2.

As it is seldom necessary to open this hinged inner door it is held shut tightly by brass machine screws on all four sides. A broad felt gasket is interposed between the inner door and the casing as an additional protection against the entrance of air and moisture. Detachable mounting bars are furnished with each telephone. These



Fig. 1—No. 890 Mine-A-Phone
Showing Plunger and Lock



Fig. 2—Outer Door Open

Mine-A-Phones

are arranged to extend across the back of the instrument either horizontally or vertically so that the installation can be easily made under widely varying conditions.

A small terminal box mounted on the underside of the telephone contains three binding posts for the line and ground wires. These terminals pass through watertight bushings in the bottom of the box so that it is unnecessary to open the instrument to make connections or disconnections. The hole in the terminal box is threaded for $\frac{3}{4}$ inch conduit to facilitate the installation work where the conduit method of wiring is used.

The reader's attention is directed to the standard plunger lock with which Mine-A-Phones are regularly equipped. The advantage of this form of lock is that only one hand is required for its manipulation. It is only necessary to push the small plunger on the front of the lock to throw the bolt and release the clamping lever that holds the door shut with constant pressure. To close the door the lever is pushed back until the latch trips. We also furnish, when specified, a key operated lock as shown in Fig. 3 so that telephone service may be denied to all except persons who carry keys. The two forms of locks are interchangeable and can be easily exchanged in a few moments time.



Fig. 3—Showing Key Lock

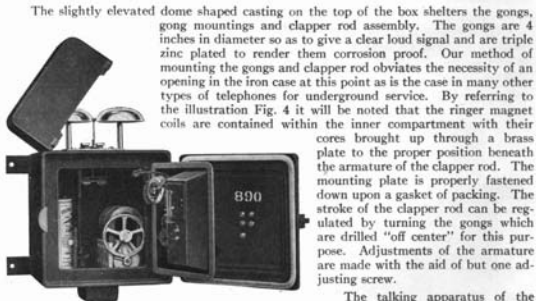


Fig. 4—Both Doors Open and Hood Raised

The slightly elevated dome shaped casting on the top of the box shelters the gongs, gong mountings and clapper rod assembly. The gongs are 4 inches in diameter so as to give a clear loud signal and are triple zinc plated to render them corrosion proof. Our method of mounting the gongs and clapper rod obviates the necessity of an opening in the iron case at this point as is the case in many other types of telephones for underground service. By referring to the illustration Fig. 4 it will be noted that the ringer magnet coils are contained within the inner compartment with their cores brought up through a brass plate to the proper position beneath the armature of the clapper rod. The mounting plate is properly fastened down upon a gasket of packing. The stroke of the clapper rod can be regulated by turning the gongs which are drilled "off center" for this purpose. Adjustments of the armature are made with the aid of but one adjusting screw.

The talking apparatus of the No. 890 Mine-A-Phone consists of our standard long distance transmitter and receiver modified slightly for service underground. The transmitter is made with a moisture-proof variable resistance element and as a further protection is mounted

within the inner compartment. The mouthpiece projects from the right hand side of the inner door as clearly shown in Fig. 2. The transmitter is a recognized standard of high quality and will give entire satisfaction. The receiver is of the permanent magnet type made with waterproof windings and a hard rubber shell. There are no exposed binding posts or other metal parts to come in contact with the hand of the user. The receiver cord is sixteen inches in length, made exceptionally heavy and treated with beeswax to make it impervious to moisture. In order to avoid damage to the receiver cord, due to jamming between the case and the outer door, an automatic take-up device is provided to pull up the slack in the cord when the receiver is replaced between the jaws of the hookswitch. The take-up device forms no part of the circuit, as the device does not engage the electrical conductors of the receiver cord.

Our experience has taught us that the ordinary form of gravity controlled hookswitch is not sufficiently rugged for mine telephones. We have, therefore, devised a positive spring controlled hookswitch in which the force of gravity is not employed. The receiver instead of being suspended from a lever terminating in a fork shaped yoke, normally rests between the jaws of a special receiver holder. When the receiver is taken out of the jaws a trigger depresses a small plunger which passes through the door and actuates the contact spring of the hookswitch. This is a superior feature found only in the Mine-A-Phone.

