

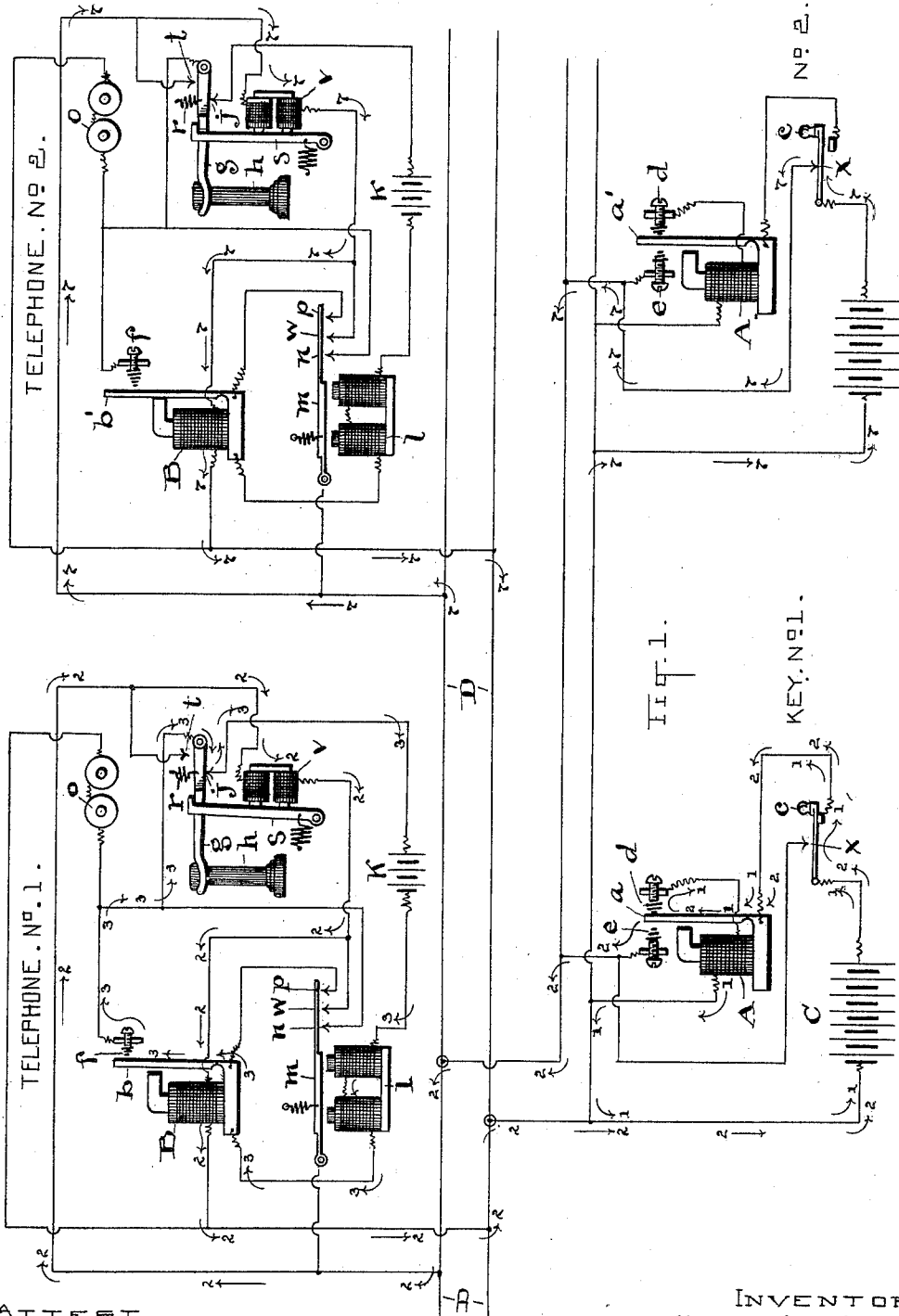
(No Model.)

