L. E. HICKS.

TELEPHONE SYSTEM.

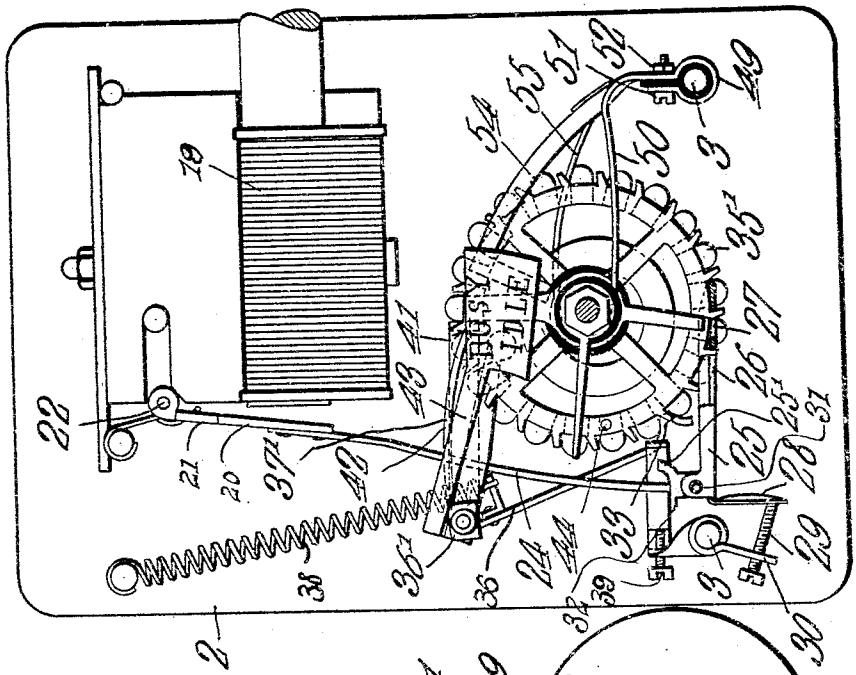
APPLICATION FILED JULY 30, 1908.

**958,248.**

Patented May 17, 1910.

4 SHEETS—SHEET 1.

Fig. 3.



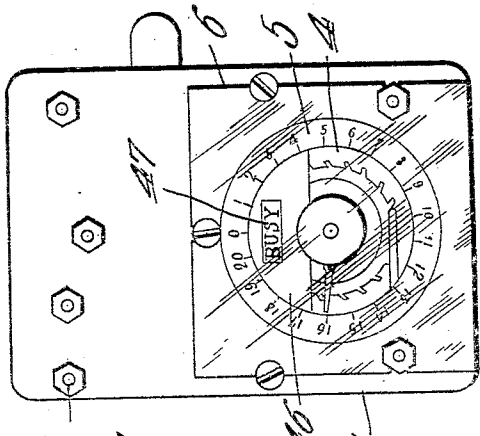


Fig. 1.

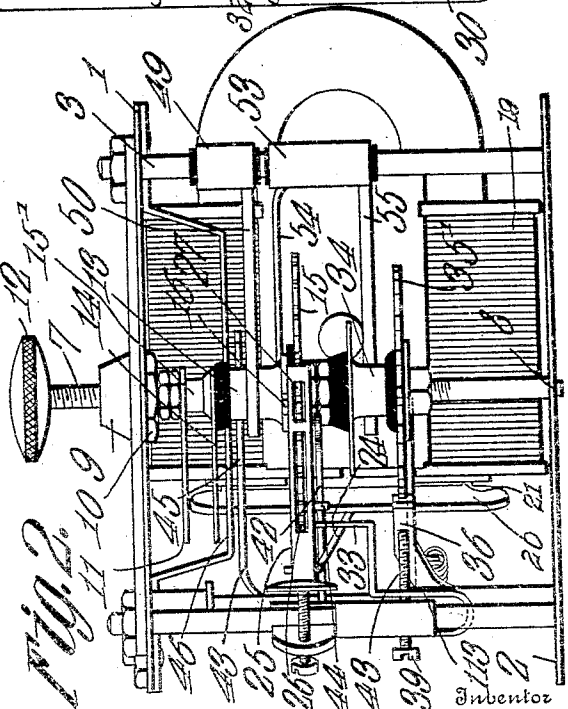


Fig. 2.

Witnesses

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4 SHEETS—SHEET 2.

Fig. 4.

