W. W. HILL.

LOCK-OUT TELEPHONE SYSTEM.

APPLICATION FILED MAY 16, 1908.

935,024. **Patented Sept. 28, 1909.**

6 SHEETS—SHEET 1.

Fig. 1

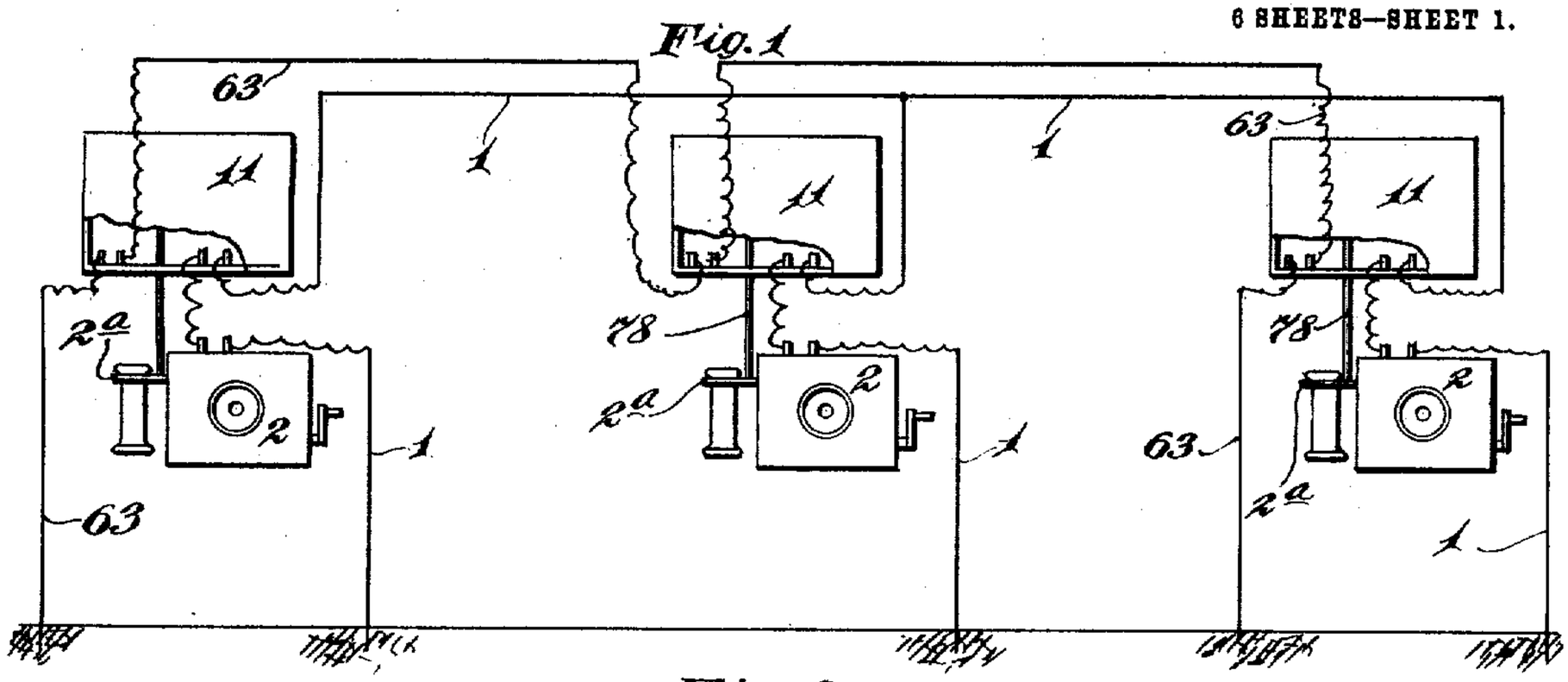


Fig. 2

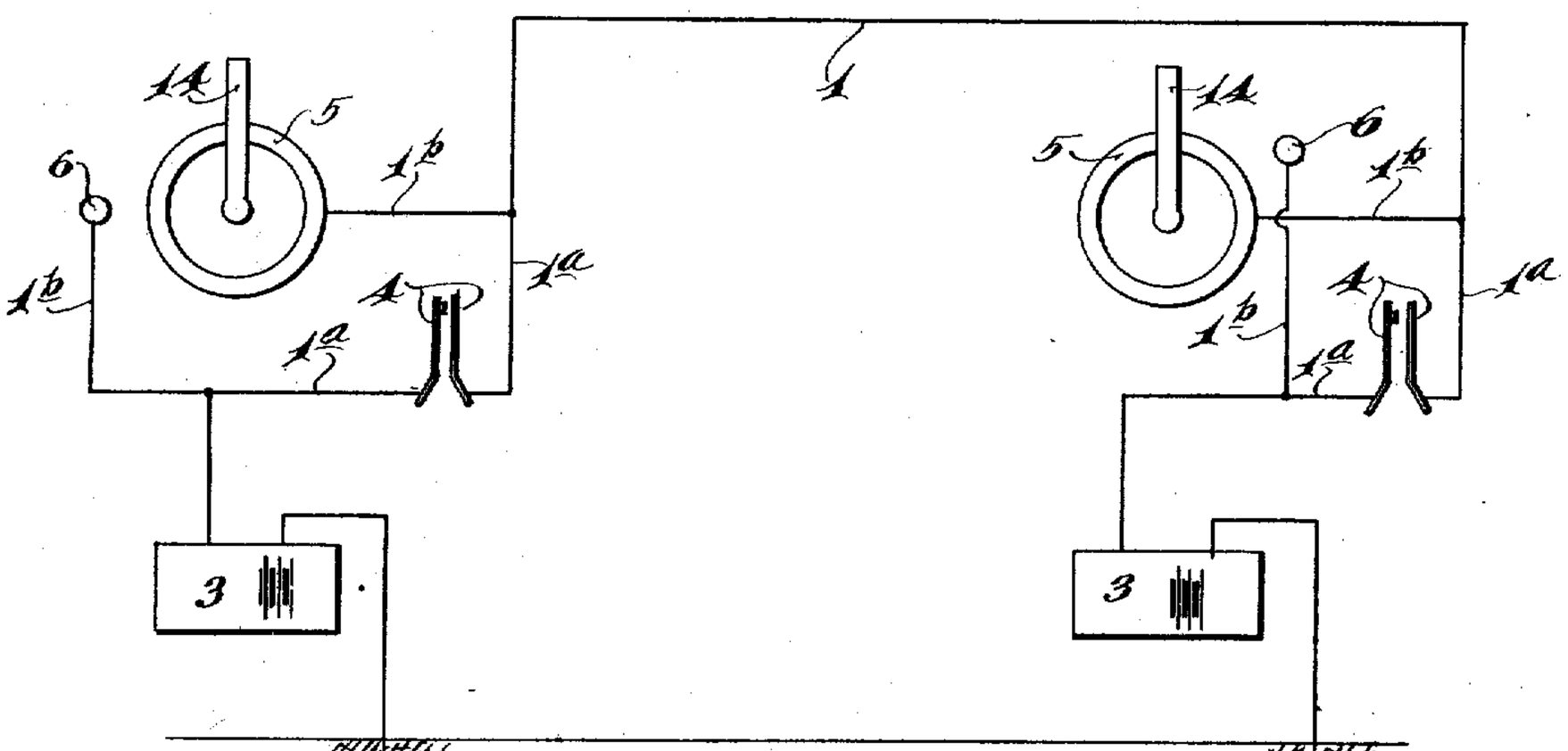
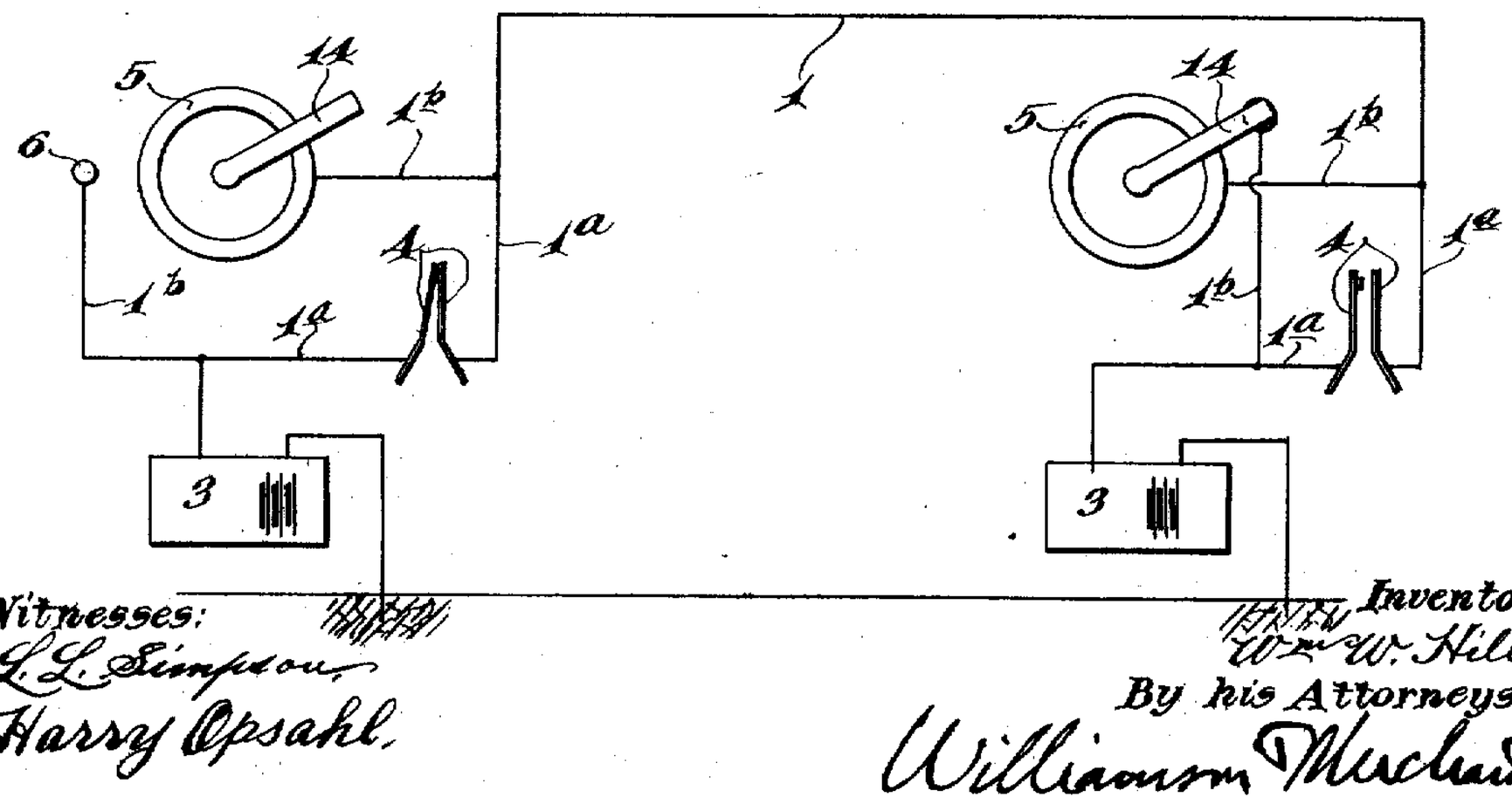