2 Sheets—Sheet 1.

W. H. HARTER.
PARTY LINE TELEPHONE SYSTEM.

No. 584,352.

Patented June 15, 1897.



ATTEST

R. B. Moxey
A. M. Sharp

INVENTOR.

William H. Harter

By *H. T. Fisher* ATTORNEY

(No Model.)

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FIG. 25.

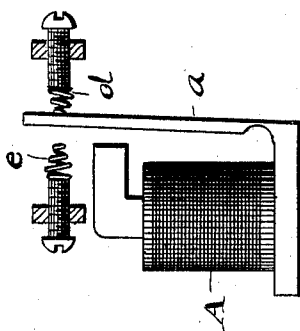
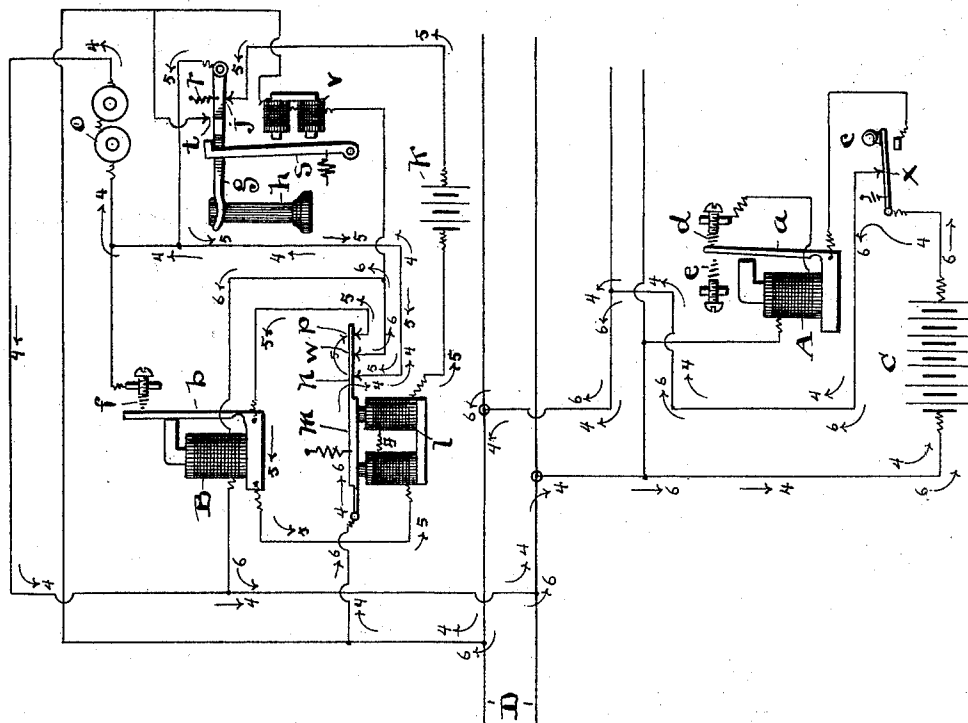


FIG. 26.



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UNITED STATES PATENT OFFICE.

WILLIAM H. HARTER, OF NORWALK, OHIO.

PARTY-LINE TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 584,352, dated June 15, 1897.

Application filed August 10, 1896. Serial No. 602,212. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. HARTER, a citizen of the United States, residing at Norwalk, in the county of Huron and State of Ohio, have invented certain new and useful Improvements in Party-Line Telephones; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the selective ringing of substation-telephones on what is generally known as a "party-line"—i. e., two or more subscribers' stations connected to a single wire or circuit—and the object of the invention is to provide means whereby any one party or telephone on such a party-line circuit can be called by the operator at the central station without calling or disturbing any of the other parties on the same circuit, at the same time unlocking the particular telephone selected for talking while all the others remain locked out, thus preventing any possible interruption by them while the one that has been called is in use.

