

W. W. HAWKINS.
PARTY LINE TELEPHONE SYSTEM.
APPLICATION FILED MAY 10, 1906.

1,030,089.

Patented June 18, 1912.

2 SHEETS-SHEET 1.

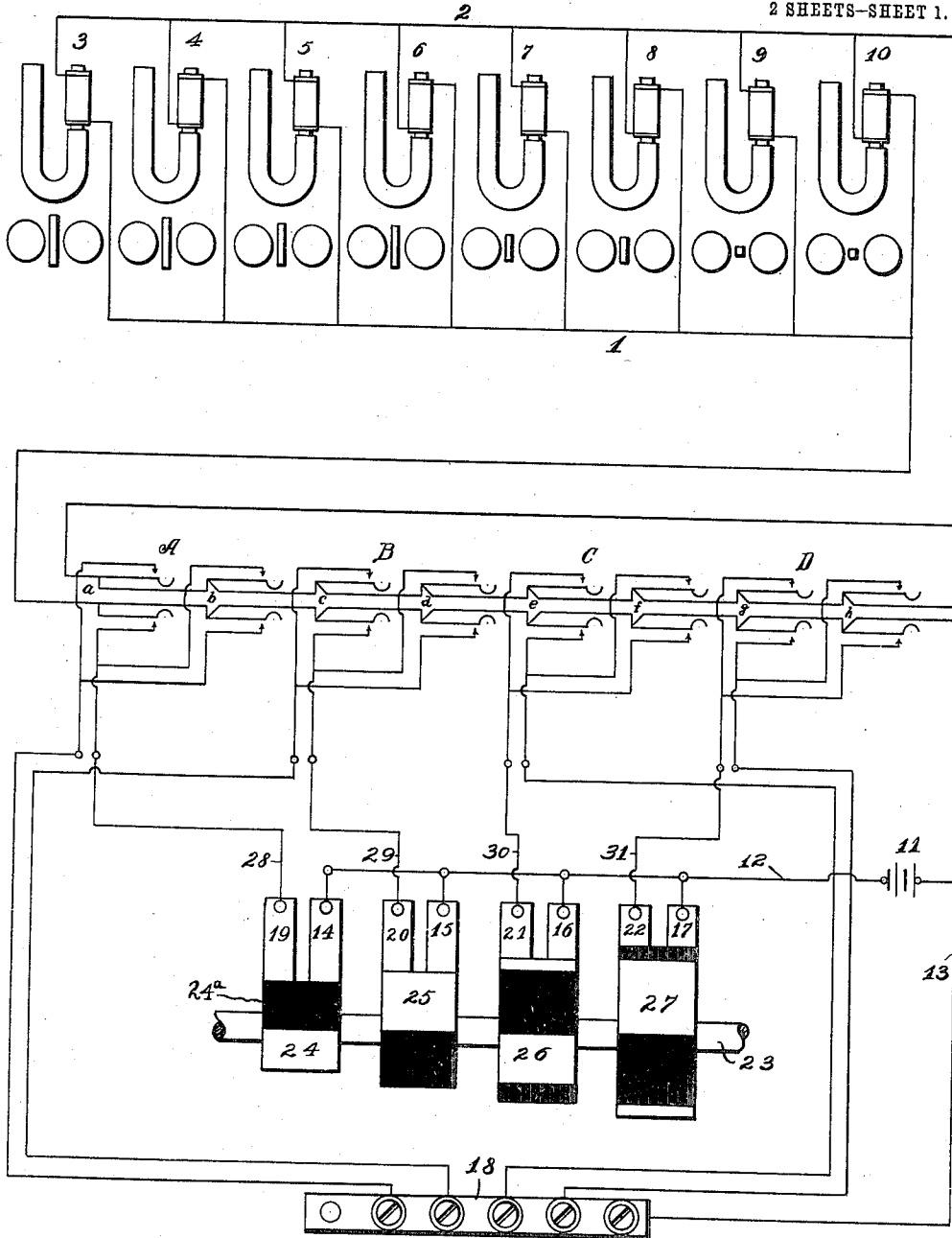


FIG. 1

WITNESSES:

Brennan & West.
Ludo H. Keller.