Fig. 3



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6 SHEETS—SHEET 2.

Fig. 4

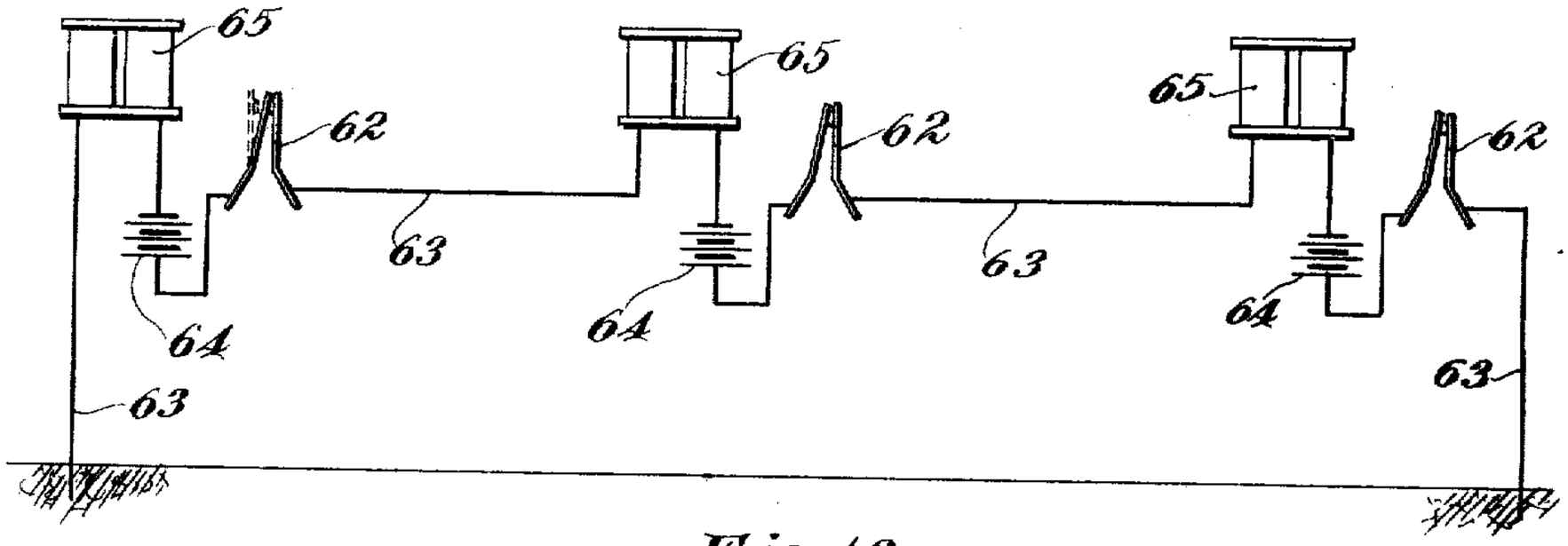


Fig. 13

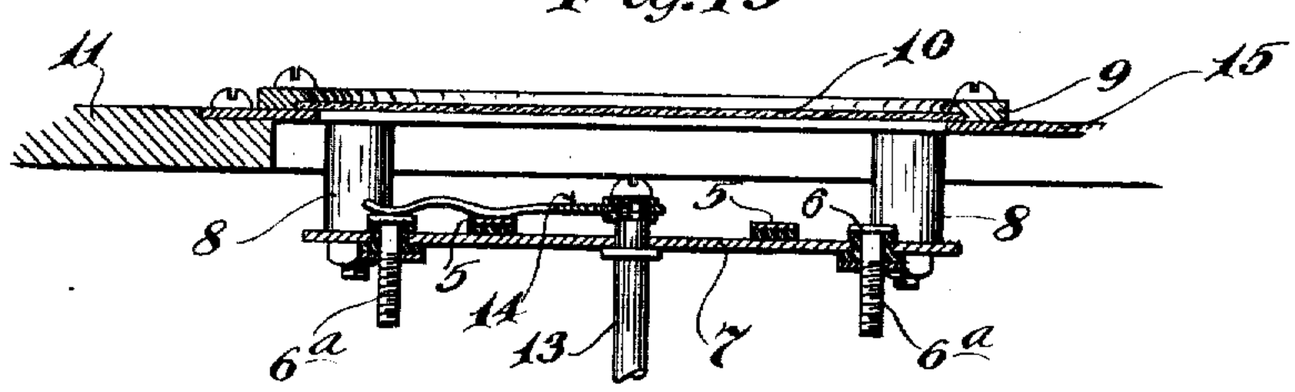
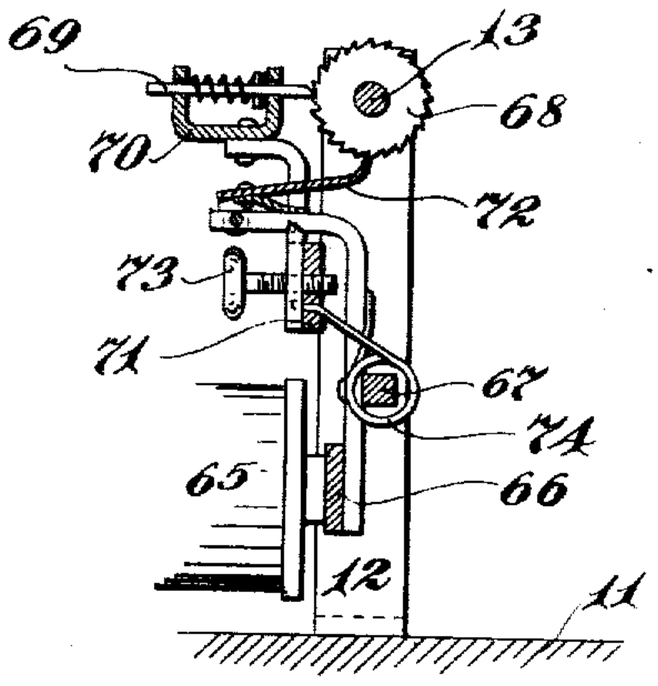