Figure 1 is a diagrammatic view of my arrangement of circuits and parts, showing two telephones on one line and two corresponding sets of keys at the central station or operating end. Fig. 2 is a similar view, but showing only one telephone and one key, the position of the various parts being shown as when a party is being called. Fig. 3 is a detail of a harmonic vibrating magnet.

These illustrations serve to show what I have found to be simple and effective means for "selecting" or "calling" any one of a number of telephones on what is technically called a "party-line" without disturbing or ringing the other bells on the same circuit. Then as an additional advantage a "lock-out" arrangement is added to the selective device, by means of which it is within the control of the operator to lock out all the other parties on the line who have not been called or selected for talking, thus insuring strict privacy of communication between subscribers, and thereby making the service quite as efficient and satisfactory as on independent lines—i. e., a separate and distinct circuit for each telephone. The advantages of a line of

this kind over a single or independent line in point of economy are numerous, affording a very material cheapening in line construction, switchboard capacity, operating force, and other ways obvious to practical men, and thus enabling telephone-service to be furnished to subscribers at rates that are within reach of a much larger circle of users and yet at a proportionately larger margin of profit to the company operating the plant.

The principle of selection involved in this device is the contemplated unity or harmony of action between the two corresponding reeds at the central and the sub stations, and the construction and operation is such that when any one of the reeds at the central station is set into vibration its corresponding reed at the substation, on the line with which the central-station reed may be temporarily connected, will respond with action. The corresponding reeds must be tuned to the same pitch, so that there will be isochronous action between them, so long as the central-station reed is continued in vibration, and this ascertained harmony controls in the selection. This fact has been practically demonstrated in the application of the principle to other electrical devices and therefore requires no further substantiation.

What is claimed as novel in this invention is the special arrangement or adaptation of the principle, in the manner described hereinafter, to the selective ringing of telephone-bells on a party-line.

In Fig. 1 I show two telephones, No. 1 and No. 2, on the same line or circuit, and each telephone can be connected with its corresponding selective device, No. 1 and No. 2, at the central or operating end. These selective devices or "keys," as they may be called, are assembled in groups and of a number corresponding with the assumed number of telephones to be operated on any one party-line, one such group of keys being serviceable for a plurality of lines.

The selecting reed electromagnet at the central station is indicated by A and its corresponding reed device at the telephone or substation by B. The reeds *a* and *b* of each, respectively, are of the same fundamental tone or pitch and have the same vibratory action—that is, they vibrate in harmony with the same

number of vibrations per second. Telephone No. 2 has similar selecting devices, but with the exception that the reeds a' and b' , respectively, are of a different tone or pitch from a and b —that is, with a greater or less vibratory action than in telephone No. 1. These reeds a' and b' are shown here as being a trifle longer than reeds a and b to indicate the difference between the two; but in reality it requires but a little modification in size or weight to vary the harmonic pitch or vibratory action of the reeds in the various telephones.

The calling or selecting of one telephone among two or more on a line is done by the operator at the central by merely "plugging in" and establishing a circuit between the exchange apparatus and the line and then depressing the key c to close the circuit which operates the selective device. By this operation the various parts are set in motion, and in turn a new or branch circuit is established at the substation for ringing the call-bell and at the same time unlocking the telephone, (which was locked when the operator inserted the plug into the line-socket by the operation of the central-office-battery current through the back contact on key c), so that the subscriber called can open communication on the line. The various circuits and the parts they operate are as follows:

First. The circuit which is established by depressing the key c at central to operate magnet A and which attracts reed a to make contact at contact-point e . This initial circuit is indicated in Fig. 1 by arrows 1.

Second. The circuit established by reed a and contact e and shown by arrows 2. This circuit extends from central to the telephone called, whichever one it may be, and, assuming that it is to No. 1, it is along the arrows 2 and transmits rythmical impulses of current, which when of just the right period and duration serve to operate electromagnet B and reed b .