Mine-A-Phones are equipped with a five bar hand generator which we recommend for general service, as its output provides for the operation of a large number of telephones on the line.

Notwithstanding the fact that the generator is mounted inside the sealed compartment additional precautionary measures are taken to make generators proof against any possible interior condensation of moisture. The vital part is the laminated armature which we wind with silk insulated copper magnet wire and then treat with armature varnish thoroughly baked on. The winding is enclosed and protected by a covering of oiled canvas to eliminate the possibility of grounding the circuit on the armature core. It is unnecessary to unscrew the generator crank when the inner door is opened as the crankshaft is equipped with a separable clutch that also serves to insulate the crank handle. The hole in the door through which the crankshaft passes is fitted with a stuffing box to exclude air and moisture.

Two standard size dry cells mount inside of the telephone and are securely held in place by means of a spring retainer. With average service the two cells will furnish the talking current for a year or more as the transmitter has a fairly high resistance and therefore a low battery consumption.

One of the special features that can be provided at a slight additional charge is a "cut-out" push button key for disconnecting the telephone from the line when the telephone is not in use and the outer door is closed. The push button key, which is mounted in the inner compartment, engages a lug on the inside surface of the outer door and operates whenever the door is closed.

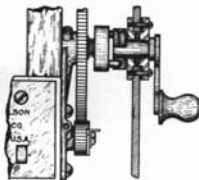


Fig. 5—Showing Generator Clutch and Crank Packing.

Mine-A-Phone Code List

Code No.	Ringer Resistance	Generator
890-I	1600 Ohms	5 Bars
890-L	2500 Ohms	5 Bars

Mounting space 14 x 17 inches. Net weight 80 pounds. Packed for domestic shipment in individual box measuring 22 x 16 x 14 inches. Gross weight 125 Pounds. When shipped for export two instruments are packed in one box measuring 31 x 20 x 14 inches, and having a gross weight of 225 Pounds.

Mine-A-Phones

Telephones for Surface Stations

The telephone instruments described in the following are equipped with apparatus corresponding to that used in the No. 890 Type Mine-A-Phone so that maximum efficiency will be obtained when the several types are connected to one system. Two standard equipments are listed both under the Wall and Desk types. These equipments differ only in the resistance of the ringer coils. The 1600 ohm ringer equipment should be used when the number of telephones connected to one line does not exceed 15, and the 2500 ohm ringer equipment when from 15 to 20 instruments are so installed. It is possible to connect and use a greater number of telephones on a line than the figures given but this is not recommended if best results are desired. Do not connect on any circuit instruments with different ringer resistances. If extension bells are used they should have the same resistance as the telephones with which they are used.

No. 1000 Desk Telephone

This instrument, as the name implies, is generally used on desks in the offices of the various mine officials on account of its handiness and convenience. This type of telephone is also preferred by some for installation in the homes for the same reasons. The No. 1000 Desk Telephone consists of a desk stand of our regular pattern and a desk set box as shown in Fig. 6. The desk stand is of the all metal construction finished in semi-glossy black enamel with nickel plated trimmings. Its equipment includes our long distance type transmitter and receiver together with all necessary cords. The induction coil mounts in the base of the desk stand which allows the use of a three conductor cord between the desk stand and the desk set box. This arrangement also facilitates the use of the desk stand as an extension instrument with the desk set box when so desired.

The desk set box contains the hand generator and ringer equipment which for Mine-A-Phone systems consists of a five bar generator and either 1600 or 2500 ohm ringers. The binding posts inside of the cabinets are all numbered to correspond with numberings on the tips of the desk stand cord so that mistakes will not be made in connecting the set for use. Two cells of dry battery are required to operate the telephone.