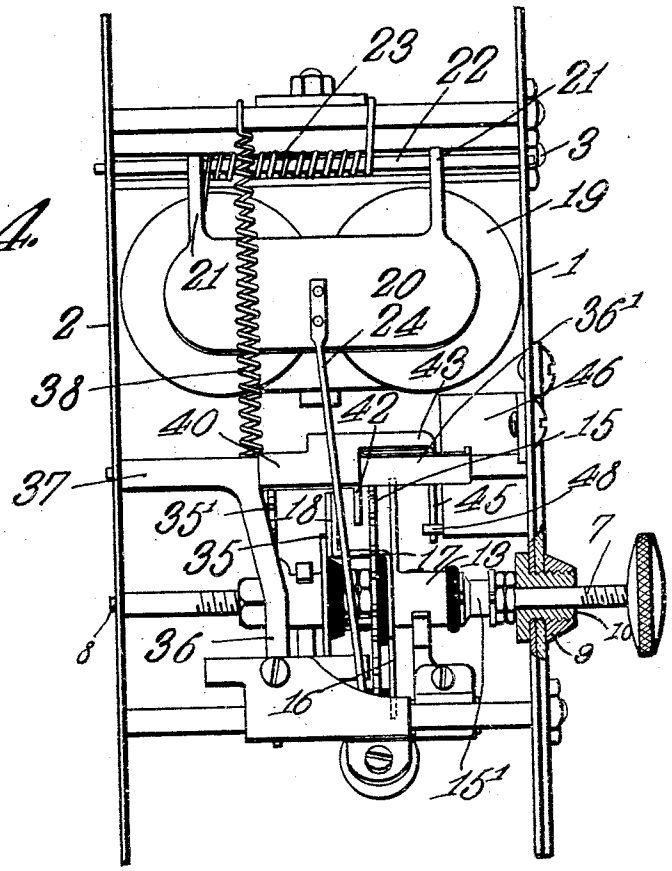



Fig. 7.

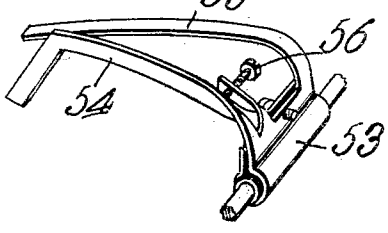
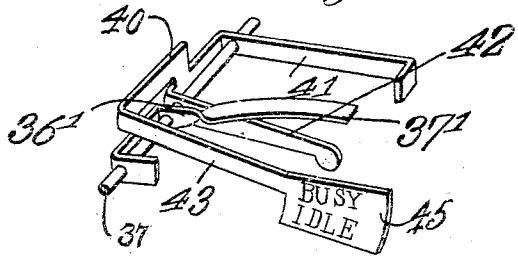



Fig. 8.

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4 SHEETS—SHEET 3.

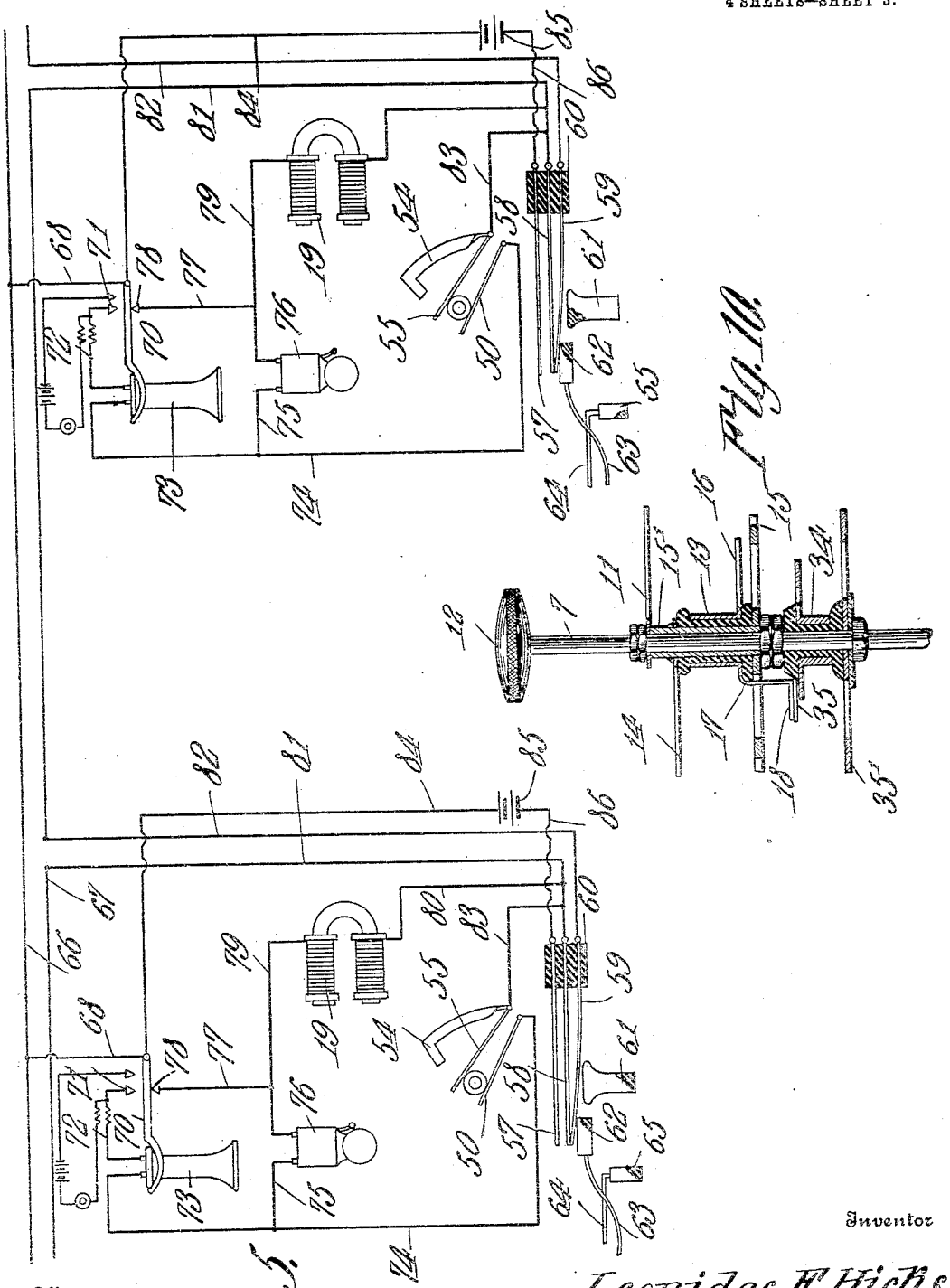

Fig. 1.