Fig. 14



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6 SHEETS—SHEET 3.

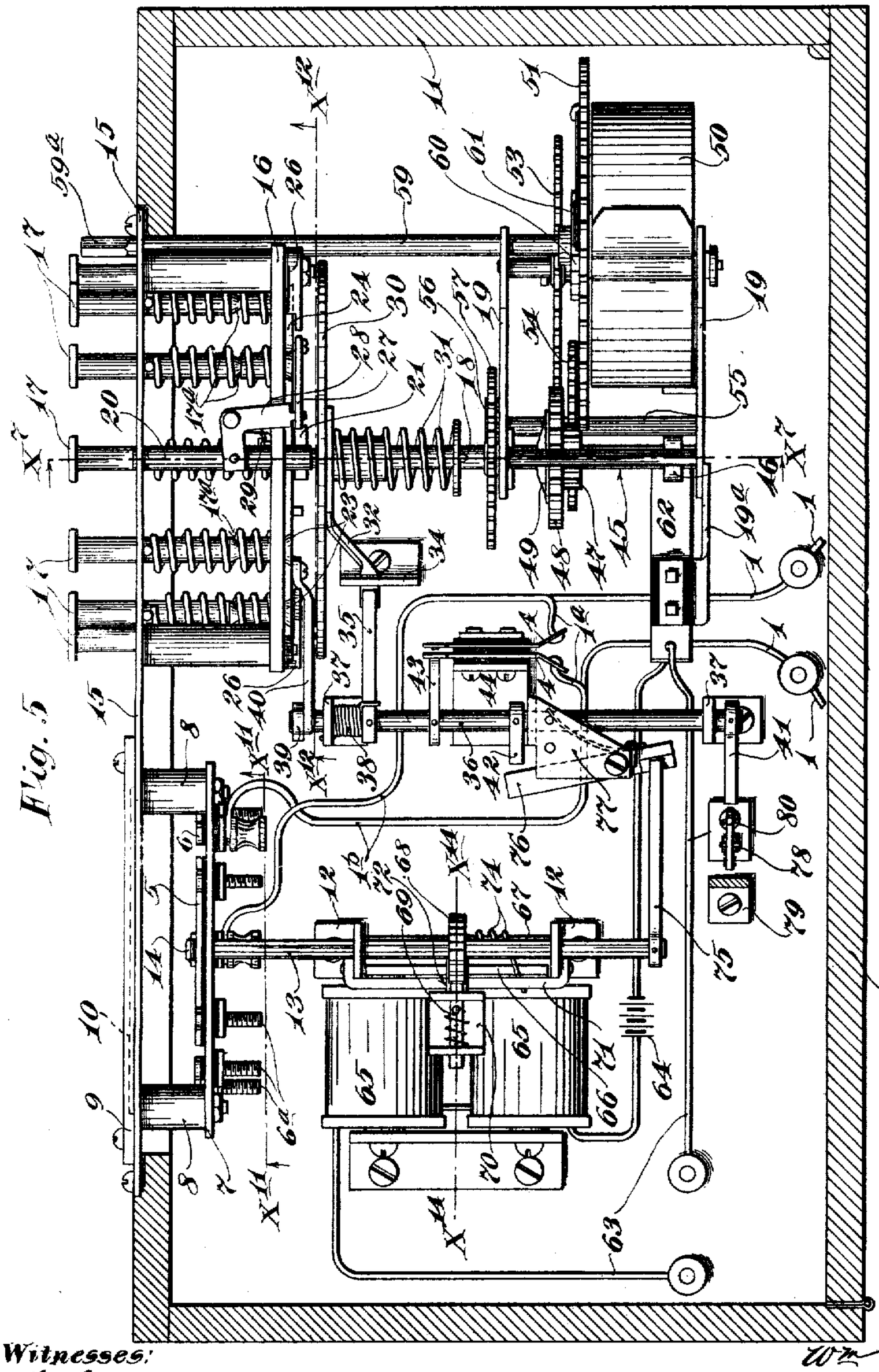

Fig. 5

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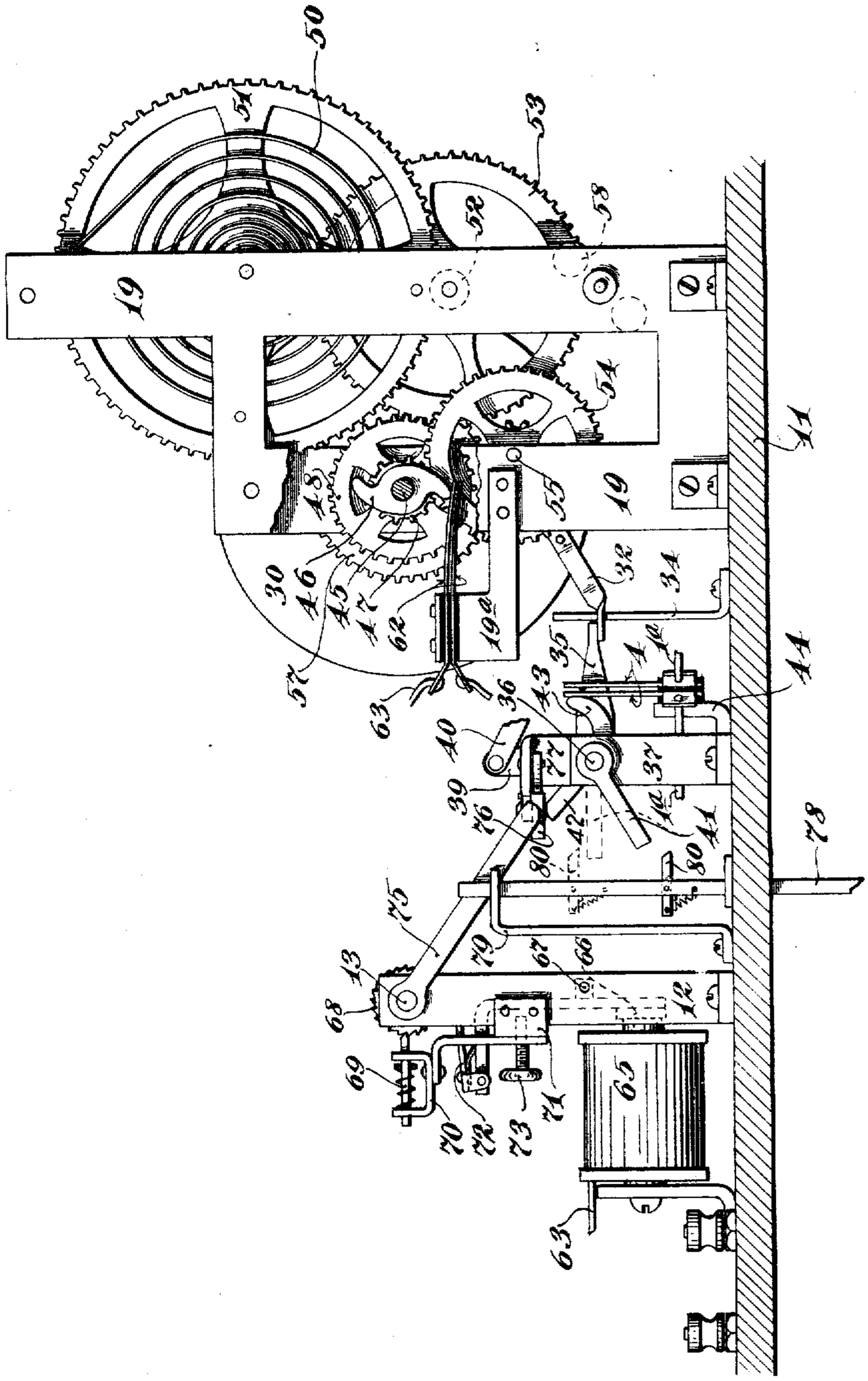
6 SHEETS—SHEET 4.

