Oct. 9, 1923. 1,470,430

M. C. ELLISON

TELEPHONE AMPLIFIER SYSTEM

Filed Oct. 16, 1922 2 Sheets-Sheet 1

Fig. 1.

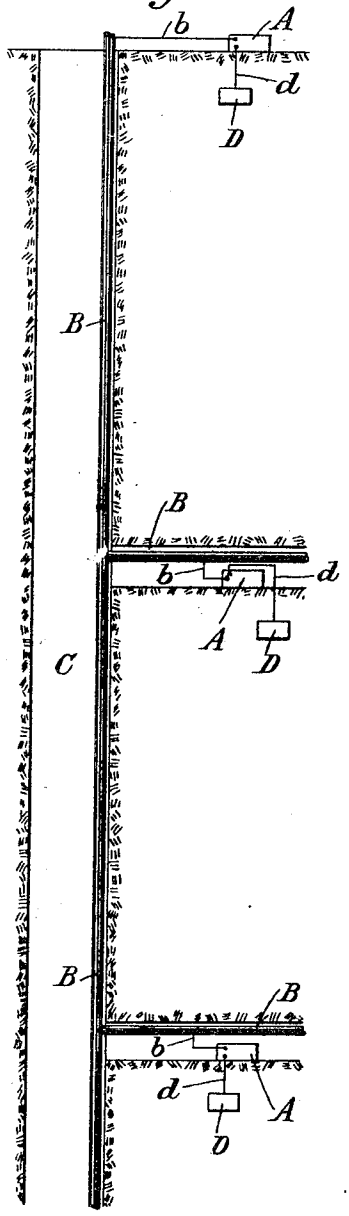
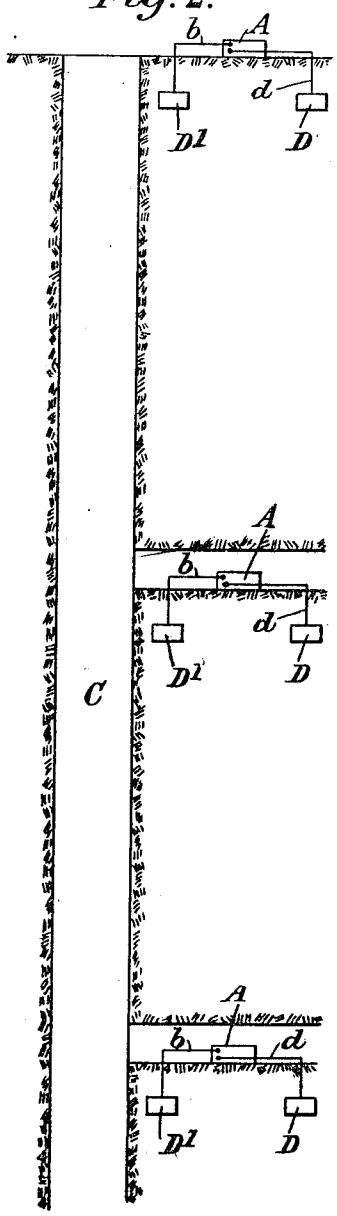


Fig. 2.



