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M. L. ALMQUIST

1,834,992

DEVICE FOR PRODUCING MODULATED CURRENTS

Filed May 15, 1930

Fig. 1

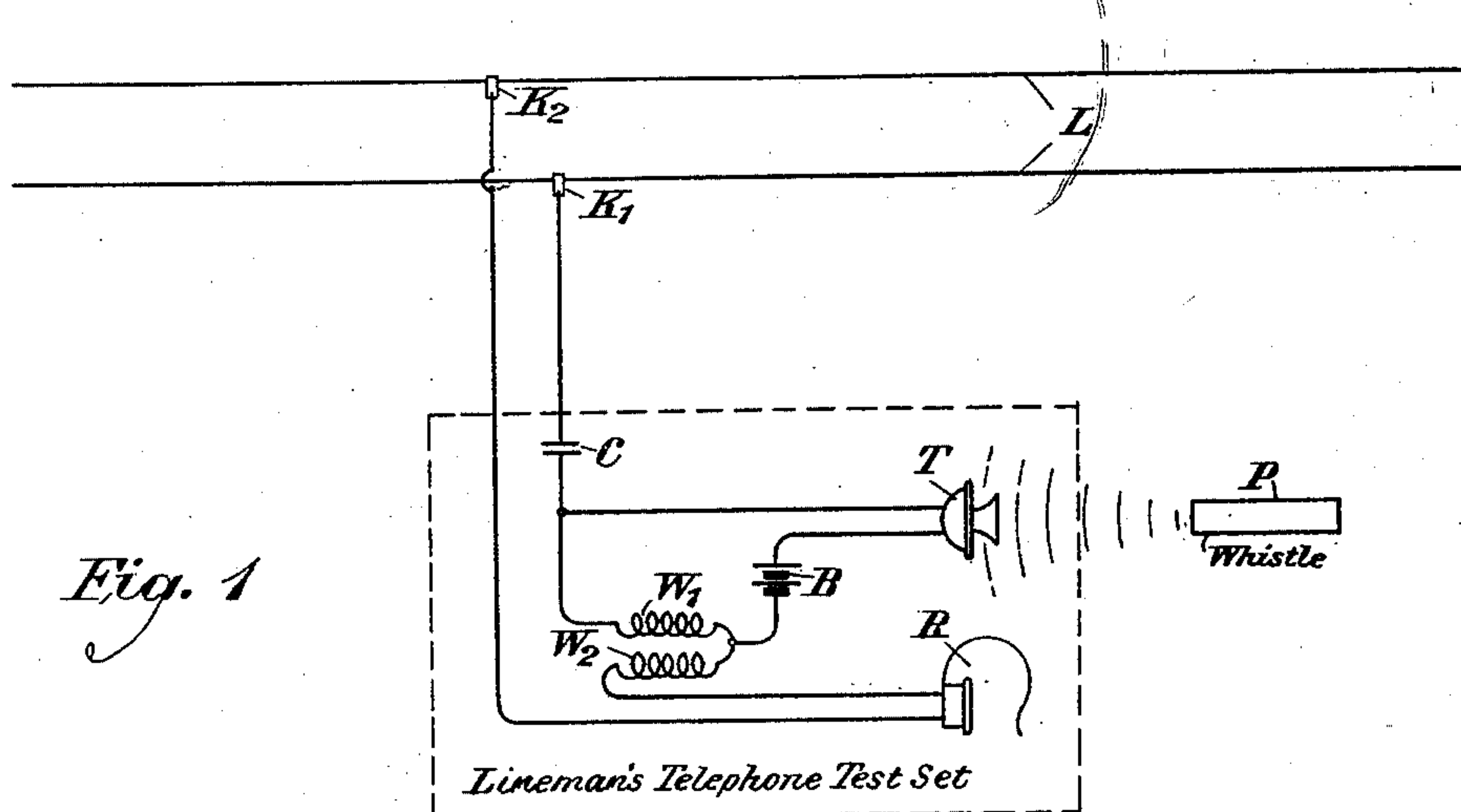


Fig. 2

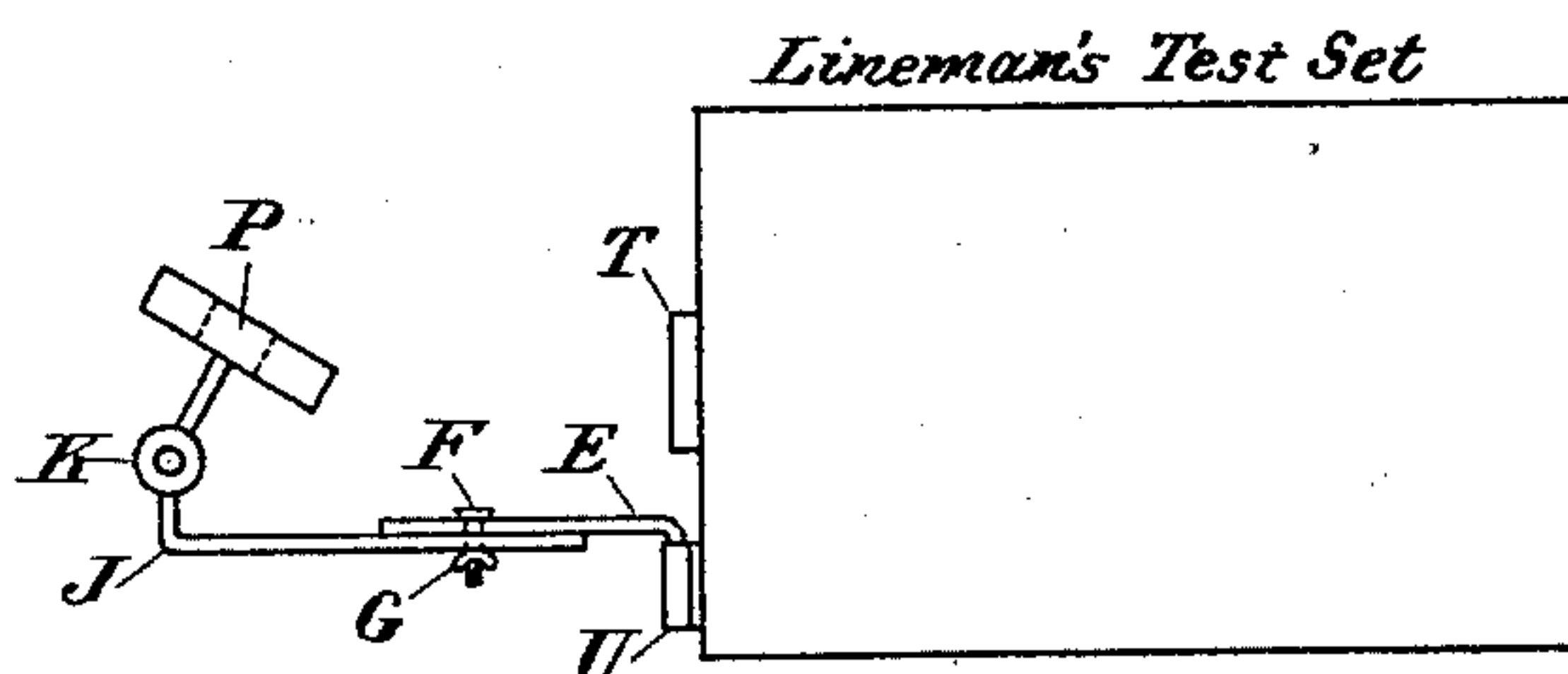


Fig. 3

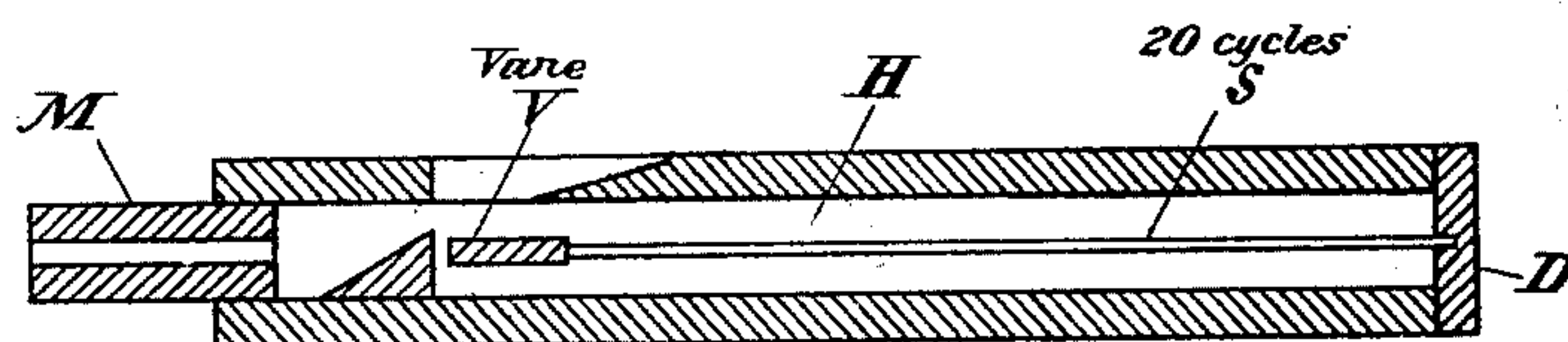