Fig. 10.

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4 SHEETS—SHEET 4.

Fig. 6.

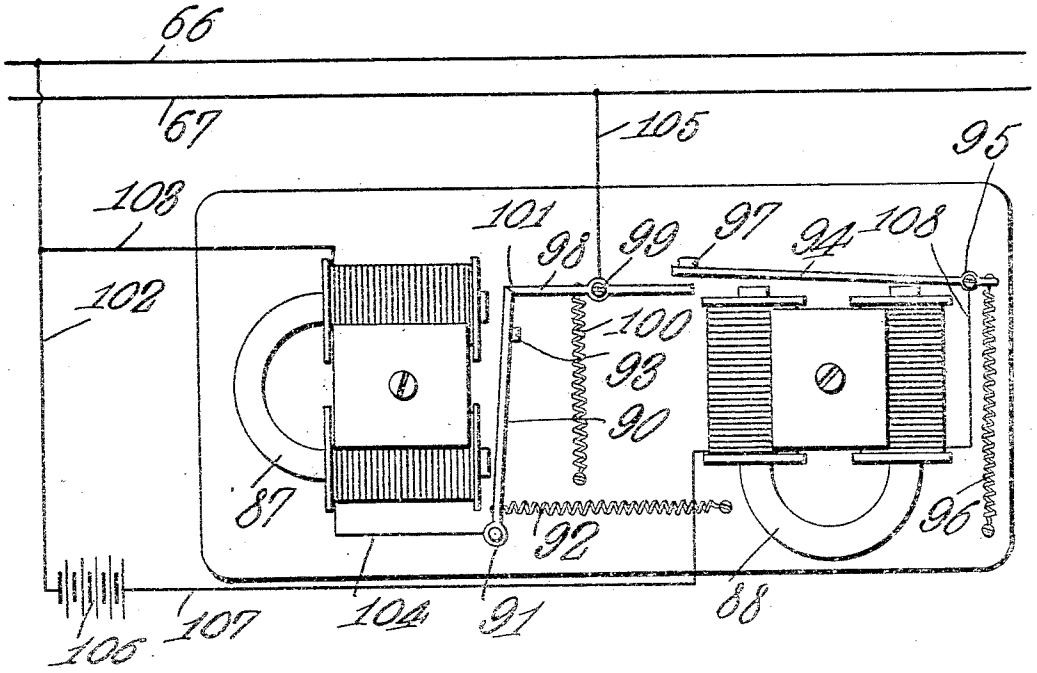
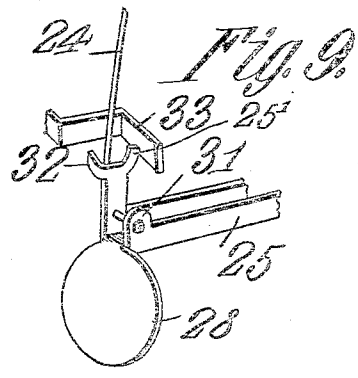



Fig. 9.




Witnesses

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# UNITED STATES PATENT OFFICE.

LEONIDAS E. HICKS, OF STINSON, WEST VIRGINIA.

## TELEPHONE SYSTEM.

958,248. Specification of Letters Patent. Patented May 17, 1910.

Application filed July 30, 1908. Serial No. 446,139.

*To all whom it may concern:*

Be it known that I, LEONIDAS E. HICKS, a citizen of the United States, residing at Stinson, in the county of Calhoun and State of West Virginia, have invented a new and useful Telephone System, of which the following is a specification.

This invention has reference to improvements in telephone system and is designed more particularly to insure privacy in multi-party telephone lines.

The present invention provides means whereby any subscriber upon a line may call up any other subscriber on the same line, at the same time cutting out all other subscribers except the one desired. Furthermore, provision is made whereby a subscriber may call up central for connection to some other line and by means of an apparatus located at the central office the operator there may call up any one of a number of subscribers on a multi-party line and cut out all intermediate subscribers, and those beyond the two parties wishing to converse so that eavesdropping or interference from other subscribers is prevented. Moreover provision is made for notifying all other subscribers of the fact that the line is in use.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, in which drawing—

Figure 1 is a plan view of the selecting mechanism taken from the dial side. Fig. 2 is a side elevation of the same on a somewhat larger scale. Fig. 3 is a plan view of the structures shown in Figs. 1 and 2 with the cover plate removed and some parts shown in section. Fig. 4 is a view of the structures of Figs. 1, 2 and 3 taken at right angles to the showing of Fig. 2. Fig. 5 is a diagrammatic view of the electric circuit at two subscribers' stations. Fig. 6 is a diagrammatic view of certain apparatus peculiar to the central station, some parts being shown in elevation. Figs. 7, 8 and 9 are detail perspective views. Fig. 10 is a detail section through the manually operated setting part of the selecting mechanism.