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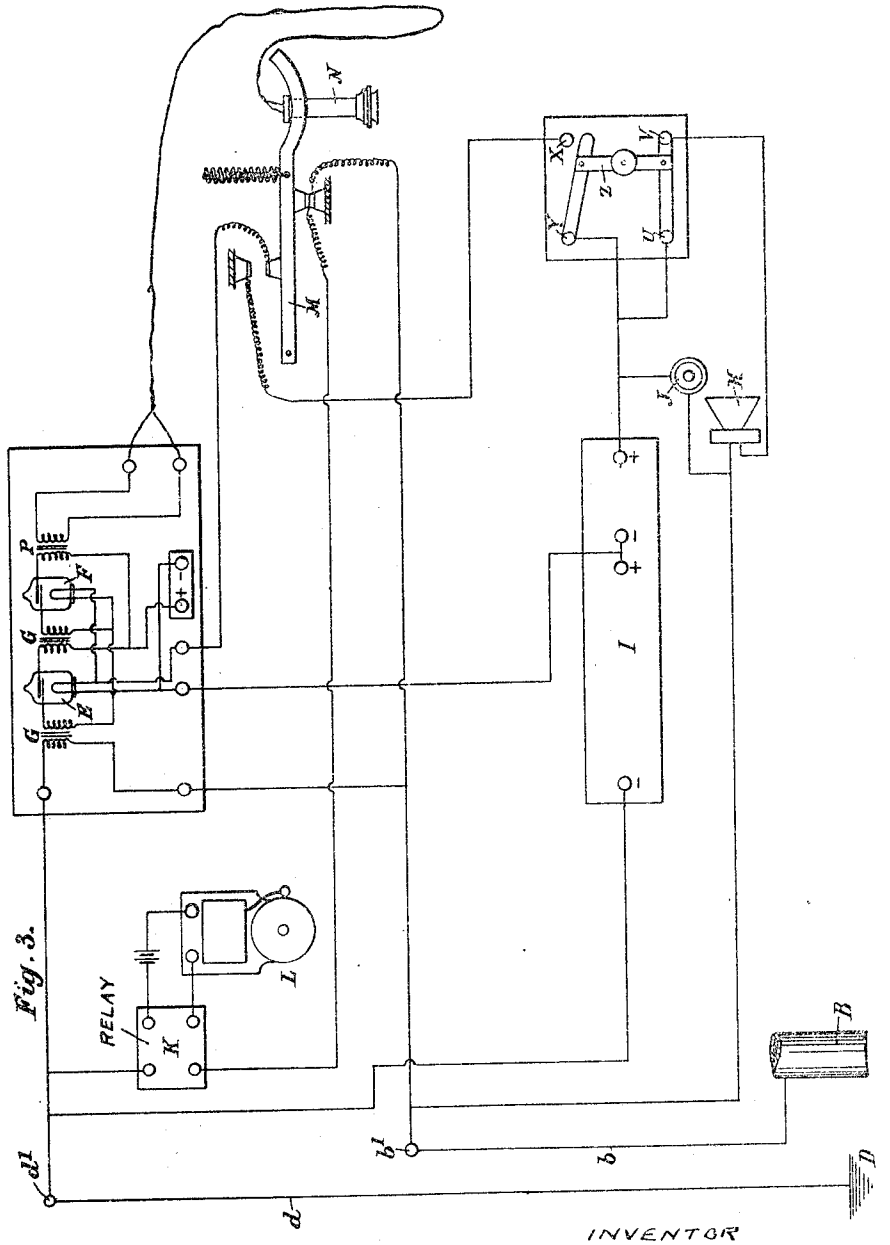


Fig. 3.

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UNITED STATES PATENT OFFICE.

MICHAEL CHETWYND ELLISON, OF HUTTONS, ENGLAND.

TELEPHONE AMPLIFIER SYSTEM.

Application filed October 16, 1922. Serial No. 594,850.

To all whom it may concern:

Be it known that I, MICHAEL CHETWYND ELLISON, a subject of the King of Great Britain, residing at Huttons Ambo Hall, in the county of York, England, have invented new and useful Improvements in Connection with Telephone Amplifier Systems, of which the following is a specification.

This invention consists principally in a system of telephony without the need of special connecting wires and intended more especially for use in mines, and the like, the said invention providing means by which telephonic communication can be carried on, by means of telephonic or like, apparatus, without the necessity for connecting wires between such apparatus. I employ two earths, or two earthed metallic conductors, or an earth and an earthed metallic conductor, (which, for brevity, I will refer to as the earths) as the means for obtaining the required communication so that conversation can be carried on between places at a distance apart in a mine, or the like, or between the mine and the surface above, or the entrance to, the mine, or the like.

The transmitting apparatus employed in accordance with this invention may comprise a direct current circuit with a microphone therein to cause fluctuations in the current and flowing between the two earths, or a circuit with a current (having fluctuations caused therein by a microphone) transformed from the current passing between two earths such, for instance, as earthed metallic conductors constituted by pipes; for example, haulage ropes compressed air pipes, or water-pipes, where such are available, or wire haulage ropes. The receiving apparatus may comprise an audio frequency three electrode thermionic valve amplifier, the input terminals of which are connected to two earthed conductors preferably the same as those to which the transmitter is connected although this is not essential.

I may employ any required number of valves, and any type of three electrode receiving valve and audio frequency inter-valve closed iron core transformers arranged in any suitable manner, or any other amplifying device may be employed.