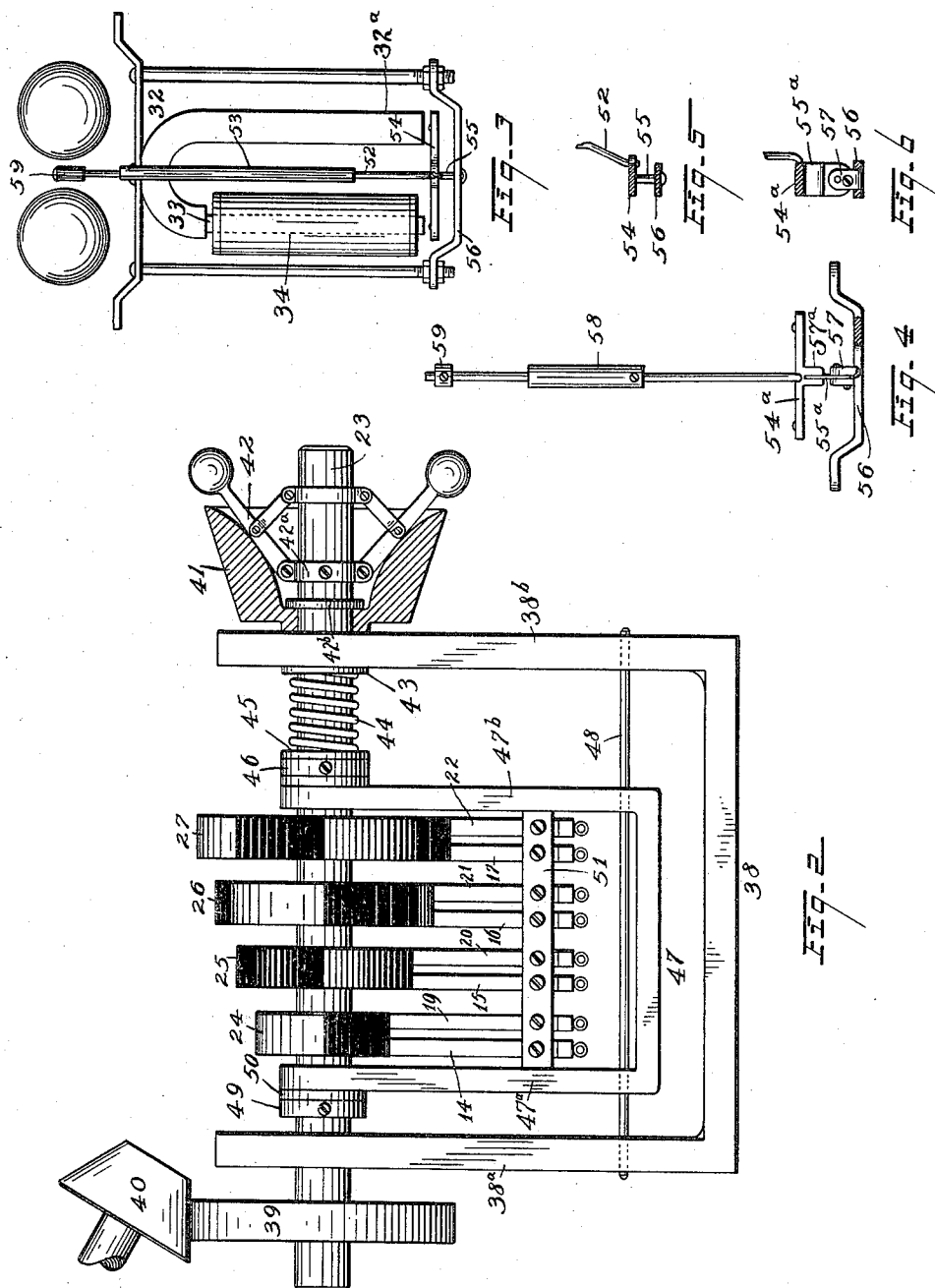
INVENTOR,
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BY
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ATTYS.

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UNITED STATES PATENT OFFICE.

WILLIAM W. HAWKINS, OF CLEVELAND, OHIO.

PARTY-LINE TELEPHONE SYSTEM.

1,030,089.

Specification of Letters Patent.

Patented June 18, 1912.

Application filed May 10, 1906. Serial No. 316,182.

To all whom it may concern:

Be it known that I, WILLIAM W. HAWKINS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Party-Line Telephone Systems, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention relates to party line telephone systems, and particularly to harmonic systems, wherein a particular sub-station on a line is selected by means of the vibrations of a tuned reed.

The objects of the invention are to provide an extremely simple and efficient system of this type and one which will permit of the employment of a larger number of subscribers or sub-stations on a party line than is the case with systems now generally in use.