Referring to the drawings, the first more particularly to Figs. 1, 2, 3, and 4, there are shown two spaced plates 1 and 2 secured together in separated relation by suitable posts 3. The plate 1 is provided near one end with a circular opening 4 through which portions of the interior mechanism are visible, and this opening is surrounded by a scale 5, the purpose of which will hereinafter appear. The scale 5 and opening 4 are covered by a glass plate 6 serving as a protection for the scale, as a bearing support hereinafter described, and preventing access to the interior of the mechanism although permitting the ready observation of the same.

Extending centrally through the glass plate 6, and concentric with the opening 4 is a shaft 7 having step bearings in the plate 2 as indicated at 8. The shaft 7 is provided with bearings in the glass plate by means of a collar 9 on one side of the glass plate into which is screwed a bushing 10 on the other side of the glass plate, the bearings being thus clamped to said plate, which latter is provided with a suitable opening for the passage of the bushing 10.

Below the bushing 10 the shaft 7 has secured thereto an indicating hand or pointer 11 so that when the shaft is turned the hand 11 will rotate therewith. The hand 11 is designed to cöoperate with the index 5, which latter is provided with an annular series of numbers or other indication, and the hand, being visible through the opening 4, may be brought into coincidence with any one or more of the numbers in succession. At the accessible end of the shaft 7 beyond the collar 9 there is a button 12 by means of which the shaft may be rotated. In practice this button may be made of hard rubber or any other suitable material in any convenient or ornamental shape.

Below the pointer 11 the shaft carries a ratchet wheel 15 having as many teeth as there are indications on the index 5 and mounted upon a sleeve 15′ which extends upward from the wheel, the upper end of said sleeve being adjacent to the pointer 11. The sleeve 15 is capable of rotating independently of the shaft and another conducting sleeve 13 is carried upon and made fast to the sleeve 15′ but is, however, insulated therefrom. And upon the end of the sleeve 15′ adjacent to the pointer 11 is firmly secured another pointer 14 rotatable with said sleeve 15′ and ratchet wheel 15. Projecting radially from the sleeve 13 at the end thereof adjacent to the ratchet wheel 15 is a conducting finger 16 and extending from the sleeve 13 through a portion of the ratchet wheel is a small arm 17 which after having

been carried through said wheel is then bent at right angles to itself and terminates in a finger 18 extending radially with relation to the axis of the shaft 7.

Suitably secured between the plates 1 and 2 is an electromagnet 19 in operative relation to which is an armature 20 carried by arms 21 projecting radially from an armature shaft 22 suitably journaled in the plates 1 and 2. The shaft 22 is under the normal control of a spring 23 tending at all times to keep the armature away from the poles of the magnet 19. Fast on and extending from the armature in a direction away from the shaft 22 is a rod 24 having pivotally secured at its free end a pawl 25 in operative relation to the ratchet wheel 15 before mentioned. This pawl is formed to straddle the ratchet wheel and is provided with two slots 26 and 27 in line one with the other. The slot 27 is near the end of the pawl 25 and is of such size as to readily receive a single tooth of the wheel 15, the other slot 26 receiving one or more adjacent teeth, while the walls of the slot 27 will prevent more than one tooth at a time entering the said slot and consequently the pawl will act upon the ratchet wheel 15, when operating the same, to move it a distance of but one tooth at a time.

The pawl 25 is provided with an angle plate 28 in the path of which is an adjustable back stop screw 29 extending through an ear 30 fast on one of the posts 3 connecting the plates 1 and 2. The rod 24 and the pawl 25 are connected together by means of a pivot eye 31, and movement of the pawl about its pivot in one direction is limited by means of a stop 33 engaging the rod 24. The pawl 25 is also provided with a finger 25′ which is opposite to the finger 32 and on the side of the rod 24 adjacent to a bracket 33 which bracket is in the path of the said finger 25′ and is carried by the same post 3 on which the ear 30 is mounted and is adjustable by means of a set screw 39.

The stop or bracket 33 is made elastic by being returned upon itself as indicated at 113 and the screw 39 passes through one leg of this returned end portion of the bracket so that the active end of the bracket where engaged by the finger 25′ may be adjusted to and fro with relation to said finger to permit a greater or less movement of the pawl 25.

The instrument as a whole will occupy the relative position shown in Fig. 3, that is with the ratchet wheel lowermost and the pawl below the ratchet wheel. The tendency of the spring 23 to hold the armature away from the poles of the magnet serves to hold the pawl 25 in the position shown in Fig. 3 that is with the angle extension 28 engaging the screw 29, and in this position the pawl is forced toward the ratchet wheel with one of the teeth extending through the slot 27. If now the magnet be energized the armature is attracted against the action of the spring 23 and as soon as the angle extension is free from the back stop screw 29, the free end of the pawl 25 will drop away from the ratchet wheel 15. The movement of the pawl 25 away from the ratchet wheel 15 is controlled by the finger 32, but this movement is sufficient to free the pawl from the ratchet wheel. The pawl is now moved forward until stopped by the bracket 33 engaging the finger 25′ which, acting as a lever, raises the pawl again into engagement with the teeth of the ratchet wheel, the movement being such that the slot 27 receives the next tooth to the one first engaged thereby. Now when the magnet is deënergized, the spring returns the armature to its original position, and the pawl 25 is caused thereby to move in a direction to rotate the ratchet wheel. In order to prevent the pawl from escaping from the teeth of the ratchet wheel in this active movement, these teeth are slightly inclined as indicated in the drawings, and the angle plate 28 of the pawl 25 extending downward in a direction away from the armature shaft 22 by its weight tends to raise the pawl into engagement with the teeth of the ratchet wheel and to hold it there. The return movement of the armature and pawl under the action of the spring 23 is arrested by the back stop screw 29 which also serves to maintain the pawl in engagement with the teeth of the ratchet wheel 15, and thus prevent any farther movement of the latter. By successively energizing and deënergizing the magnet 19 the ratchet wheel is caused to rotate in one direction step by step to the desired extent as will hereinafter appear.