Fig. 6



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935,024. **Patented Sept. 28, 1909.**

6 SHEETS—SHEET 5.

Fig. 7

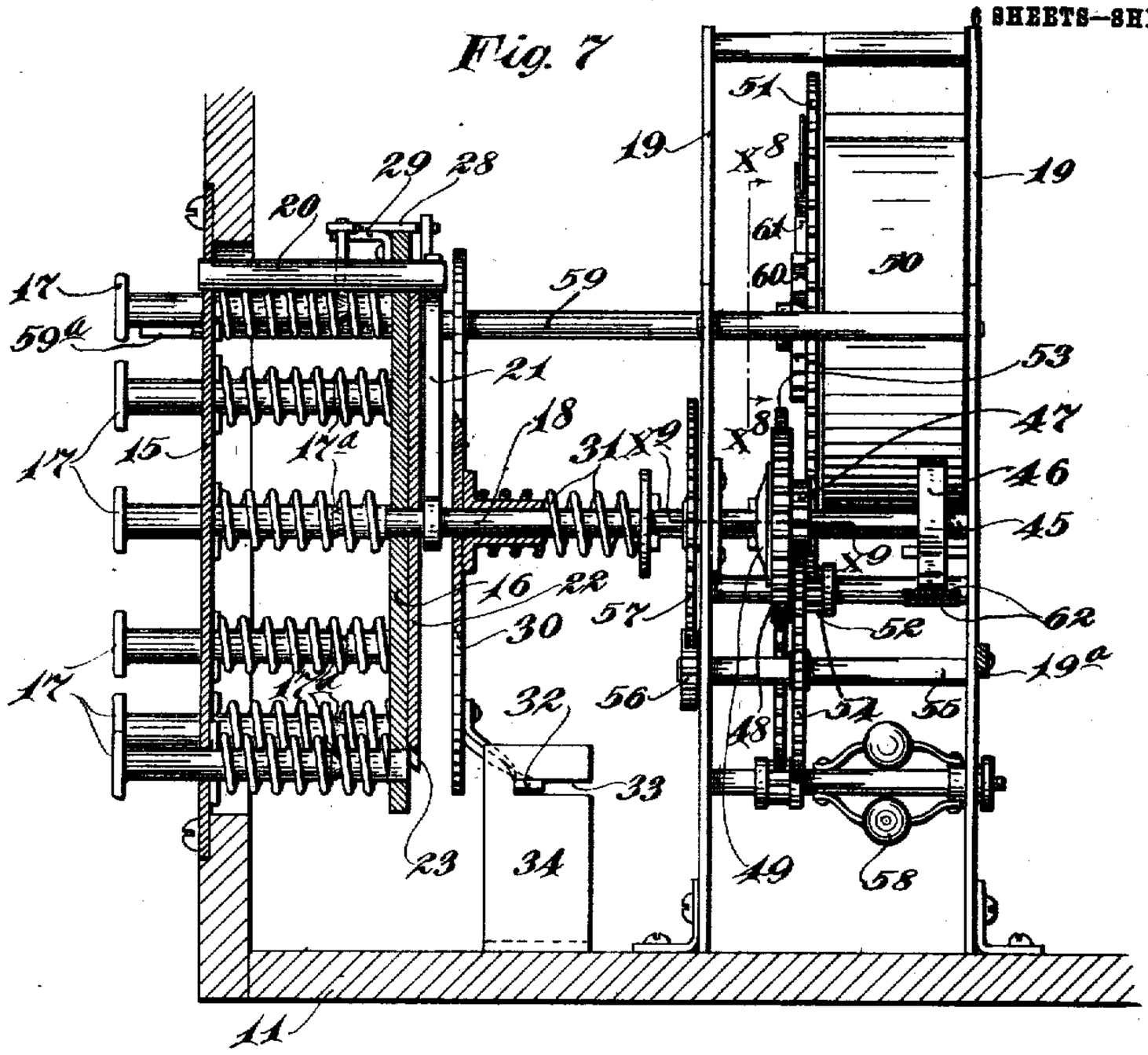


Fig 9

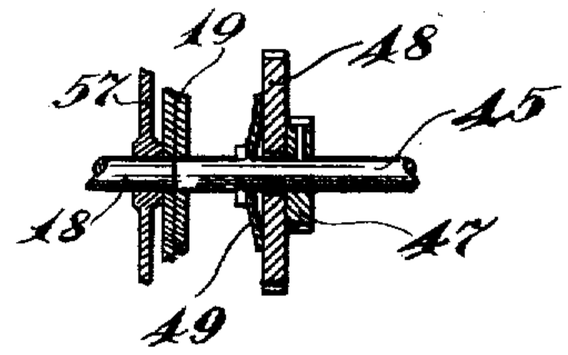
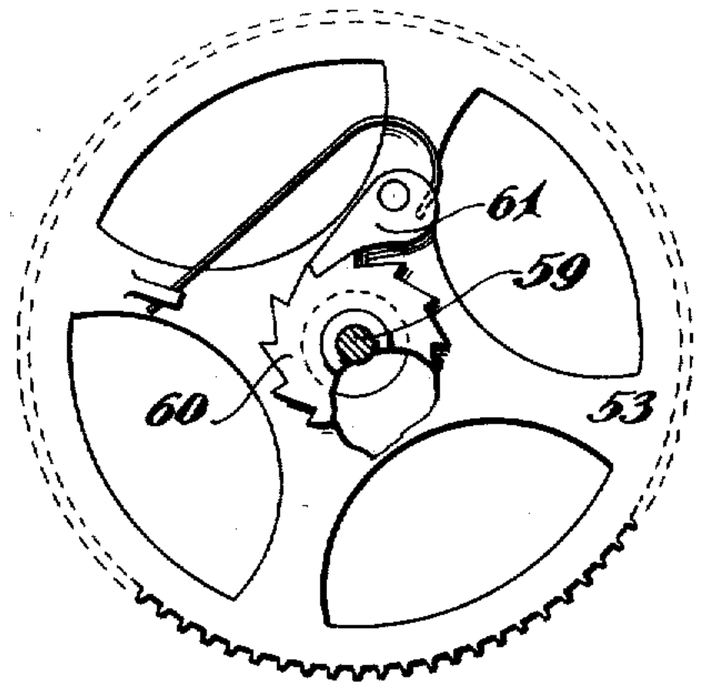


Fig 8



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6 SHEETS—SHEET 6.