This telephone can be furnished with a condenser wired in the receiver circuit to insure proper ringing efficiency when the receiver is accidentally left off the hook.



Fig. 6—No. 1000 Desk Telephone

Code No.	Ringer Resistance	Generator
1000-I	1600 Ohms	5 Bars
1000-L	2500 Ohms	5 Bars

Add the letter "K" to the code number if "Sure-Ring" condenser is desired. Mounting space for extension bell is $9\frac{1}{4} \times 11\frac{1}{2}$ inches. Size of packing case depends upon the number of instruments ordered. Approximate gross weight per telephone 35 Pounds.

No. 896 Compact Wall Telephone

This is the right equipment to use in places such as engine and boiler rooms, shaft houses, tipples, machine shops, etc., where a rugged non-waterproof wall instrument is required. The cabinet of this telephone is made of exceptionally high quality quartered oak and is given a handsome dull golden oak finish so that the set may be used for residence installations, where the Mine-A-Phone system connects the homes of the various mine officials.



Fig. 7—No. 896 Telephone

receiver circuit. The use of this attachment eliminates the ringing trouble that occasionally occurs when the user fails to hang up the receiver when finished talking.

The design allows the shipment of telephones of this type completely assembled in a small size individual packing case that reduces transportation charges to a minimum. Our instruction book containing complete information concerning the operation, installation and maintenance of telephones of this type is packed with each telephone.

Code No.	Ringer Resistance	Generator
896-I	1600 Ohms	5 Bars
896-L	2500 Ohms	5 Bars

Add the letter "K" to the code number if "Sure-Ring" condenser is desired.

Mounting space 22 x 9 inches. Packed one in a box that measures 23 x 10½ x 9 inches and weighs 33 pounds gross.

The equipment of the No. 896 Type Telephones as shown in Figs. 7 and 8 is equivalent to that used in the Nos. 890 and 1000 Types, in order that maximum talking and ringing efficiency will be obtained. The apparatus includes our standard long distance transmitter and receiver, a powerful five bar hand generator and either 1600 or 2500 ohm ringers as ordered. All parts are mounted in the most accessible manner and the interior circuit wiring can be easily traced when inspections are made. Any part may be removed without disturbing any adjacent apparatus or its wiring.

Fig. 8 shows a "Sure-Ring" condenser installed on the inner side of the door and connected in the

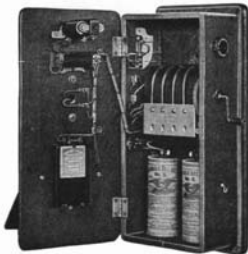


Fig. 8—Open View, No. 896 Telephone

Mine-A-Phones

No. 962 Water-proof, Loud-Ringing Signal Bell

Loud ringing signal bells of this type are used either with the No. 890 Mine-A-Phone as an extension auxiliary signal or with the No. 963 Hand Generators for separate signaling systems where telephonic connections are not essential. When used with the telephone it is customary to locate the No. 890 Telephones in the various entries at some distance from the headings so that it will be easily accessible from the adjacent rooms or branch tunnels where coal is being taken out. The No. 962 Bell is connected to the telephone by means of an extension circuit and is installed nearer the heading so that it can be readily advanced with the work without re-installing the Mine-A-Phone.



Fig. 9—No. 962, 6-inch, Loud Ringing Bell

The No. 962 Loud Ringing Signal Bell will meet all demands imposed upon it by most rigorous and adverse conditions. It is mechanically well made and the water-proofing features are such

that the apparatus may be submerged in water without becoming inoperative. The frame and cover are made of cast iron and when fastened together they overlap to form a watershed. Bells of this type are equipped with 6-inch triple zinc plated gongs which have a clear, loud tone and can be easily heard above the sound of running drills, cutters and other mining machinery. The interior mechanism is extremely simple as will be noted from the open view of the bell, Fig. 10. The chief drawback to the use of most signal bells is their inability to retain a permanent adjustment. In the No. 962 Bell the movement of the clapper rod is limited by eccentric dowels on either dies. By turning these dowels on their axis the play of the clapper rod can be quickly and easily adjusted. The gongs are likewise drilled "off center" in order to provide a further adjustment.