Fast on but insulated from the shaft 7, and on the side of the ratchet wheel remote from the button 12 is another sleeve 34 carrying an elastic contact brush 35 in the path of the finger 18 before described. Finally there is secured to the shaft 7 near the step end 8, a toothed wheel 35′, in the path of the teeth of which is a pawl 36, fast on and projecting from a rock shaft 37 journaled at its ends in the plates 1 and 2. The pawl 36 is held in elastic engagement with the teeth of the wheel 35′ by means of a suitable spring 38 controlling the rock shaft 37. The teeth of the wheel 35′ are rounded and the pawl 36 is correspondingly rounded so as to not interfere with the rotation of the wheel when force enough is applied to rotate it but at the same time preventing rotation of the wheel and the shaft under a force insufficient to cause the pawl 36 to ride out from between the teeth of the said wheel.

Mounted loosely on the rock shaft 37 ad-

jacent to the pawl arm 36 is a yoke 40 from which projects three spaced arms 41, 42, and 43. The arm 41 terminates in a tongue adapted to enter between the teeth of the wheel 35′, the arm 42 is in the path of a pin 44 projecting from the under face of the ratchet wheel 15 near the periphery thereof, and the arm 43 terminates in a plate 45 upon which may be displayed the words "Idle" and "Busy."

Fast on the under side of the plate 1 of the frame of the structure is a diaphragm 46 close behind which the plate 45 is located. The diaphragm 46 is provided with a slot 47 through which either the word "Idle" or the word "Busy" may be made visible, but not both at the same time. When the pin 44 on the ratchet wheel 15 engages the arm 42, then the yoke 40 is rocked and the plate 45 is moved to a position where the word "Idle" is visible through the slot 47. At the same time, the arm 41 is so moved that its free end is no longer between two of the teeth of the wheel 35′ and this wheel may then be rotated, since when the end of the arm 41 is between any two teeth of the wheel, the latter is locked against rotation. When the pin 44 is out of engagement with the arm 42, then the end of the arm 41 again drops between two of the teeth of the wheel 35′ and the "Busy" sign is again displayed. A stop 48 on the under side of the diaphragm 46 limits the movement of the plate 45, and the arms 41, 42 and 43 in a corresponding direction, the arms being normally moved by gravity, when not under the control of the pin 44, though a spring may be used for the same purpose if so desired. There is also loosely mounted upon the rock shaft 37 adjacent the arm 42 and between the said arm 42 and the arm 43 a pawl 36′ the free end 37′ of which is in the path of the teeth of the ratchet wheel 15 and engages the teeth of the said ratchet wheel and prevents it from rotating backward when the pawl 25 is moved against it by the energy of the magnet 19. The pawl 36′ is moved by gravity into engagement with the teeth of the ratchet wheel 15, though a spring may be used if so desired.

Secured to but insulated from one of the posts 3 is a collar 49 carrying a conducting brush 50 in electrical engagement with the sleeve 13. This collar is clamped tight to the post 3 with an intervening insulation by means of a suitable screw 51 which may project a distance beyond its engagement with the collar to there receive a clamp nut 52, for the attachment thereto of an electrical conductor. Also carried by the same post 3 which carries the collar 49, is another collar 53 suitably insulated from the said post 3 and this collar carries two spaced elastic brushes 54 and 55. The brush 54 is elastic in the direction of the length of the axis of the shaft 7, and its free end is in the path of the finger 16 carried by the collar 13. The brush 55 is elastic in the direction at right angles to the direction of the axis of the shaft 7 and is in electrical contact with the sleeve 34 before referred to. The brush 54 may be adjusted to a nicety by means of an adjusting screw 56 carried by the collar 53 in an arm projecting from said collar.

In connection with the structure so far described, there is used a series of three spring brushes 57, 58 and 59, which may be in the form of ordinary leaf springs arranged close to each other in parallel relation and all firmly fixed at one end where they are separated by insulating blocks 60. These three leaf springs are under the control of a suitable push button 61, whereby they all may be brought into electrical contact. The spring brushes 58 and 59 are also under the control of a switching mechanism consisting of an insulating block 62 on the end of a spring arm 63 suitably bent to be controlled by a lever 64 pivoted at one end and at the other end provided with a manipulating handle 65. This device is so arranged that when the lever 65 is moved in a direction to engage the arm 63, the latter is actuated against the tendency of its elasticity and the insulating head 62 is brought into contact with the spring brush 59 and forces the same into contact with the spring brush 58, but the movement of the structure is not sufficient to cause contact between the spring brushes 58 and 57.