Fig. 10

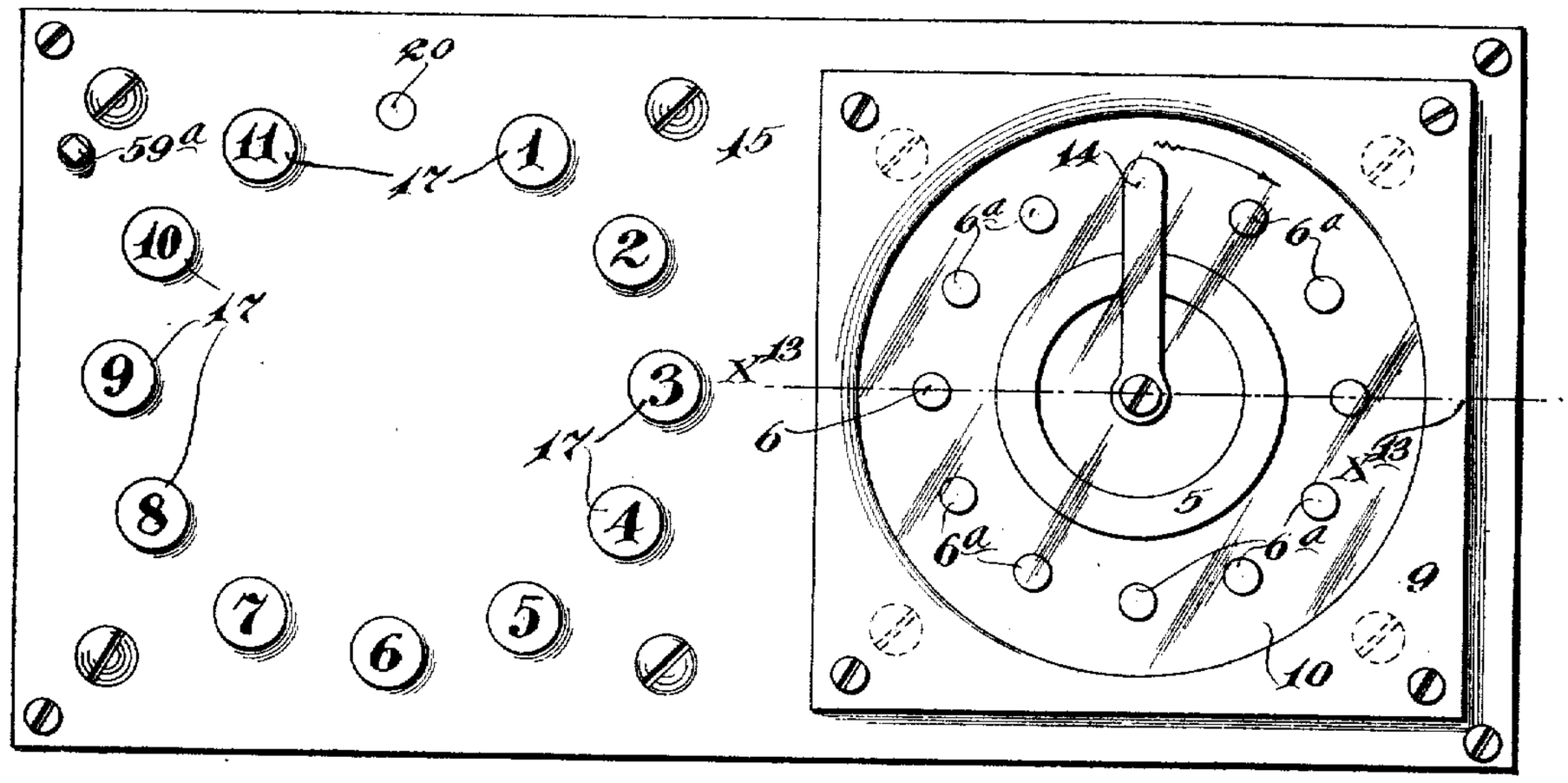


Fig. 11

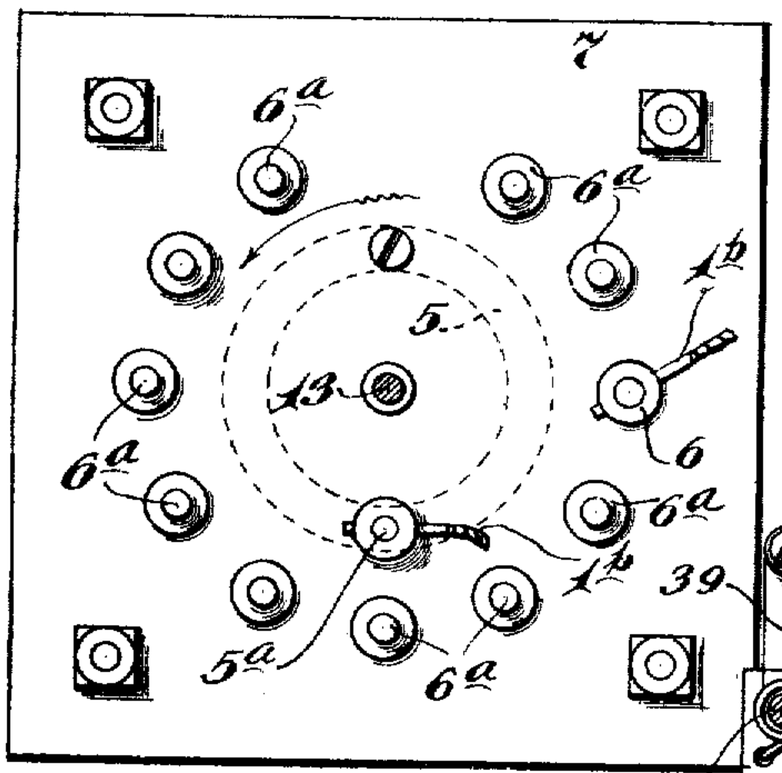
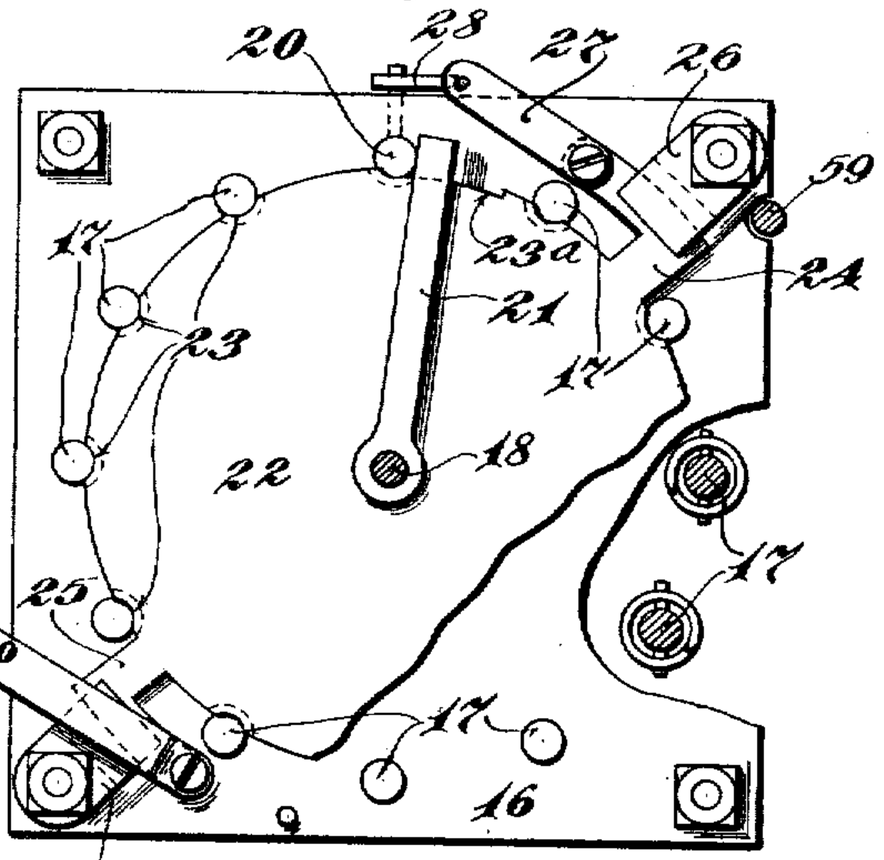


Fig. 12



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UNITED STATES PATENT OFFICE.