The ringer coils, vital parts of the telephone, are fully protected against the injurious effects of moisture. These coils are assembled in the usual way and then mounted in metallic cases. All extra space inside the coil cases is filled with beeswax and the cover is sealed on. In this way we obtain a magnet winding that is proof against mechanical injury or impaired insulation, due to exposure to moisture.

When No. 962 Bells are used as extensions to telephone instruments, the ringer coils should have the same resistance as those used in the telephones. Bells with 1000 and 1600 ohm ringers are carried in stock, although bells with special resistance ringers can be supplied promptly. Use this bell wherever a strong, positive operating, water-proof, signal bell is required.



Fig. 10—Open View No. 962, 6-inch Loud Ringing Bell

a strong, positive operating, water-

Mounting space 17 x 13 inches. Net weight 17 Pounds each. Five shipped in standard package that measures 18 x 15 x 5 inches and weighs 21 pounds gross.

No. 963 Iron Clad Hand Generator

This magneto hand generator when used with the No. 962 Loud Ringing Bell described on page 8 makes an ideal signalling equipment for mines. Apparatus of this type is superior to many others, not only because of its mechanical strength and high efficiency, but to its ability to withstand corrosive waters and gases as well. In signalling sets of this type the hand generator furnishes the electrical energy required to ring all bells on the circuit, therefore there are no batteries to become exhausted and fail at the critical moment. There are no contact points liable to arcing and the equipment may be used in gaseous mines with perfect safety.

The exterior view of the No. 963 Iron Clad Hand Generator is shown by Fig. 11. The housing is substantially made of two iron castings which are painted with a corrosion-proof black enamel. Detachable mounting bars similar to those used on the No. 890 Mine-A-Phone are provided for mounting the apparatus on any surface. The five bar hand generator is fastened to a shelf which is a part of the door casting. This method of mounting prevents the generator crank from getting out of alignment and absolutely precludes the possibility of binding. The crank shaft is properly bushed and packed to exclude moisture and the cover is screwed tightly down upon a watertight gasket.



Fig. 11—No. 963 Iron Clad Hand Generator



Fig. 12—Open View No. 963 Iron Clad Hand Generator

This generator has a sufficiently large output to ring simultaneously from ten to fifteen bells on one circuit. Hand generators of this kind can be placed at all points on the circuit from which it is required to transmit signals. The diagram on page 12 shows the schematic arrangement of a mine signalling system, although many other ideas will suggest themselves to the prospective purchasers.

Where a non-watertight hand generator equipment is required for interior use at surface stations, we furnish a hand generator of equal output mounted in a neatly finished oak box.

Mounting space 10 x 8 x 10½ inches. Net weight 30 Pounds. Packed one in a box measuring 12 x 10 x 12 inches. Gross weight 42 Pounds.

Mine-A-Phones

Mine-A-Phone Switchboards

In many mines the number and locations of the telephone instruments composing the Mine-A-Phone system prohibits the use of one telephone circuit connecting all stations. When this condition is encountered it is necessary to provide a switchboard for terminating the various lines so that inter-connections can be made quickly and easily. As the amount of switching for systems of this kind does not require the constant attention of an operator, a clerk can be assigned to perform the switching duties in addition to his regular work.

Fifteen Line Switchboard No. A-11741

Our compactly arranged No. A-11741 Wall Type Switchboard, as shown in Fig. 13, is most suitable for Mine-A-Phone systems in which there are not more than fifteen separate lines. The complete apparatus is assembled within a quarter-sawed oak cabinet which occupies the same amount of wall space as our standard wall telephone. The apparatus compartment is divided lengthwise into halves which are hinged together so that any of the interior equipment or wiring can be inspected easily and quickly.