In the drawings forming a part hereof, Figure 1 represents a diagrammatic view of my system; Fig. 2 represents a form of governor by which the frequency of the pulsations of the ringing current may be kept substantially constant; and Fig. 3 represents an elevation of one of the magnetic ringers which I employ in my system; Fig. 4 represents a modification of the vibrating reed employed with the ringer illustrated in Fig. 3; Fig. 5 represents a sectional detail of the reed shown in Fig. 3 and Fig. 6 represents a similar detail of the modification shown in Fig. 4.

In carrying out my invention, I make use of the well-known principle of selecting any one of a number of ringers for operation by impressing upon their common line ringing currents, the frequency of the pulsations of which corresponds to the rate of vibration of a vibrating reed. By applying varying weights to the different reeds, they will respond to pulsations of correspondingly varying frequencies. By the peculiar construction of magnet which I employ with each ringer, I am enabled to operate each of a pair of reeds tuned to respond to the same number of frequencies of pulsation in the ringing current, by simply reversing the direction of the current through a portion of the magnet, thereby enabling me to double the number of subscribers or sub-

stations that could otherwise be placed on the same line. I also provide a regulator whereby the frequency of the pulsations transmitted along the line may be kept substantially constant.

Referring to Fig. 1, 1 and 2 designate the limbs of a telephone line extending from the sub-stations 3, 4, 5, 6, 7, 8, 9, and 10 to the central office, said office being provided with the usual apparatus for transmitting currents to the sub-station lines. The switches corresponding to the sub-stations 3, 4, 5, 6, 7, 8, 9, and 10 are indicated at *a, b, c, d, e, f, g, and h* respectively. 11 represents any source of direct current from which extend the conductors 12 and 13, the former being connected with brushes 14, 15, 16 and 17 of any desired number of circuit-making and breaking devices and the latter with a bus bar 18. The opposing brushes (19, 20, 21 and 22) of each pair are connected respectively with the groups of switches A, B, C, and D at the central station, each group corresponding to a pair of ringers that have the same rate of vibration. 23 designates the shaft of a circuit-making and breaking device on which are mounted a suitable number of disks 24, 25, 26 and 27, the periphery of each of said disks being composed of a suitable number of conducting and non-conducting segments to transmit the desired number of pulsations to the conductors 28, 29, 30, 31 leading to the groups of switches at the central station. The disk 24 may have the body thereof formed of non-conducting material 24^a with a single conducting segment embedded therein. The disk 25 may be provided with two such segments, disk 26 with three, and disk 27 with four such segments. It will be apparent, from this construction, that the disks 25, 26, and 27 will, within a given time, impress upon their respective conducting wires two, three and four times the number of pulsations respectively that are impressed upon the wire 28 by the disk 24. A frequency of such pulsations which I have found to be effective for the purposes of my invention is for the disk 24, 1200 per minute, for the disk 25, 2400 per minute, for the disk 26, 3600 per minute, and for the disk 27, 4800 per minute. The vibrating reeds of the ringers of sub-stations 3 and 4 are tuned or weighted to respond to the number of

pulsations or ringing currents transmitted per minute from the disk 24. The reeds of the ringers 5 and 6 are weighted to respond to the pulsations or ringing currents transmitted by the disk 25, the reeds of the ringers 7 and 8 are so weighted as to respond to the ringing currents or frequency of pulsations transmitted by the disk 26; and the reeds of the ringers 9 and 10 are weighted to respond to the ringing currents or pulsations transmitted from the disk 27.

In Fig. 3 there is shown in detail one of the ringers illustrated in the diagrammatic view in Fig. 1. This ringer comprises a frame supporting a horseshoe magnet 32. One limb of this magnet is almost entirely replaced by a soft iron core 33. Assuming that the right hand pole of this magnet is the north pole, the end of the core 33 will normally be the south pole. To the core 33 there is applied a helix or spool 34 wound with conducting wire, in the manner customary with electromagnets. If an electric current be transmitted through the winding of the spool in one direction, its effect will be to tend to strengthen the polarity of the magnet 32 and, of course, of the core 33; but, if the spool is wound in the reverse direction and the current is not also reversed, the effect of said current will be to reverse the polarity of the magnet. With this magnet I preferably employ a polarized armature 54. If the current be flowing through the coil 34 in such direction as to tend to reinforce or build up the polarity of the magnet and of the core 33, no appreciable effect will be produced on the armature with the strength of current which I employ, as the core 33 is already substantially saturated, it forming part of the magnetic circuit of the permanent magnet. If, however, the current be sent through in the reverse direction, the effect will be to reverse the polarity of 33 and will cause it to repel the adjacent end of the armature. Owing to the shortness of time that the current is flowing through the coil, the permanent branch of the magnet will not be depolarized, and it will continue to attract the adjacent end of the armature, with the result that the reed 52 will be vibrated.