In Fig. 5 the line wires are indicated at 66 and 67, and are assumed to be attached to each subscriber's telephone instrument in the particular branch considered, there being from two to any desired number of subscribers on a single line, thus constituting a multi-party line. Two subscribers' stations are shown in this figure.

The conductor 66 is connected by a conductor 68 to the telephone hook 70, and under the control of this hook is contact 71 connected by a conductor 72 to the receiver 73. The transmitter and its circuit have been omitted from the drawings as being unnecessary for the understanding of the invention, since they may be of the ordinary type. The receiver has its other side connected by a conductor 74 to the brush 50 before referred to. The conductor 74 is connected by a conductor 75 to a bell 76, and the other side of the bell is connected by another conductor 77 to a contact 78 under the control of the telephone hook 70. This same contact 78 is connected by a conductor 79 branched off from the conductor 77 to one side of the magnet 19, and the other side of this magnet is connected by a conductor 80 to the spring brush 58, which latter is connected by a conductor 81 to the conductor 67 at one side of the break in the con-

tinuity thereof. The other side of the gap in the conductor 67 is connected by the conductor 82 to the spring brush 59. The spring brush 58 is also connected by the conductor 83 to the contact brush 54 before referred to, and as the brushes 54 and 55 are in electrical connection, this same brush 58 is therefore, by the conductor 83, in electrical connection with both brushes 54 and 55. The spring brush 57 is connected by the conductor 86 to the small battery 85 which in turn is connected by a conductor 84 to a conductor 68 which in turn is connected to the line conductor 66.

At the central station is located the apparatus shown in Fig. 6 in addition to the set such as has been described, which set is located at each subscriber's station. In this apparatus, there are two electromagnets 87 and 88 mounted upon a suitable base which may be made of some insulating material such as glass, porcelain or hard rubber. In operative relation to the magnet 87 is an armature 90 mounted at one end upon pivot support 91, and under the normal control of a spring 92 tending at all times to move the armature away from the poles of the magnet. Near the free end of the armature 90 on the side remote from the magnet is a back stop 93.

In operative relation to the magnet 88 is an armature 94 mounted at one end upon a pivot pin 95, and under the control of a suitable spring 96 tending to move the armature away from the polar ends of the magnet 88. At the free end of the armature 94 there is a back stop 97 on the side of the armature remote from the magnet 88. The magnet 88 is in such position that its armature 94 is at right angles to the armature 90, and the free end of the armature 94 toward the free end of the armature 90, these free ends being separated by, say, the space of an inch. The space between the free ends of the armatures 90 and 94 is spanned by a contact lever 98 mounted at its center upon a pivot pin 99 and under the control of a suitable spring 100 tending to move the contact on its pivot so that one end 101 of the said contact will engage with the free end of the armature 90 while the other end 101 will engage the free end of the armature 94, the free ends of these armatures being in the path of the ends of the said contact, but the arrangement is such that the said contact cannot be connected with both of the said armatures at once. Since the base is made of insulating material, the parts before mentioned as secured thereto need no further insulating.

The main line conductor 66 is connected to one side of the magnet 87 by the conductors 102 and 103 and the other side of the said magnet is connected to the armature 90 by the conductor 104. The armature 90 and the contact 98 are capable of electrical connection, and the said contact is connected to the other main line conductor 67 by the conductor 105. The conductor 102 connects the line conductor 66 and a battery 106, the other side of the battery 106 being connected by a conductor 107 to one side of the magnet 88, and the other side of the said magnet is connected by a conductor 108 to the armature 94, which armature is capable of connection with the contact 98 which is in turn connected by the conductor 105 to the line conductor 67.

Let it be assumed that the dial 5 contains enough indications for a zero position which may be indicated by zero and for central which may be indicated, say by 1, and for a number of subscribers, say from 2 to 20 of the dial indications, the showing of the drawings being from zero to twenty. The number of teeth in the ratchet wheel 15 and the number of teeth in the wheel 35′ will agree with the number of the dial indications.

The index or hand 14 is so located with reference to the pin 44 that when the hand points to zero the pin 44 is in engagement with the arm 41 and the wheel 35′ is thereby unlocked, and the word "idle" is displayed at the slot 47. When the parts are in this position the contact finger 16 will point to some one number on the dial 5 which is the number of the station under consideration, each separate station on the same line having a different number and the finger 16 of the several stations being differently located for this purpose, the location of the finger corresponding to the particular number of the station, and such finger points to such number when the pointer 14 is at zero.

The wheel 35′ is unlocked when the pointer 14 indicates zero and then the shaft 7 may be rotated by means of the knob 12 to any desired position.

It will be understood that the fingers 16 and 18 are located at different points with reference to each other in the different instruments on the same branch of the line so that when the fingers 18 are all pointing to the same indication on the dial and the pointers 11 and 14 are at zero, the fingers 16 do not point to the same indication in any two instruments on the line and these fingers 16 are therefore at different points with reference to each other, but the finger 16 in some one of the instruments on a full and complete line is in contact with the brush 54 and such contact takes place in turn in all the stations.

To operate the system, the shaft 7 is turned until the pointer 11 indicates the number of the telephone station on the line which it is desired to call up. This movement of the shaft 7 also carries the contact 35 a corresponding distance from the contact

18, these two contacts being normally in engagement when the pointer 11 is at zero.