This switchboard is furnished with complete facilities for terminating and interconnecting fifteen telephone lines. Each line equipment consists of a No. 11 Plug-restoring Drop—our most sensitive and efficient signal for magneto systems. When a call is made on any line a shutter indicator of segmental form is displayed on the proper line equipment, which shows the operator that a connection is desired with another line. The operator in the act of inserting a connection cord plug to answer the call automatically restores the indicator to its normal position.

This feature saves work on the part of the operator, decreases the time taken to establish a connection and eliminates the possibility of failure to restore the drop shutter by hand as is required with switchboards otherwise equipped. We furnish the switchboard equipped with twelve feet of switchboard cable wired to the line terminals so that a neat orderly connection can be made to the terminal or lightning arrester strip.

Connections between the various lines are made by means of three pairs of connecting cords and plugs with their associated clearing-out signals, ringing and listening keys and minor apparatus. An extra single cord and plug enables the operator to answer incoming calls when all of the connecting cord equipments are in use.

The operator's telephone set is of the combination type equipped with one standard long distance transmitter and receiver. This type of talking set requires the use of but one



Fig. 13—No. A-11741 Switchboard

hand, leaving the other free for operating purposes. The operator's equipment also includes a powerful five-bar hand generator for signalling purposes and a night alarm bell which gives a continuous ring as long as there are any unanswered calls on the switchboard. The operation of the night alarm bell is controlled by a push button switch mounted in the wood work below the line drops.

The weight of this switchboard when packed for shipment is approximately 60 pounds. Wall mounting space $9\frac{3}{8} \times 17\frac{3}{8}$ inches.

Forty Line Switchboard No. 107

This wall type switchboard is designed and equipped for handling mine telephone systems of more than fifteen separate lines. It has an ultimate capacity for 40 lines and 5 pairs of connecting cord equipments. Switchboards of this type can be ordered with partial equipment to care for immediate requirements. Additional line or connecting cord equipments can be ordered and installed as needed.

The cabinet as shown in Fig. 14 is arranged for mounting upon a wall and is made of thoroughly seasoned quarter-sawed oak with a dull golden oak finish. It consists of two parts, a strong backboard and a hinged front section which contains all of the apparatus. When the front section is swung out from the wall all of the interior parts are accessible for inspection or tests. Further accessibility is gained by the use of a hinged keyboard by means of which all of the ringing and listening key terminals and wiring can be exposed to view.

The apparatus for the line and cord circuits is the same as in the No. A-11741 switchboard described on the opposite page. Each line is equipped with a No. 11 Plug-restoring Drop and the cord pairs with the usual complement of plugs, cords, ringing and listening keys, etc. The operator's telephone equipment includes a transmitter suspended from an adjustable arm and a head band receiver. Current for ringing purposes is furnished by a five bar switchboard hand generator. Incoming calls at night are indicated by a night alarm bell with controlling switch.

The wiring of the line equipments is terminated in twelve feet of switchboard cable for the operator's telephone battery and the night bell battery.

When fully equipped and packed for shipment this switchboard weighs approximately 125 pounds. Wall mounting space $15\frac{3}{8} \times 36$ inches.

We issue a separate bulletin describing larger switchboards, which we will furnish on request.

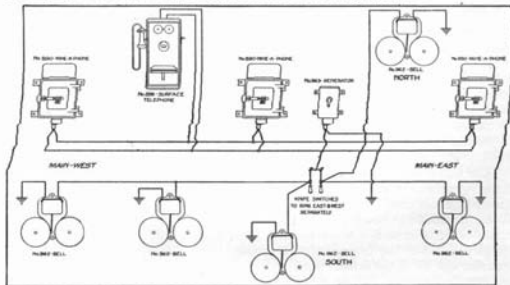


Fig. 14—No. 107-E Switchboard

Mine-A-Phones

Best Plan of a Mine-A-Phone Installation

Mine Superintendents should carefully consider the method of wiring their mines for telephones and bells. The accompanying diagram shows a practical plan of wiring; the kind of wire used should depend on the local conditions. Individual telephones and bells may be protected by fuses, if desired. It is recommended that all wiring be run in conduit. This method costs slightly more but gives greatest protection to the wiring system.