When the current is broken, the electromagnet formed by the core 33 and coil 34 is immediately deenergized and, as the current has been flowing for an almost infinitesimal period of time, no appreciable effect has been produced on the pole 32^a, so that, during the interval between pulsations, the pole 32^a remagnetizes the core 33 in its normal direction, thus causing the armature to be attracted thereto, producing a reflex action and vibration in the reed and enabling the hammer 59 to strike both bells. The weight or hammer 59 on said reed being such as to cause said reed to vibrate with the

frequency of the pulsations transmitted through the coil 34 from the corresponding disk of the circuit-making and breaking device, it will be apparent that the sending of pulsations through the coil 34 in the proper direction will cause the bell to be rung in the manner above described.

In operation, the current will flow from one of the circuit-making and breaking disks, as 24, to the appropriate switch group A at the central station. The operator, having spread the arms in the switch *a* into engagement with the proper terminals, as by operating his switch key, the current will flow along the limb 1 and through the windings of the coils on all of the ringers. Only the ringers 3 and 4 have their reeds tuned to respond to the pulsations transmitted from the disk 24 along the line 1 and, for this reason, all the other ringers will be silent. Of the two ringers 3 and 4, only that one will respond whose coil is wound in a direction to reverse the normal polarity of its core. If the core of the ringer 3 is so wound, its armature will be vibrated and the ringer will operate to call this sub-station. The coil of the ringer 4 being wound in the reverse direction, when the operator spreads the branches of switch *b* into engagement with their terminals, the current from 28 flows along the limb 2 and through the winding of the ringer 4 in a direction to reverse the polarity of the core, and the armature of this ringer will be operated in the same manner as was that of the ringer 3. At this time, the current is flowing through the winding of ringer 3 in a direction the reverse of that supplied to it through branch 1, the pulsations transmitted from 25 may be made to operate either of the ringers 5 and 6, according as the switch *c* or *d* is utilized to complete the circuit. So also the pulsations from 26 and 27 may be made to operate their corresponding ringers.

An important advantage of the construction and arrangement of the ringers above described is their retention of magnetism. This is due to the fact that, when one of a pair of sub-stations is being called, the current is reversed through the coil of the ringer of the other sub-station, thereby reenergizing the magnet.

It is desirable, if not absolutely necessary, that some means should be provided for regulating the speed of the shaft 23 to keep the frequencies of the pulsations substantially constant; for, if the pulsation frequency be about midway between those of two sets or pairs of ringers, no bell will be sounded, or else a ringer of each pair will be operated at the same time. To avoid these results, I provide the form of speed regulator for the shaft 23 shown in Fig. 2. In this figure, 38 designates a frame, pref-

erably U-shaped, the upright arms 38^a, 38^b of which support the shaft 23. Outside of said frame, the shaft 23 is provided near one end thereof with a disk 39 which is driven by a cone 40. The other end of the shaft extends through a cup 41 carried loose on the shaft. The inner surface of said cup is convex, to afford a bearing surface for the arms 42 of the centrifugal governor which is secured to the shaft by means of a collar 42^a, a washer 42^b being provided between said collar and the inner bottom of the cup.

43 designates a washer surrounding the shaft and interposed between the outer end of the spring 44 and the inner face of the upright frame member 38^b. The other end of the spring bears against a washer 45 which in turn bears against a collar 46 adjustably secured to the shaft.

47 denotes a U-shaped frame the vertical arms 47^a and 47^b of which are sleeved upon the shaft 23. This frame carries the brushes and is prevented from rotating with the shaft by means of a long rod 48 extending through its vertical members and the vertical members of the frame 38.

49 denotes a collar which is secured to the shaft 23. Between said collar and arm 47^a is placed a washer 50. The collar 49 is spaced from the inner face of the arm 38^a a sufficient distance to permit the shaft 23 to be moved by the spring 44 until the disk 39 is at the rear or enlarged end of the cone 40, said collar preventing the spring from moving the disk entirely out of contact with said cone. The strength of the spring 44 and the adjustment of the collar 46 are such as to prevent the shaft from being moved by the governor a sufficient distance to cause the disk 39 to be carried beyond the front or reduced end of the cone 40. Under all ordinary conditions of operation, the speed of rotation of the cone 40 will not vary sufficiently to produce any material travel of the disk 39 along its surface, but the construction of governor which I have described will maintain substantially constant the frequency of pulsations produced by the disks 24, 25, 26 and 27 and transmitted to the line by the brushes 14, 19, 15, 20, 16, 21, 17 and 22 which are carried by the supporting bar 51 within the frame 47.