Fig. 4

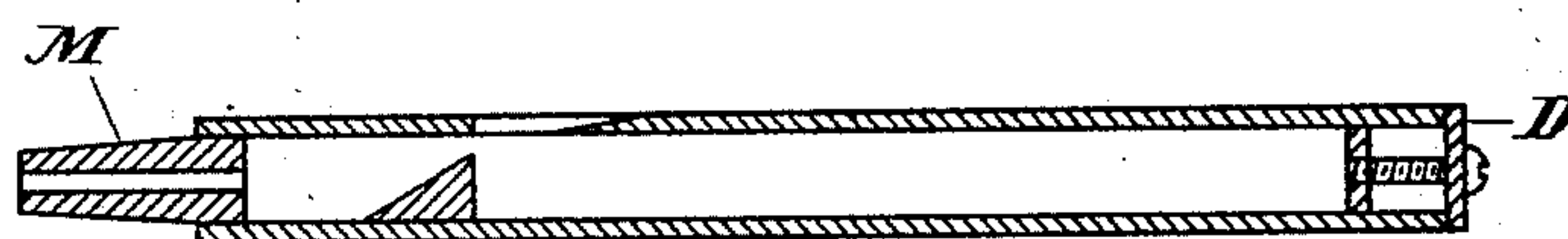
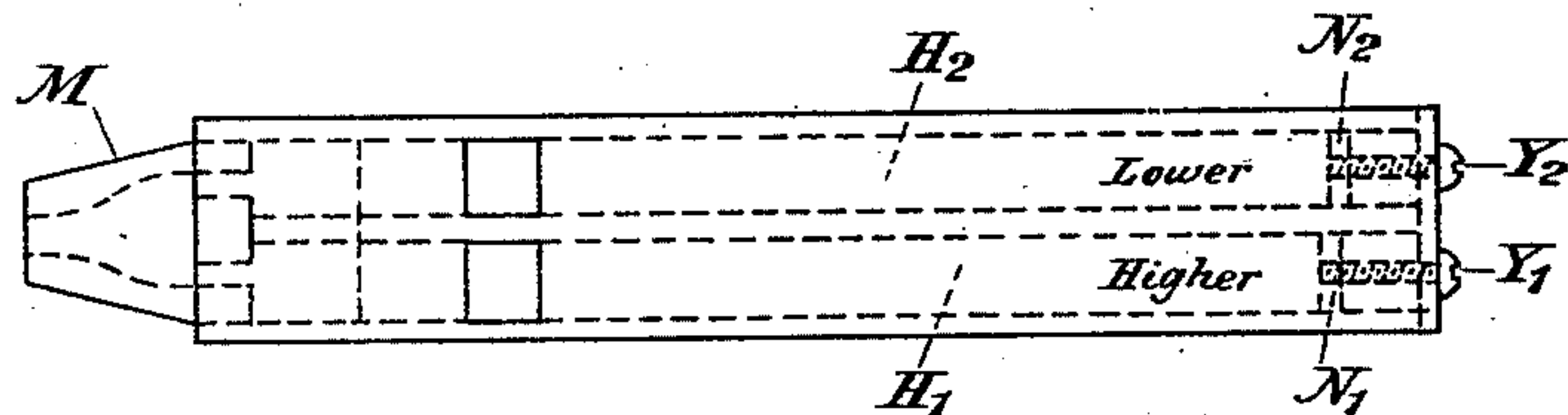


Fig. 5



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DEVICE FOR PRODUCING MODULATED CURRENTS

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This invention relates generally to signaling systems. More particularly this invention relates to arrangements for producing modulated currents. Still more particularly this invention relates to apparatus employing a column of air and a vibratory element for producing modulated currents.