The advantages of this plan are:

- A. A metallic circuit for the telephones entirely independent of the signal bell circuit.
- B. An independent circuit for the signal bells.
- C. A means of ringing the signal bells in whole or any part of the mine, as desired.
- D. In case of accident to wires in one section of the mine, the bells in the other sections can be operated.
- E. The ringing of the bells is not dependent on the telephone wires.
- F. The ringing of the bells is independent of the power circuit in mines so equipped.
- G. The bells are not dependent on fragile incandescent lamps which, if broken, puts the bell out of service, or, if short circuited, burns up the bell coils and puts the whole system of bells out.
- H. The telephone users are not liable to shocks when the signal system is being used.
- I. No condensers are required for the telephones. Telephone condensers are made of tin-foil sheets separated by a very thin sheet of paper, which is liable to puncture due to induced current. When the telephone condenser is short circuited, the telephone will be burnt out if circuit is grounded and will "kill" the whole bell and signal system.

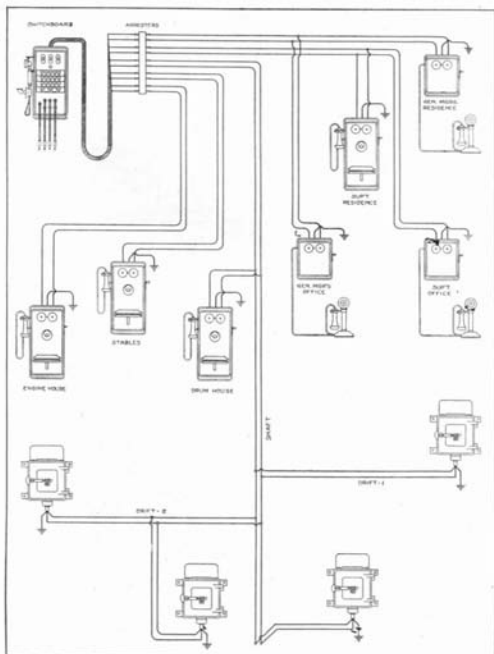
J. No explosions can occur due to burnouts of bells and telephones, as a very low tension current is used throughout the system.

K. The expense of running a third wire over the whole system is well justified by the additional independence of the signal and telephone system. It is also to be remembered that the telephones are located comparatively close to the shaft, whereas the bells are located near the working face of the mine.

The most perfect installation we can recommend has a pair of wires for both telephones and bells and is shown in Circuit No. 149, sent upon request. Other circuits for special conditions submitted upon receipt of full particulars from applicant.

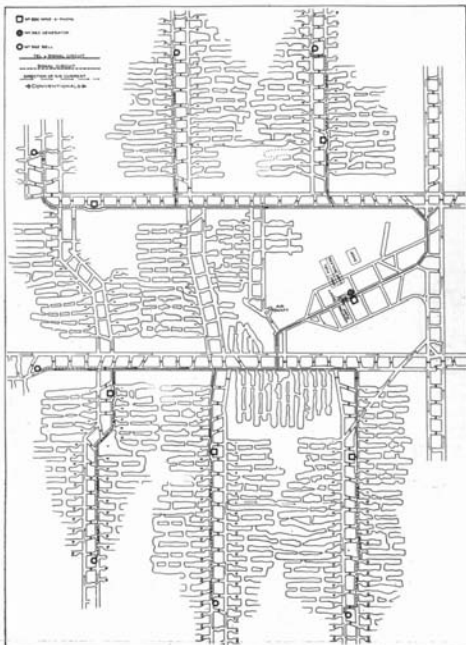
We advise you to use Mine-A-Phones that have had the test of time the world over. Use polarized bells that have no contacts to get dirty and spark. Use hand generators that are reliable and not dependent on power circuits which are of no service when the fuses blow or the engine stops. Run separate telephones and bell circuits. The best is always the cheapest.