As will appear more particularly from Figs. 3—6, the reeds of the ringers are weighted to secure the desired frequency of vibration corresponding to the pulsations transmitted by the various disks. This may be accomplished by applying to the reed 52 a weight 53 of slightly greater diameter than the reed and of considerable length. This reed is carried by the polarized armature 54, a short spring 55 connecting the latter to the plate 56. Or the armature may be connected to the plate 56 by means of a

flat spring 55^a, the lower end of which is secured between upstanding lugs 57 carried by the plate 56 and downwardly projecting lugs 57^a carried by the armature 54^a.

In Fig. 4, I show my preferred manner of weighting the reed. This is by the application of the weight 58 thereto at the nodal portion thereof. In vibrating, the lower portion of the reed, which is nearest the armature, moves in advance of the upper end, the inertia of the latter being increased by the striking hammer 59 carried thereby. As a result the upper portion of the reed vibrates with respect to the lower portion, and there is a point between such portions which is comparatively quiet. To this point I apply the weight 58, the weight extending on both sides thereof and serving the functions of tuning the reed, stiffening the same when liable to bend and making it more certainly responsive to the pulsations transmitted to the ringer.

I claim:

1. In a party line telephone system, the combination, with a telephone line, of a pair of sub-stations having each a ringing or signaling device comprising a permanent magnet, a portion of said magnet consisting of a soft iron member forming a pole piece, a coil surrounding each of said members, said coils being wound in opposite directions, a ringing polarized armature for each magnet, said armatures being tuned to respond to pulsations of the same frequency, and means for impressing on said line pulsations of a frequency corresponding to that of said armatures, substantially as specified.

2. In a party line telephone system, the combination, with a telephone line, of a pair of sub-stations having each a ringing or signaling device comprising a permanent magnet, a portion of said magnet being formed of soft iron which forms a portion of the pole piece, a coil surrounding each soft iron pole, said coils being wound in opposite directions and being in circuit with said line, a ringing polarized armature for each magnet, said armatures being tuned to respond to pulsations of the same frequency, means for impressing on said line pulsations of a frequency corresponding to that of said armatures, and means for reversing the direction of said pulsations, substantially as specified.

3. In a party line telephone system, the combination, with a telephone line, of a pair of sub-stations having each a ringing or signaling device comprising a permanent magnet, a portion of said magnet being of soft iron forming a pole piece, a coil surrounding each of said members, said coils being wound in opposite directions, a ringing polarized armature for each magnet, said armatures being tuned to respond to pulsations of the same frequency, means for impressing on

said line pulsations of a frequency corresponding to that of said armatures, and means for maintaining substantially constant the frequency of pulsations on said line, substantially as specified.

4. In a party line telephone system, the combination, with a telephone line, of a pair of sub-stations having each a ringing or signaling device comprising a permanent magnet, a portion of said magnet being of soft iron which forms a part of a pole, a coil surrounding each soft iron pole, said coils being wound in opposite directions and being in circuit with said line, a ringing polarized armature for each magnet, said armature being tuned to respond to pulsations of the same frequency, means for impressing on said line pulsations of a frequency corresponding to that of said armatures, means for reversing the direction of said pulsations, and means for maintaining substantially constant the frequency of pulsations impressed upon the line.

5. In a selective party line telephone system, the combination of a ringer, said ringer comprising a permanent magnet, a portion of said magnet being of soft iron forming a pole piece, a coil surrounding said pole piece, a ringing polarized armature adjacent the poles of the magnet, said armature being tuned to respond to pulsations of a certain frequency, and means for transmitting

through the coil pulsations of corresponding frequency, substantially as specified.

6. The combination with a line, of a ringer thereon, said ringer comprising an electromagnet, an armature, a reed operatively connected thereto, a weight applied to said reed at the nodal point thereof, an armature connected to said reed, and means for impressing on said line current pulsations of a frequency corresponding to the rate of vibration of said reed, substantially as specified.

7. In a party line telephone system, the combination, with a telephone line, of a pair of sub-stations having each a ringing or signaling device comprising a permanent magnet, a portion of said magnet being of soft iron forming a pole piece, a coil surrounding each of said members, said coils being wound in opposite directions, a polarized ringing armature for each magnet, said armatures being of opposite polarity from the poles having the windings and being tuned to respond to pulsations of the same frequency, and means for impressing on said line pulsations of a frequency corresponding to that of said armatures, substantially as specified.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

WILLIAM W. HAWKINS.

Witnesses:

ALBERT H. BATES,
J. B. HULL.