Third. The circuit shown by arrows 3 and created by the vibrating reed b coming into contact with the contact-spring f . This circuit is established to operate electromagnet l by the local (telephone or other) battery k for the purpose of attracting the armature extension m into contact at n , p , and w . These contacts serve to simultaneously establish the fourth, fifth, and sixth circuits, which are shown in Fig. 2 for greater convenience and to avoid confusion, though present in Fig. 1.

Fourth. The fourth circuit (shown by arrows 4) is established at contact n and armature extension m and serve as a path or branch circuit for transmitting the ringing-currents from the line D to the call-bell o of the telephone.

Fifth. The fifth circuit (shown by arrows 5) is established by armature extension m and contacts n and p and serves to maintain the local-battery circuit through the electromagnet l , keeping the armature extension m

in contact at n , p , and w , and this serves to keep the call-bells in circuit on line 4 and continuing until the local circuit 5 is broken at j , when the subscriber removes the receiver or ear-phone h from the hook g .

Sixth. The sixth circuit is shown by arrows 6 and is established by armature extension m coming into contact at w and establishing a shunt or "short" circuit across the terminals of the electromagnet v , thereby preventing the current from flowing through the magnet to attract the locking-armature s and locking the hook g .

Seventh. The seventh circuit is established to maintain a constant current over the entire party-line when that line is connected at the central station for communication, and is shown by arrows 7 in Fig. 1. This circuit 7 is for the purpose of keeping a current flowing through the locking-magnets v of the uncalled telephones to lock all the hooks g , so as to prevent any of the uncalled telephones being used or intruding upon or interrupting the one which has been called. This circuit 7 is shunted, as described, over circuit 6 in the telephone that has been called, and thus all the telephones but the one called are "locked out." When the subscriber removes the receiver h from hook g , contact is broken at j and all the circuits with the exception of 7 are broken, the various parts returning to their first or normal position.

Circuits 1, 2, and 3 are of but a few seconds' duration, or just so long as the operator keeps the key c depressed. Circuits 4, 5, and 6 continue until the subscriber removes the receiver from the hook to open communication over the line. Circuit 7 is on until the operator disconnects the line at the central station by removing the plug from the line-socket.

Now, having separated the several circuits and indicated their function, the operation will be clearly understood and is as follows: Suppose, for example, the operator at the central office has a call for telephone No. 1. She "plugs in" on that particular party-line and then depresses the key c , which completes or closes the circuit indicated by arrows 1 in Fig. 1. This circuit extends through reed a to contact d , which is the normal contact-point of said reed, and thence by the arrows 1 to coil A. Said coil in turn attracts reed a to itself and establishes contact at e and thereby completes circuit 2. Then as the current is cut off from the coil A on line 1 the reed a will spring back to its normal position against contact d , and the operation will be repeated and continued so long as the operator keeps the key c depressed and circuit 1 closed. Each vibration of the reed a will make contact at e , and a momentary impulse of current from the battery C will be transmitted over the line 2 to the substation-magnet B, and the reed b being in harmonic sympathy with reed a each successive impulse of current will produce a corresponding pull on reed b at regular intervals and in synchronism with the vibrations

of reed *a*, thereby augmenting the range of motion of the reed *b* until the contact *f* is reached. When the vibrations of reed *b* have attained a sufficient range of movement to make contact at *f*, the local circuit 3 is momentarily closed. The local circuit 3 extends from contact *f* over line 3 through the telephone hook or support arm *g*, holding the receiver *h*, thence through contact *j*, line 3, local battery *k*, magnet *l*, and back through the reed *b* to contact *f*. This circuit sends the current from battery *k* through the electromagnet *l*, attracting the armature of the same and thereby closing the local circuit 5 and maintaining it independently of contact *f*, and at the same time establishing and maintaining the ringing or calling circuit 4 through the contacts and lines shown in Fig. 2. This so continues until the receiver is taken from the hook by the subscriber and the circuit is interrupted at *j*. When the armature of magnet *l* is attracted, its extension *m* makes contact at *n* for the ringing-circuit on line 4. This circuit extends from the proper generating source at the central office through the key *c*, or otherwise, over line 4 to the call-bells *e* and back over the line to central, the local circuit extending over lines 5, through local battery *k*, contact *j* on receiver-hook *g*, through armature extension *m* at contacts *n* and *p*, over line 5, through electromagnet *l*, and back to battery *k*, causing the magnet to hold armature down and keeping contacts *n* and *p* closed, thus providing a continuous ringing-circuit over line 4 until the receiver *h* is removed from the hook *g*. The hook is then drawn up by the spring *r* and contact is broken at *j*. This restores the various parts to their original or normal position and the subscriber is free to communicate over the line.