Wiring Diagram of a Typical Metallic Circuit for a Mine-A-Phone System



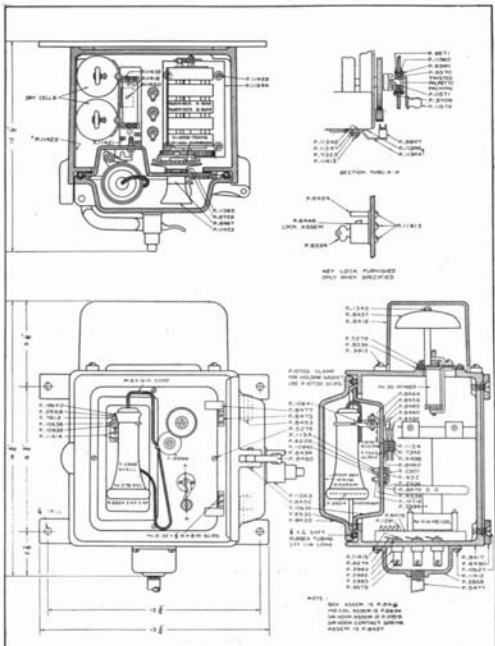
Mine-A-Phones

Conventional Diagram of a Mine-A-Phone and Alarm Signal System
Installed in a Typical Mine



Mini-A-Phones

Line Drawing of No. 890 Mine-A-Phone Showing Piece Part Numbers



Mine-A-Phones

A Few Mining Companies Using the Mine-A-Phone System

In what mining districts can you find telephone apparatus with a better record than that built by the Stromberg-Carlson Telephone Manufacturing Company?

Anaconda Copper Mining Company, Butte, Montana.	Jamison Coal & Coke Company, Pittsburgh, Pennsylvania.
Colorado Fuel and Iron Company, Denver, Colorado.	Pocahontas Consolidated Collieries Co., Pocahontas, Virginia.
Oliver Iron Mining Company, Duluth, Minnesota.	Consolidation Coal Company, Fairmont, West Virginia.
Dork Brothers Mining Company, St. Louis, Missouri.	Ducktown Sulphur, Copper and Iron Co., Isabella, Tennessee.
Wapello Coal Company, Hiteman, Iowa.	Alaska Threadwell Gold Mining Company, Threadwell, Alaska.
Sunnyside Mines, Eureka, Colorado.	Davis Coal and Coke Company, Cumberland, Maryland.
American Smelting & Refining Company, Denver, Colorado.	Goldfield Consolidated Mining Company, Goldfield, Nevada.
Ahmeek Mining Company, Calumet, Michigan.	Broken Hill Junct. North Silver Min. Co., Broken Hill, New South Wales.
Porcupine Crown Mines, Timmins, Ontario.	Mysore Gold Mining Company, Madras, India.
Pearl Lake Gold Mines, Schumacker, Ontario.	Sandwell Park Colliery Company, West Bromwich, England.
Nipissing Mining Company, Cobalt, Ontario.	Crown Mines Limited, South Africa.
Dominion Coal Company, Glace Bay, Nova Scotia.	West Rand Consolidated Mines, South Africa.
Canadian Copper Company, Copper Cliff, Ontario.	New Goch Gold Mines, South Africa.
Mond Nickel Company, Coniston, Ontario.	Robiarson Deep Limited, South Africa.
Republic Iron and Steel Company, Birmingham, Alabama.	South Africa Tin Mines, South Africa.
Philadelphia & Reading Coal and Iron Co., Pottsville, Pennsylvania.	Superior Coal Company, Benld, Illinois.
Pennsylvania Coal & Coke Corporation, Cresson, Pennsylvania.	Federal Mining & Smelting Company, Wallace, Idaho.
Cambria Steel Company, Johnston, Pennsylvania.	Cleveland-Cliff Iron Company, Ishpeming, Michigan.
	Ray Consolidated Copper Company, Ray, Arizona.