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LOCK-OUT TELEPHONE SYSTEM.

935,024. Specification of Letters Patent. **Patented Sept. 28, 1909.**

Application filed May 16, 1908. Serial No. 433,224.

To all whom it may concern:

Be it known that I, WILLIAM W. HILL, a citizen of the United States, residing at Sumter, in the county of McLeod and State of Minnesota, have invented certain new and useful Improvements in Lock-Out Telephone Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to party line telephone systems, such as generally used in rural districts, and the invention has for its object to provide improved means for locking out of listening and speaking communication with the transmission circuit or line all stations except the calling and the called stations.

The importance of the provision of lock-out means such as indicated will be readily understood by all persons familiar with the use of party lines, and especially of rural lines where many phones are connected on the same line and where frequently persons at the stations on the line other than the calling and called stations will listen to the conversation going on over the line and will also often interrupt such conversation.

My invention provides a simple and efficient device whereby a person at any one of the stations, by the manipulation of so-called selecting keys and coöperating devices, may set into action a so-called pulsator, and, through the latter and coöperating electric circuits, may set a so-called circuit finder or closer at the called station in such position as to close the transmission circuit through the telephone at such called station, leaving all of the other stations cut out of the transmission circuit.

The improved lock-out telephone system is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a diagrammatic view showing the circuits of the improved system. Figs. 2 and 3 are fragmentary views in diagram of parts of the transmission line. Fig. 4 is a diagrammatic view of the so-called selecting circuit or line. Fig. 5 is a view chiefly in plan but partly in horizontal section, showing a case or box containing practically all of the local mechanism of the party selecting or cut out system. Fig. 6 is a side elevation of the parts shown in Fig. 5, some parts being sectioned and some parts being broken away. Fig. 7 is a vertical section taken approximately on the line x^7 x^7 of Fig. 5, some parts being left in full, and some being broken away. Fig. 8 is a detail in section taken approximately on the line x^8 x^8 of Fig. 7. Fig. 9 is a detail in section, taken on the line x^9 x^9 of Fig. 7. Fig. 10 is a view in elevation, looking at the front face of the case shown in Fig. 5. Fig. 11 is a detail in section taken on the line x^{11} x^{11} of Fig. 5. Fig. 12 is a section taken approximately on the line x^{12} x^{12} of Fig. 5, some parts being broken away. Fig. 13 is a section taken on the line x^{13} x^{13} of Fig. 10; and Fig. 14 is a section taken on the line x^{14} x^{14} of Fig. 5.

Directing attention first to Figs. 1, 2 and 3, the numeral 1 indicates the ordinary wires of the customary transmission line and the numeral 2 indicates, as entireties, telephones of standard construction located at different stations on the transmission line. In Figs. 2 and 3 the numeral 3 indicates the customary batteries, usually contained within the cases of the several telephones.

In accordance with one of the features of this invention, the transmission line 1, at each station, is arranged to be closed through either one of two normally open branch circuits 1^a or 1^b. In the wire 1^a is interposed a pair of normally separated spring contacts 4; and one of the wires 1^b is connected to a contact ring 5, while the other wire 1^b is connected to a fixed contact 6.

In the preferred arrangement of the system, the contact ring 5 is secured to but insulated from a supporting plate 7, which, as best shown in Fig. 13, is connected by short horizontal posts 8 to a frame 9 that holds a transparent cover 10 and is secured to one side of a case or box 11, in which latter, as already indicated, the local parts of the selecting and cut-out mechanism are arranged. The contact 6 is also shown as secured to but insulated from the supporting plate 7.

Located concentric to the contact ring 5 and mounted in suitable bearings afforded by the plate 7 and by brackets 12 on the box 11, is a shaft 13, which at its front end is secured to but insulated from a contact arm 14; and which arm, on account of the function it performs, may be designated as a "contact finder". This contact finder 14 constantly engages with the contact ring 5; and, when properly positioned, will engage

the contact post 6 and thereby close the transmission line through the wires 1^b.

There is only one live contact 6 at each station, but preferably dead or blind contacts 6^a are circumferentially spaced on the outer face of the plate 7, equi-distant from the axis of the shaft 13. In fact, the said contacts 6 and 6^a are preferably made duplicates one of the other, but only one thereof being connected in the circuit, and in no two stations will the live contact 6 be located at the same point. In Fig. 11 one of the wires 1^b is shown as connected to the contact ring 5 by a binding post 5^a, and the other wire 1^b is shown as connected to the ninth contact post, directions being taken in respect to the arrow marked on Figs. 10 and 11. Also as illustrated, there are eleven of these contact pins, which provides in the system for connecting eleven stations or telephones, each station having a contact 6 connected or located at one of the eleven different positions. The importance of connecting the said contact 6 of the several stations at different points will hereinafter clearly appear.

Located at the front side of the case 11 and mounted to slide in an outer plate 15 and an inner plate 16, both of which are rigidly secured to said case, are eleven outwardly spring-pressed selecting keys, so-called, which in number and in relative positions correspond to the eleven live contacts 6 of the eleven other connected stations. Otherwise stated, these selecting keys 17 are circumferentially spaced around the axis of a shaft 18, which shaft is journaled in the bearing plate 16 and in the inner side plate of a sort of a clock frame 19 that is rigidly supported by the case 11. More particularly stated, said selecting keys 17, like the contacts 6—6^a, are spaced thirty degrees apart, and at the top of the series a space is left for a twelfth member in the form of a lock bolt 20, that is also mounted in the plates 15 and 16. Normally the lock bolt 20 projects inward, as shown in Fig. 5, and engages a stop arm 21 that is carried by the shaft 18, and thereby locks the said shaft against rotation, see also Fig. 12.

Held closely against the inner bearing plate 16 and mounted for slight oscillatory movement on the shaft 18 is a lock disk 22 provided with slight peripheral notches 23 that normally aline one with each of the selecting keys 17. Said lock disk 22 is also provided with an elongated peripheral notch 23^a that always clears the inner end of the lock bolt 20, (see Fig. 12). The lock disk 22 is further provided with projecting diametrically opposite angular arms 24 and 25, which, as shown, are embraced by retaining clips 26 on the plate 16 so that the said lock disk is held against lateral movement. The arm 24 is connected, by a link 27, to one arm of a bell crank 28, the other arm of which bell crank is pivotally connected to the lock bolt 20, as best shown in Figs. 5, 7 and 12. At its elbow the bell crank 28 is pivotally connected to a small bracket 29 (see Fig. 7) on the upper portion of the plate 16.

Each selecting key 17 is provided with a peripheral groove 17^a which, when the said key is moved inward to its extreme position, alines with the coöperating notch 23 of the lock disk, for a purpose which will hereinafter appear. Normally, the inner ends of the said keys 17 are moved outward of the plane of the lock disk 22, as shown in Fig. 7.

Located close to the stop arm 21 of the shaft 18 and mounted to slide on said shaft, is a tripping disk or plate 30. This tripping plate is spring-pressed outward, as shown, by a coiled spring 31 that reacts against the same and against an anchor washer on the shaft 18; and it is held against rotation by a trip arm 32 secured thereto and arranged to slide in the slot 33 of a bracket 34 secured to the bottom of the case 11, all as best shown in Figs. 5, 6 and 7.

Normally the projecting end of the trip arm 32 engages the projecting end of an arm 35 that is carried by a rock shaft 36 mounted in suitable bearings 37 on the bottom of the case 11. A torsional spring 38 (see Figs. 5 and 12) reacts against the arm 35 and the adjacent bearing 37 and exerts a force tending to rock the shaft 36 in a direction to move the arm 35 downward, such movement being, of course, resisted by the trip arm 32.