Assuming that the apparatus of Fig. 6 is not installed in the system then the battery 85 is made strong enough to ring all the call bells and energize all the magnets 19 of the line, and the connections are made in the following manner.

The push button 61 is manipulated to close the circuit between the brushes 57 and 58, it being understood that the lever 64 is normally in a position to bring the block 62 into contact with the spring 59 and force the same into contact with the spring 58 so that under normal conditions the circuit is closed between the two springs 58 and 59. Therefore when the push button 61 is actuated there is a circuit established from the battery 85 by the conductor 86 to the spring 57, thence to the spring 58 and by conductor 80 to the magnets 19 returning by the conductors 79 to the contacts 78 and receiver hook 70, the receiver, of course, being on the hook 70, and from the hook 70 the circuit may be traced by the conductor 84 back to the battery 85. This energizes the magnet 19 and the rachet wheel controlled thereby is turned a distance of one tooth, and by then manipulating the push button 61 the requisite number of times the pointer 14 is brought into coincidence with the pointer 11 and the contact arm or finger 18 is brought into engagement with the spring contact 35 carried by the sleeve 34. Since the contact finger 18 is in electrical connection with the sleeve 13 and the contact finger 35 is in electrical connection with the sleeve 34 there is therefore now established a circuit from the sleeve 13 to the sleeve 34 and betweeen the spring brushes 50 and 55. While this is occurring impulses are sent to line through the conductors 81 and 82, in each direction, returning through the conductors 68 and 84 to the battery 85, and the particular instrument or station having the number to which the index has been moved has its ratchet wheel 15 moved correspondingly so that the brushes 16 and 54 at that particular station are then in engagement. Of course all the other instruments or stations on the line have been caused to operate in like manner and in some instances the brushes 16 may have made engagement with the brushes 54 but have moved again out of engagement therewith.

The ringing circuits of the two particular stations under consideration are now coupled together, the circuit to line being completed at the home station through the fingers 18 and 35 and at the distant stations through the brushes 16 and 54. By holding down the push-button 61 on the last impulse given to it for a considerable time a steady current flows through the ringing circuit and the bell 76 being of the ordinary trembler type will ring and so give the necessary signal at the called station. This circuit may be traced from the battery 85 at the calling station, to the brushes 57 and 58, thence by conductors 81 or 82 to the main 67, and to the called station, entering to the brushes 58 or 59 as the case may be thence by conductor 83 to the brush 54, brush 16, brush 50, conductors 74 and 75, bell 76, conductor 77, contact 78, hook 70, conductor 68 to the main 66, returning to the calling station, thence by the conductor 68 and conductor 84 back to the battery 85. The signal having been given the receivers may now be lifted off the hooks and conversation may be carried on in the usual manner.

The talking circuit may be traced from the telephone 73, the current being caused in the usual manner through the usual induction coil, through the hook 70, thence by conductor 68 to the main 66, to the calling station, thence by conductor 68 there located to the hook 70, telephone 73, conductor 74, brush 50, brush 16, brush 54, conductor 83, conductor 81 or 82 back to the calling station, conductors 81 or 82 there located, brushes 58 or 59 or both, conductor 83, brush 55, contacts 18 and 35, brush 50, conductor 74, back to the telephone 73 at the calling station.

Since the talking circuit is only completed through the brushes 50 and 55 at the calling station, and the brushes 16 and 54 at the called station after the ratchet wheel has been impelled a sufficient number of times corresponding to the number of the particular station desired, it will be seen that all the other stations are out of circuit and eavesdropping is thereby prevented.

When the calling subscriber has finished he may again depress the button 61 the requisite number of times until all the instruments have again reached the zero position. If the calling subscriber fails to do it any other subscriber whose intrument has been disturbed may do the same thing.

When it is desired to operate the instruments from a central station the apparatus shown in Fig. 6 is installed and is used both for causing the movement of the local instruments and for ringing the call bells at the local station. In such case the battery 85 at the subscriber's station is used to energize the magnet 87 only and this magnet being normally in a bridge of the line it is purposely wound to such a low resistance as compared with the other magnets that the greater portion of the electric current from the battery 85 will flow through the coils of the magnet 87 and not through the coils of the other magnets on the line in sufficient quantity to operatively energize the said other magnets, the battery 85 at each subscriber's station being purposely too weak when the central station structure of Fig. 6 is installed in the system to operate any of

the magnets but the magnet 87. At the central station the large battery 106 is for the purpose of operating the instruments and ringing the call bells while the small battery 85 at each station is then used only to make the connections of the large battery with the telephone line when it is desired to call the other stations.