When two or more parties are on a single line, it occasionally happens that two of them desire to use the line at the same time; but as this cannot be done it is desirable to lock out all but one or any two intercommunicating on the same line, so that strict privacy of communication can be had. Such a device or arrangement constitutes a part of my invention, in combination with the selective feature above described. The arrangement and operation of the device is as follows: After the key *c* at the central has been depressed and the various parts of the apparatus at the substation have operated the key is permitted to assume its normal position against contact *x*. A circuit will be established extending from the office-battery *C*, over line 4, to main line *D*, where it will divide into branch circuits through the various telephones on the line, as shown by arrows 7 in telephone No. 2, Fig. 1. This circuit 7 passes from the main line *D* to the magnet *v* at the substation and back again to the main line through electromagnet *B*. The magnet *v* attracts the armature *s*, which is provided with a hook or stop adapted to engage directly with the arm

of the receiver-hook while the latter is in its normal position of rest with the receiver *h* on its hook, thus locking the receiver-hook and preventing its going up and making contact at *t* for communication over the line. This operation is the same for each telephone on the line, except in the case of any one having been "selected" for talking, which latter condition is shown in Fig. 1. This one must remain unlocked while the others are locked, and this is done by shunting the current around or past the locking-magnet *v* in the telephone called, permitting its armature to be drawn back by the spring and out of engagement with the telephone-support arm. This shunt-circuit is shown in Fig. 2 and is formed by the line 6, contact *w*, and armature extension *m*, with the latter down as when that particular telephone has been selected or called, as hereinbefore described. When the receiver is taken from the hook and the latter is drawn up by its tension-spring, the local circuit 3 is interrupted at *j* and the original condition of the line restored. When through talking, the subscriber gives the usual "ring-off" signal, whereupon the operator at the central withdraws the plug from the line-circuit, disconnecting it from the battery, and thereby unlocking all the telephones on that line and permitting a fresh call to be made from any of the substations.

In Fig. 3 an enlarged detail is shown of one of the reed-magnets and its contacts. Any change in structure or design in the magnets may be made, of course, and a tuning-fork may be substituted for the musical reed, as any special design of the magnets may suggest, without affecting the identity or spirit of the invention. The reed-magnet contacts are here shown as screws having conical springs at their ends, but these might also be changed. The object of the cone-shaped spiral-spring contact is to maintain the connection long enough to overcome the inertia and to more certainly operate the armature of the electromagnet *l*, the spiral being of such weight and elasticity as to follow the motions of the reed without materially affecting the uniformity of its vibrations. The contact *f* of reed *b* must of necessity be so adjusted that contact is made only after several vibrations of the reed have taken place and its amplitude sufficiently increased. This would necessarily occupy but a very small fraction of a second's time. Each impulse of current on the line from the transmitting-battery *C* will tend to vibrate all the reeds on the line, but in accordance with the well-known law of harmonics that particular reed only which is of the same fundamental tone or pitch as the corresponding transmitting-reed will respond with action or increase in amplitude, and thus make contact at *f* for operating the local circuit and apparatus.