At its forward end, the rock shaft 36 is provided with an upwardly projecting arm 39 that is connected, by a link 40, to the arm 25 of the lock disk 22. At its other end, said shaft 36 is provided with a projecting arm 41, while at its intermediate portion it carries a short arm 42 and a tappet or cam 43, the purposes of which will presently appear.

The transmission line contacts 4 above described are shown as insulated from each other and from a supporting bracket 44 on the bottom of the case 11, by means of which brackets they are normally held separated, as shown in Figs. 5 and 6. A slight oscillatory movement of the shaft 36 will, however, cause the tappet 43 to press the contacts 4 into engagement and thus close the transmission circuit at that point.

Axially alined with the shaft 18 and mounted in the frame 19 is a short shaft 45, which shaft 45 is separate from and is not connected to rotate with the said shaft 18. This shaft 45, as shown, is provided with a double tappet 46, with a fixed pinion 47, and with a spur gear 48, which latter is connected to said shaft 45 and pinion 47 by a frictional coupling 49. The shaft 45 is driven from a motor spring 50, as shown,

through the following train of gears: A gear 51 that is directly subject to the motor spring 50 meshes with a small pinion 52 that is connected to rotate with a spur gear 53, which, in turn, meshes with the gear 48 of said shaft 45. The pinion 47 meshes with a gear 54 carried by a shaft 55 provided with a pinion 56 which, in turn, meshes with a gear 57 carried by the shaft 18. By the connections just described, the shaft 45 will be given twelve complete rotations to one rotation of the shaft 18; or, otherwise stated, the said shaft 45 will be given one rotation while the shaft 18 and its stop arm 21 are being given one-twelfth of a rotation. This latter statement should be remembered.

The numeral 58 indicates a centrifugal governor which, as shown, is driven from the gear 53. The master wheel 53 above described, is, as shown, connected to a winding shaft 59 by means of a ratchet wheel 60 and spring-pressed dog 61, best shown in Fig. 8. This winding shaft 59, as shown, projects at the front of the case 11 and is provided with an angular end 59ª to which a key may be applied for the purpose of winding up the motor spring. The said motor spring, at its inner end, is secured to the shaft 59 and at its outer end is suitably anchored to the frame 19. The train of gears described and their shafts are all suitably journaled on the said frame 19.

Normally, one end or the other of the double tappet 46 engages one and holds in contact a pair of spring contacts 62, which contacts are shown as supported by an extension 19ª of the frame 19, best shown in Figs. 5 and 6. These contacts 62, at the several stations, normally close a so-called "selecting circuit", shown as made of grounded wires 63, batteries 64, and magnets 65, of which magnets, as well as the said pairs of contacts 62, there is one for each station. This arrangement is illustrated in Fig. 4, wherein, however, only three stations are shown, the manner in which the system is further carried out being obvious.

One of the magnets 65 is suitably supported within each case or box 11 and, as shown, an armature 66 is arranged for coöperation with each thereof. Said armature, as shown, is intermediately secured (see Fig. 14) to a short shaft 67 that is pivotally supported by the two bearing brackets 12 before described. Between the brackets 12, the shaft 13 to which, as already described, the so-called "contact finder" 14 is secured, is provided with a ratchet wheel 68 that is normally held against backward rotation by a spring-pressed retaining dog 69, shown as mounted in a bearing 70 supported by a bar 71, which, in turn, is rigidly secured to the brackets 12. At its upper end, the armature 66 is provided with a spring-pressed driving dog 72 that coöperates with the ratchet wheel 68. A screw 73 applied to the bar 71 regulates the extreme oscillation of the armature, or rather, the armature lever 66. Normally, the magnets 65 are all energized so that the lower end of the armature lever 66 is drawn toward the left with respect to Fig. 14. A spring 74, which, as shown, surrounds the shaft 67, reacts against the fixed bar 71 and against the upper portion of the armature lever 66, and exerts a force which, when the magnet is deënergized, causes the driving pawl 72 to move back into engagement with the next tooth to the rear of the ratchet wheel 68. The movement of the ratchet wheel 68 and, hence, of the shaft 13, takes place when the armature lever 66 is moved by the action of the energized magnet.

At its extreme rear end, the shaft 13 is provided with a radially projecting lock releasing arm 75 that normally engages the beveled end of a spring pressed lock lever 76 and holds the said lever against the tension of its spring in the position shown in Fig. 5. This lock lever 76 is intermediately pivoted to the laterally turned upper end portion of a bearing pedestal 77. The free end of the lock lever 76 is thus normally held out of the path of movement of the arm 42 of the shaft 36; but when it is released its spring will throw the same immediately above the said arm 42 (see Fig. 6).

For coöperation with the arm 41 which is carried by the shaft 36 of each station instrument, there is a vertically movable rod 78 mounted in suitable guides 79 and provided with a spring-pressed dog 80. The normal positions of the rods 78 and dog 80 are shown by full lines in Fig. 6. At their lower ends, these rods 78 (see diagram view Fig. 1) are connected to the receiver hooks 2ª of the respective telephone instruments.

Operation: In Fig. 10 the selecting keys 17 are numbered, consecutively, in the direction of the movement of the hands of a clock, and each one of these keys occupies a position that corresponds to the position of the contact 6 of one of the distant stations. According to this illustration, the instrument at station No. 9 is shown at the extreme left in Figs. 1, 2, 3 and 4, and we will assume that a person at this station No. 9 wishes to call up station No. 2. To accomplish this, the person at station No. 9 pushes the key 17 numbered 2 on his instrument inward as far as it will go. When this key 17 is thus pushed inward to its limit, it engages the tripping disk 30, forcing the same against the spring 31 far enough to cause the trip arm 32 to release the arm 35 of the rock shaft 36. When the said shaft 36 is thus released, it is given a slight oscillatory movement by the spring 37, and this movement of said shaft accomplishes two things, to wit,—first, it causes the tappet 43 to move the contacts 4 into engagement, as shown at the left in

Fig. 3; and second, through the arm 39 and link 40, the lock disk 22 is given a slight movement which serves to engage the peripheral portion of said lock disk with the channel 17^a of the pushed-in selecting key 2. This slight oscillation of the lock disk 22 therefore serves to lock the pushed-in selecting key in its extreme innermost position; and, furthermore, serves to lock all of the other selecting keys of the calling instrument in their normal positions. Another very important action results from the above noted movement of the lock disk, to-wit,—through the link 27 and bellcrank 28, the lock bolt 20 is moved forward or into a position to release the stop arm 21 of the shaft 18. When the arm 21 is released, the motor spring, acting through the train of gears, rotates the shafts 45 and 18 until the stop arm 21 engages with and is stopped by the inwardly projected end of the inwardly pressed selecting key 17 numbered 2, and which as just above described, was locked in its set position by the lock disk 22. In the illustration just above given, the arm 21 and shaft 18 were given two-twelfths of a complete rotation, and, hence, the shaft 45 was given two complete rotations.

Two complete rotations of the shaft 45 causes the double tappet 46 to four times break and again close the selecting circuit 63 by direct action upon the contact 62 at the calling station, all as best indicated at the left hand in Fig. 4. The four electrical impulses thus produced in the selecting circuit will simultaneously actuate the magnets 65 at all of the stations, and the four vibratory movements produced in each armature lever 66 will impart four intermittent movements to each ratchet wheel 68, shaft 13, and contact finder 14. It will be remembered that two of such steps of movement are, with the arrangement described, required to impart a one-twelfth rotation to the respective contact finders. It is now thought to have been made clear that the four electrical impulses sent out over the selecting circuit has had the effect of setting the contact finders 14 of all of the stations in position No. 2. Only at station No. 2, however, does the contact finder come into engagement with a fixed contact 6, which is connected in the transmission line, as shown at the right in Fig. 3. Hence, at all other stations, the contact finders 14 remain inoperative and do not close any transmission line or other circuit connection. Fig. 3 shows the condition of the transmission line after station No. 9 has set the line for communication with station No. 2 over the transmission line. When these two stations are thus connected, the call signal, preferably by the use of the ordinary telephone bell connections, may be sent from station 9 to station 2, but no other station in the system will hear this call. Furthermore, persons may communicate in the usual way over the transmission line between stations 9 and 2, but no party at any other station can get either into speaking or listening communication with this closed talking circuit.