It is assumed that the dial 5 has enough indications for a zero position and for central, say indication 1, and for a number of subscribers say indications 2 to 20, the number of teeth in the ratchet wheel and in the wheel 35′ at each station agreeing with the said indications. Then in order to call up another station through the central mechanism the switch 64 is first moved to a position to permit the spring contacts 58 and 59 to separate and the push-button 61 is then depressed to bring the several spring contacts 57, 58 and 59 together. This couples up the small battery 85 to the line and also sends an impulse to the magnet 87 at central from said battery, the circuit being from the battery 85 to brush 57, thence to brushes 58 and 59, thence by one of the conductors 81 or 82 to the line wire 67, then by conductor 105 to the contact lever 98 and armature 90 and by the conductor 104 to the magnet 87, returning by the conductors 103 and 102 to the line wire 66 and back to the battery 85 by the conductors 68 and 84. The magnet 87 being thus energized attracts the armature 90 and moves it out of engagement with the end 101 of the contact 98 which is normally in contact with said armature because of the springs 92 and 100 respectively. Then the contact 98 is moved by the spring 100 so that the other end 101 of said contact makes connection with the armature 84 and this establishes the circuit from the battery 106 through the conductor 107 to the magnet 88 and from the other side of the magnet by the conductor 108 to the armature 94 thence by the contact 98 to the other conductor 105 which is connected directly to the line wire 67, the other side of the battery being connected through the conductor 102 to the other line wire 66. Now as the armature 94 moves under the attraction of the magnet 88 it engages the end of the contact 90 remote from the end 101. This rocks the contact 98 and thereby moves the said other end 101 to a position beyond the free end of the armature 90 so that when the said armature 90 is returned by the spring 92 to its normal position it does not engage the contact 98. When the push-button 61 is released the spring brushes 57, 58 and 59 separate and the circuit is broken and the armature 94 is returned by the spring 97 to its normal position, and the spring 100 rocks the contact 98 and causes the latter to make connection at its end 101 with the armature 90. Under these last named conditions the magnet 87 is again coupled up to the line and the magnet 88 is cut out and the apparatus has its parts in the position in which they were before the push-button was moved. Each time the push-button 61 is actuated an impulse flows over the line and operates the apparatus at the central station as described, thus causing the closing of the battery 106 on the line and the sending to line of a correspondingly strong impulse which energizes the magnets 19 of the several instruments on the line causing the rotation of the ratchet wheels 15 in the same manner as was herebefore described with relation to the system of Fig. 5. The signal is caused to ring and the talking circuit is completed and conversation carried on in the same manner as already described.

The circuit may be broken at any time by either the calling subscriber or the receiving one by moving the lever 64 to break contact between the contact brushes 58 and 59, it being understood that during conversation these contacts have been closed at the calling station and of course have not been separated at the called station. After the circuit has been broken in the manner just described, the lever 64 should be again returned to its normal position so that the spring brushes 58 and 59 are kept in contact to maintain the line intact for permitting calls and conversations in the ordinary manner.

What is claimed is:

1. In a telephone system, a subscriber's instrument comprising a mechanically rotatable toothed member, an electric contact fast thereto, and a hand or pointer also fast to said member, another toothed member, an electric contact fast thereto and adapted to engage the first named contact, an electrically operated means for actuating the second named toothed member step by step, a hand or pointer fast to the said second named toothed member, and electric circuit connections from each contact.

2. In a telephone system, a subscriber's instrument comprising a manually operable rotatable toothed member, an electric contact movable therewith, a hand or pointer movable with said member, another toothed member, an electric contact actuated thereby and adapted to engage the first named contact, an electrically operated means for actuating the second named toothed member, a hand or pointer actuated by the said second named toothed member, electric circuit connections from each contact, and an index common to both pointers.

3. In a telephone system, a subscriber's instrument comprising a manually operable rotatable member, an electric contact movable therewith, a hand or pointer also movable with said member, another rotatable

member, an electric contact actuated thereby and adapted to engage the first named contact, an electrically actuated means for actuating the second named member step by step, a hand or pointer actuated by the said second named member, electric circuit connections from each contact, and another contact adapted to maintain the circuit intact after being broken at the first and second named contacts.

4. In a telephone system, a mechanically rotatable contact, an electrically rotatable contact, adapted to engage the first named contact at a predetermined point in its rotation, and means under the control of the electrically actuated contact for locking the mechanically actuated contact except at a predetermined zero position.

5. In a telephone system, local stations each provided with electrically operable selecting mechanism and with a source of current incapable of actuating the selecting mechanisms at the other local stations, and a central station relay comprising an electro-magnetic circuit controlling means responsive to the current furnished by the current sources at the local stations, electro-magnetic circuit controlling means responsive only to comparatively strong current, and a current source of requisite strength for the said last named electro-magnetic means and coupled to the line by the latter.

6. In a telephone system, local stations each provided with electrically operable selecting mechanism, and with a source of current incapable of actuating the selecting mechanisms at the other local stations, and a central station relay comprising electro-magnetic circuit controlling means responsive to the comparatively weak current furnished by the local stations, another electro-magnetic means responsive only to comparatively strong current, means controlled by the second named electro-magnetic means for cutting the first named electro-magnetic means out of the circuit and a current source of requisite strength for the second named electro-magnetic means coupled to the line by the means controlled thereby.

7. In a telephone system, local stations each provided with electrically operable selecting mechanism, and with a source of current incapable of actuating the selecting mechanisms at the other local stations, and a central station relay comprising an electro-magnet responsive to comparatively weak current coming from the local stations, an armature therefor, another electro-magnet responsive to comparatively strong current, an armature therefor, a source of electrical energy sufficient to operate the second named electromagnet, an electric circuit controlled by the first named magnet to cause the charging of the second named magnet, means controlled by the armature of the second magnet for cutting the first named magnet out of circuit and line conductors normally in circuit with the first named magnet and controlled by the second named magnet to receive the charge of the current source located at the central station.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

LEONIDAS E. HICKS.

Witnesses:

WEBSTER LANCASTER,

JOSHUA DOUGLAS.