In the combined transmitting and receiving apparatus the receiving connection can be accomplished by transformers connected in the earth circuit and ringing up can be effected by means of a relay.

The following is an explanation with reference to the accompanying drawings, of how my invention can be performed, but I do not limit myself to the precise details hereinafter described and illustrated.

Figures 1 and 2 illustrate diagrammatically how telephonic systems may, in accordance with my invention, be applied to a mine from which its analogous applications will also be understood. Figure 3 illustrates, diagrammatically, a combined transmitting and receiving apparatus suitable for use in accordance with my invention.

The combined transmitting and receiving apparatus is mounted, or fixed, in any suitable, or required position in the mine, each apparatus being preferably compactly arranged within a portable box indicated at A in Figures 1 and 2, to protect the apparatus from injury and allow of its being easily moved from place to place.

In the arrangements illustrated in Figures 1 and 2 three boxes A, are shown in position, each containing transmitting and receiving apparatus, but any desired number of such boxes can of course be employed. The electrical circuit from one apparatus to another is, in the arrangement shewn in Figure 1, shewn as being effected by connecting one of the two electric mains of the respective apparatus to any suitable metallic pipe B, or the like, in the shaft C of the mine and connecting the other of the two electric mains of the respective apparatus to earth through the earthed plates D, or, if desired, the last mentioned electric mains may be connected to another metallic pipe, or the like in the mine. Instead of connecting either of the mains to a pipe, or the like, the electric mains of each apparatus may be connected to earthed plates D and D′ as shewn in Figure 2, so that both the outgoing and ingoing currents are conducted from one apparatus to another by earth.

The combined transmitting and receiving apparatus shewn diagrammatically in Figure 3 comprises an audio frequency three electrode valve amplifier, having two valves E, and F, connected in cascade by means of iron-cored inter-valve transformers G. P is a step down telephone transformer. The two earthed metallic conductors *b* and *d*, are connected to the input terminals *b′* and *d′* of this amplifier, which so amplifies the faint electrical impulses as to make them clearly audible.

For transmitting speech, a microphone H is connected in series with an accumulator I (say one of about 12 volts) which is connected across two earthed conductors, the circuit being from the right hand terminal of the battery I, switch arm a—x, microphone H, terminal b' of the set, thence by conductor b—B to another similar set, and returning via conductor D—d to terminal d', back to the left hand terminal of battery I.

For ringing up, the accumulator is connected directly across the metallic conductors without the microphone in series by means of a bell-push J, this causing a fairly heavy electric current to flow, which closes a delicate relay K at the receiving end, which in turn closes a local circuit causing a bell L to ring.

When listening, the removal of the receiver causes the switch M to close the upper contacts under spring action, thus completing a circuit from the right hand terminal of battery I, through switch arm y—x, upper contacts of switch arm M, the filaments of the thermionic tubes, and back to the central terminals of the battery I. When not listening, the receiver is left on the hook (as shown) and by its weight closes the lower contacts, thus completing a circuit from conductor B—b, the lower contacts of switch arm M, relay K, conductor d—D, which enables the relay to respond to current from a calling station. When the receiver N is lifted from the said switch lever the filaments of the valves E and F are automatically lighted and the relay is disconnected. Z is a hand operated switch which connects X and Y when listening and U and V when speaking. The switching can, of course, be accomplished in any other suitable way.

What I claim is:—

A combined transmitting and receiving station having a receiving circuit including an audio frequency amplifier comprising a plurality of three electrode valves and inter-valve transformers therefor, a step-down telephone transformer receiving the output therefrom, a telephone receiver electrically connected with said telephone transformer; a transmitting circuit including a microphone in series with a source of current; a calling circuit including a relay; a relay circuit comprising the relay contacts, a calling bell and a local battery; switching means for making and breaking the transmitting circuit and the filament circuit of the amplifier alternately; a receiver switch adapted to close the calling circuit and break the filament circuit of the amplifier when the receiver is placed thereon and to break the calling circuit and close the amplifier filament circuit when the receiver is removed; and a calling button shunting said microphone and switching means, whereby the valves are extinguished upon replacing the receiver and the pulse of current at calling may be prevented from actuating the local receiving amplifier.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MICHAEL CHETWYND ELLISON.

Witnesses:
GEORGE WILLIAM CURRY,
DOROTHY ADELAIDE HAZELL.