In connection with telephone systems, there has recently arisen a need for means whereby a lineman may transmit ringing current, i. e., current of a frequency of, for example, 1000 cycles interrupted or modulated by a current of a frequency of, for example, 20 cycles, over a circuit equipped with apparatus suitable to handle such currents. In order that this may be done, it is necessary that a source of current of, for example, 1000 cycles, as well as another source of current of, for example, 20 cycles, be readily available for producing the necessary modulation. One of the difficulties involved is that such equipment must be light in weight and small in size so that it may be readily carried from place to place along with the telephone lineman's familiar test set. The latter test set involves about as much weight as it is practical for a lineman to carry. It is also important that such equipment be quite inexpensive.

In order that these difficulties may be overcome, it is proposed in this invention to devise a whistle or pitch pipe which shall produce the necessary 1000-cycle note modulated at the 20-cycle rate. Inasmuch as the present lineman's test set is equipped with a telephone transmitter, this can be used to receive the modulated tone produced by the whistle or pitch pipe and to apply current corresponding to this tone to a telephone line. Such a whistle or pitch pipe will obviously be small in size, its weight negligible, and its cost very low.

It is the general object of this invention to devise a readily portable device for producing modulated currents suitable for ringing purposes in connection with telephone lines.

Other and further objects of this invention will be apparent from the more detailed description hereinafter following,

when read in connection with the accompanying drawings, in which Figure 1 shows an open wire pair or telephone line, a test set, and a whistle or pitch pipe designed to give a tone simulating ringing currents; Fig. 2 shows means for adjustably mounting a whistle or pitch pipe with respect to the telephone transmitter; Fig. 3 shows one form of embodiment of the whistle or pitch pipe; and Figs. 4 and 5 show a cross-sectional view and a top view, respectively, of another form of embodiment of the whistle or pitch pipe.

Referring to Fig. 1 of the drawings, an open wire pair or telephone line is designated L. A telephone lineman's test set may be connected to line L by means of a pair of test clips designated K₁ and K₂. The test set includes the familiar forms of transmitter T and receiver R, a condenser C, windings W₁ and W₂ and a battery B. The whistle or pitch pipe is designated P, and this may be placed in front of the transmitter at any distance therefrom and displaced at any predetermined angle so that its tone will be suitably impressed upon the diaphragm of the transmitter. The whistle or pitch pipe will be described in greater detail hereinafter in connection with Figs. 3, 4 and 5 of the drawings.

The whistle or pitch pipe P will produce modulated waves simulating telephone ringing current, and these will be impressed upon the diaphragm of the transmitter T. The current of battery B will be correspondingly modulated and transmitted to line L by virtue of the inductive properties of windings W₁ and W₂. The circuit extending to the line L will include clip K₁, condenser C, windings W₁ and W₂, receiver R, and clip K₂.

Fig. 2 shows the lineman's test box in which is mounted, among other things, the transmitter T. The device P is arranged so that it may be separated from the transmitter T by any predetermined distance and displaced angularly with respect to this transmitter by any predetermined amount. Here a U-shaped member designated U is mounted on the outer surface of the lineman's test box, and this member supports a metallic plate E through which a hole is bored to

accommodate a screw-threaded member F which meshes with a screw-threaded wing nut G. The device P is mounted on another metallic plate J and may be moved angularly with respect to the transmitter T about an axis K. The member J may be grooved in order that the whistle or pitch pipe P may be readily spaced from the transmitter T at any predetermined distance. Thus, by loosening the wing nut G, the pipe P may be slid to or from the transmitter T by any amount and the nut G may be fastened to the screw-threaded member F in order to maintain the spacing constant. It will be apparent that by revolving the pipe P to some predetermined angular displacement with respect to the transmitter T, the modulated tone produced thereby may be directly impressed upon the diaphragm of the transmitter T.