I claim—

1. In a telephone party-line harmonic selector signaling device, the combination of a

normally-closed main or line circuit; an electromagnet and a vibrating reed-armature at the central station, and a key for connecting the same with the line-circuit, a corresponding
 5 ing electromagnet and reed-armature at a substation adapted to close an independent local-battery circuit; an electromagnet in said local circuit having a contact-making armature adapted to automatically close and maintain
 10 the local-battery circuit within itself and as a shunt around or past the reed-armature contact, substantially as described.

2. In a telephone party-line harmonic selector signaling and lock-out device, the combination at the substation of an electromagnet with vibrating reed-armature adapted to vibrate in unison with a corresponding reed-armature at the central station; a circuit-closing contact on said reed-armature capable
 20 of closing, under ample vibration, a local-battery circuit independent of the line-circuit and of which said reed-armature constitutes a part; an electromagnet with contact-armature included in said local-battery circuit responsive to current impulses from the
 25 local battery on momentary contact of said reed-armature, and said contact-armature adapted to close and maintain the local-battery circuit within itself independent of said
 30 reed-armature, substantially as described.

3. In a telephone party-line harmonic selector signaling and lock-out device, the combination at the substation of a vibrating reed-armature, a local-battery circuit, the telephone-support arm included in said local-battery circuit and adapted to open or break
 35 said local circuit by removing the telephone-receiver from the hook, an electromagnet and circuit-closing armature included in said local circuit and adapted to close and maintain the local circuit within itself, through
 40 and including said telephone-support arm, substantially as described.

4. In a telephone party-line harmonic selector signaling and lock-out device, the combination at the substation of an electromagnet having a circuit-closing reed-armature in the main circuit, a local-battery circuit, the telephone-receiver support-arm and an electromagnet with contact-making armature included in said local circuit, said contact-armature adapted to close and maintain a
 50 shunt to the main or line circuit through and including the ordinary telephone-bell, substantially as described.
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5. In a telephone party-line harmonic selector signaling and lock-out device the combination at the substation of an electromagnet with reed-armature, a local-battery circuit, an electromagnet with contact-making

armature included in said local circuit actuated by contact makes of the said reed-armature, said contact-armature adapted to not only close and maintain the local circuit within itself but also to establish and maintain a new or shunt circuit to the main line through and including the ordinary telephone-bell, or other signaling device, substantially as described.

6. In a telephone party-line harmonic selector signaling and lock-out device the combination of a normally-closed main-line circuit, a constant current flowing in said circuit when connected at the central station for talking, an electromagnet with reed-armature at the substation included in said main-line circuit, a separate electromagnet with a hook or locking-lever armature connected in series with the said reed-armature electromagnet in the main-line circuit, said
 70 separate electromagnet responsive to said constant current, the ordinary telephone-support arm or fork, said locking-armature adapted to directly engage with and prevent the raising of said telephone fork or support
 75 arm so long as it is actuated by the main-line current, substantially as described.

7. In a telephone party-line harmonic selector signaling and lock-out device the combination of a normally-closed main-line circuit, a constant current flowing in said main-line circuit, the ordinary telephone-support arm, an electromagnet with locking-lever armature adapted to engage directly with said telephone-support arm while in its position
 90 of rest with the telephone in its place, a local or independent battery circuit, an electromagnet with reed-armature in series with said locking-electromagnet in the main-line circuit, said reed-armature adapted to close
 95 said local circuit, a third electromagnet with circuit-closing armature included in said local-battery circuit and responsive to the action of said reed-armature, whereby it closes the local circuit upon itself, a shunt or bridge
 100 contact on said circuit - closing armature, which, when closed, diverts or shunts the main-line current away from or past the locking-electromagnet, permitting its locking-armature to be withdrawn from engagement
 105 with the telephone-support arm and thereby unlocking the telephone, substantially as described.

Witness my hand to the foregoing specification this 1st day of August, 1896.

WILLIAM H. HARTER.

Witnesses:

E. G. BOUGHTON,
 LENA M. BOUGHTON.