Fig. 3 shows one form of embodiment of the whistle or pitch pipe P arranged to give the desired tone. Here a chamber H includes a column of air of such length as to be resonant at a frequency of, for example, 1000 cycles. A reed S, tuned to about 20 cycles, is supported by the base D of the arrangement. The reed S supports a vane V at its free end and this vane is adjacent to the opening of the pipe from which sound is emitted. By blowing through the mouthpiece M, the column of air within the chamber H will be brought into resonance, and it will produce a 1000-cycle note. The reed S will be set into mechanical vibration at a 20-cycle rate and this will modulate the 1000-cycle tone so as to simulate one form of telephone ringing current.

Figs. 4 and 5 represent another form of embodiment of a whistle or pitch pipe suitable to carry out the principles of the invention. Here there are two chambers H_1 and H_2 , both of which include columns of air, but these are resonant at two different frequencies. The column of air within the chamber H_1 is of smaller length than that within chamber H_2 and, therefore, the resonant frequency of the column within chamber H_1 will be higher than that of the column within chamber H_2 . These chambers H_1 and H_2 may be set so as to produce columns resonant at frequencies differing from each other by the frequency of modulation desired; for example, the respective frequencies may be 1020 and 1000 cycles, 1000 and 980 cycles, 1010 and 990 cycles, and so on.

Pistons N_1 and N_2 are adjustably positioned in chambers H_1 and H_2 , respectively. Screw-threaded members Y_1 and Y_2 are supported by the base D, and these may be manipulated for the purpose of controlling the positions of the pistons N_1 and N_2 , respectively. By causing the pistons to be moved inwardly so as to decrease the lengths of the columns of air in the chambers H_1 and H_2 ,

the resonant frequencies of these columns will be increased, and as these pistons are moved outwardly, the columns of air will have lower resonant frequencies.

While this invention has been shown in certain particular embodiments merely for the purpose of illustration, it will be understood that the principles of this invention may be applied to other and widely varied organizations without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. The method of producing a doubly-modulated air current of definite frequency characteristics with a column of air and a mechanically vibrating element of elongated shape fixed at one end and free at the other, which consists in simultaneously resonating said column of air at a predetermined frequency and mechanically vibrating the free end of said element at a different, predetermined frequency.

2. Apparatus for producing modulated currents, comprising a chamber supporting a column of air having a resonant frequency of predetermined value, one end of said chamber being open, and a tuned reed having a natural vibratory frequency of a different and predetermined value, said reed being mounted within said chamber and fixed in position at the closed end of said chamber.

3. The combination of a chamber closed at one end and open at the other, said chamber having an effective length corresponding to a predetermined frequency, a reed tuned to a different predetermined frequency one end of which is fixed in position at the closed end of said chamber, and a vane attached to the free end of said reed adjacent to the open end of said chamber.

4. A device for simultaneously producing air currents of two frequencies of predetermined values comprising two chambers of uniform cross-sectional area and of equal length, two pistons each located within one of said chambers, and screw-threaded means for controlling the relative positions of said pistons within said chambers.

5. Apparatus for producing modulated ringing currents, comprising a chamber supporting a column of air having a resonant frequency of predetermined value, said chamber being opened at one end and closed at the other, a tuned reed fixedly mounted at the closed end of said chamber and having a vibratory frequency of a different predetermined value, means for simultaneously resonating the column of air within said chamber and vibrating said tuned reed, and means for converting the resultant air waves into ringing currents.

6. Apparatus for producing double frequency ringing currents comprising two chambers of the same length each enclosing

a column of air, means associated with each chamber for adjusting its effective length so as to change the resonant frequency of the enclosed air column to any desired value, means for simultaneously resonating both of said air columns, and means for converting the resultant air currents into ringing currents.

7. A device for simultaneously producing air currents of two predetermined frequencies comprising two chambers of uniform cross-sectional area and of equal length, two pistons, one mounted in each chamber, and means associated with each chamber for adjusting the position of the enclosed piston.

In testimony whereof, I have signed my name to this specification this 14th day of May, 1930.

MILTON L. ALMQUIST.