It is, of course, understood that the station that will be selected and connected into speaking communication with the calling station will depend entirely upon which of the several keys 17 at the said calling station is pressed inward and set in the manner above described.

The initial movement of the shaft 13 causes the arms 75 to release the lock lever 76, so that the said lock levers at all stations except the calling station will be moved under the arms 42 of the coöperating rock shafts 36 and thereby lock the said rock shafts 36, lock bolts 20, and intermediate parts at all of the instruments except that at the calling station in their normal positions. This results in setting the instruments at all stations except the calling station so that no effect whatever will be produced by pressing inward one of the selecting keys thereof. This positively locks all the stations except the called station and the calling station out of the transmission line.

The oscillatory movement of the shaft 36 which was imparted in the instrument at the calling station, moves the arm 41 of said shaft from the position indicated by full lines into the position indicated by dotted lines in Fig. 6, and when the receiver at this calling instrument is taken from its supporting hook 2^a, the said hook moves upward in the usual way, but in this arrangement also serves to move upward the connected rod 78, so that the dog 80 will be sprung into a position above the end of the said arm 41. Then, when the receiver at the calling station is replaced on its hook 2^a, the said hook and rod 78 will be drawn downward, thereby causing the dog 80, acting on the arm 41, to restore to normal positions the shaft 36 and parts carried thereby with the further result that all of the parts will be restored to normal positions and the line again restored to normal condition.

It will, of course, be understood that any desired number of stations may be connected in the same lock-out system, providing the proper number of selecting keys and cooperating connections are provided. It will also be understood that the invention is not limited to the particular details of construction shown in the drawings and above specifically described, but, on the contrary, is capable of large range of modification. The manner of operation of the so-called station or party selecting mechanism is simple and capable of being very easily understood by all persons capable of using telephones.

More specifically stated, when the receiver

is removed from the hook 2ª, the rod 78 moves upward and carries the dog 80 to the position indicated by dotted lines in Fig. 6, and when the receiver is again placed upon the said hook, the dog 80 is moved downward and acting on the arm 41 moves the same from its position shown in dotted lines in Fig. 6 back to its normal position, shown in full lines, against the tension of the spring 38. Also the rocking movement imparted to the rock shaft 36 by this return movement of the arm 41 operating through the arm 39 and link 40, oscillates the lock disk 22, thereby causing the latter to release the pressed in key 17. When this pressed in or set key is released, the spring 31 moves the plate 30 outward and the latter then carries the trip arm 32 back under the free end of the arm 35, thereby locking the rock shaft 36 and parts connected thereto in their normal positions.

What I claim is:

1. In a lock-out telephone system, the combination with a transmission line and telephones at the several stations, of a selecting circuit connecting the said stations, a selecting device at each station, comprising a rotating member and properly spaced keys arranged to be set at will for controlling the extent of rotation thereof, means for sending electrical impulses over the said selecting circuit, comprising a rotating contact closer controlled by the rotary member of said selecting device and a coöperating stationary contact, and differentially acting devices for closing the transmission line, located at the different stations, each comprising a fixed contact and a rotating contact which latter is magnetically actuated by the impulses sent over said selecting circuit, substantially as described.

2. In a lock-out telephone system, the combination with a transmission line and telephones at the several stations, of a selecting circuit connecting the several stations, means at the several stations for connecting the respective telephones to the transmission line, each comprising a fixed contact and a movable contact finder, the contact finder at the several stations requiring different movements to close the circuit, magnets in said selecting circuit, devices subject to said magnets for imparting step by step movements to said contact finders, pulsating devices at the several stations operative to intermittently open and close said selecting circuit, and a multiplicity of selecting keys and cooperating devices operative to control the said pulsating device according to the selection of the called station, substantially as described.

3. In a lock-out telephone system, circuit closers at the several stations for connecting the telephones to the transmission line, each comprising a fixed contact and a movable contact finder, the contact finders at the several stations normally set in different positions in respect to their coöperating contacts, in combination with differentially acting selecting devices at the several stations each comprising a movable member and a plurality of properly spaced keys arranged to be set at will for controlling the movement thereof, and means for sending electrical impulses from any one station to the other stations, comprising a stationary contact, an intermittently acting movable contact controlled by the movable member of the corresponding selecting device, and magnets for controlling the movements of the contact finders at the several stations, substantially as described.

4. In a lock-out telephone system, the combination with telephones at the several stations, of circuit closers for connecting the several phones to the transmission line, each comprising a fixed contact and a movable contact finder, the contact finders at the several stations normally being set in different positions in respect to their coöperating contacts, pawl and ratchet devices for imparting step by step movements to said contact finders, magnets for operating said pawl and ratchet devices, a selecting circuit including said magnets, a pulsating device controlling the selecting circuit at each station, and a group of selecting keys at each station for controlling the action of the coöperating pulsators, substantially as described.

5. In a lock-out telephone system, the combination with telephones at the several stations, of circuit closers for connecting the several phones to the transmission line, each comprising a fixed contact and a movable contact finder, the contact finders at the several stations normally being set in different positions in respect to their coöperating contacts, pawl and ratchet devices for imparting step by step movements to said contact finders, magnets for operating said pawl and ratchet devices, a selecting circuit including said magnets, a pulsating device in the form of a rotary tappet controlling the selecting circuit at each station, driving means tending to rotate said tappet, a lock normally restraining said driving means, a tripping plate for releasing said lock, and a multiplicity of selecting keys operative on said tripping plate and serving to determine the extent of rotation of said tappet, substantially as described.

6. In a lock-out telephone system, the combination with telephones at the several stations, of circuit closers for connecting the several phones to the transmission line, each comprising a fixed contact and a movable contact finder, the contact finders at the several stations normally being set in different positions in respect to their coöperating con-

tacts, pawl and ratchet devices for imparting step by step movements to said contact finders, magnets for operating said pawl and ratchet devices, a selecting circuit including said magnets, a pulsating device controlling the selecting circuit at each station and comprising normally engaged contacts and a tappet for action thereon, driving means tending to rotate said tappet, a stop arm connected to rotate with said tappet, a lock normally holding said stop arm against rotation, a tripping plate with connections arranged to release said lock, a multiplicity of selecting keys operative on said tripping plate, the actuated member thereof serving as a stop to said stop arm and serving to determine the number of pulsations sent over the selecting circuit, substantially as described.

7. In a lock-out telephone system, the combination with a transmission line and telephones at the several stations, of circuit closers for connecting the telephones at the several stations to said transmission line under different manipulations or actions, means for operating said circuit closers comprising an electrical pulsating device, driving means tending to operate said pulsating device, a lock normally restraining said driving means, a tripping plate with connections for releasing said lock, and a multiplicity of selecting keys or stops operative on said tripping plate and serving to differentially limit the action of said pulsating device, substantially as described.

8. In a lock-out telephone system, the combination with a transmission circuit, a selecting circuit and circuit closers arranged to connect the respective phones to the transmission line under different manipulations or actions, magnets at the several stations located in the selecting circuit, magnet-operated pawl and ratchet devices for operating said circuit closers, normally separated contacts in the transmission line at each station, a current pulsator in the selecting circuit of each station, driving means tending to move said pulsator, a lock normally holding said driving means out of action, a tripping plate with connections for releasing said lock and for closing the transmission circuit through the said contacts, and a multiplicity of selecting keys operative on said tripping plate and affording a series of differential stops for limiting the action of said pulsator, substantially as described.

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

WILLIAM W. HILL.

Witnesses:

F. H. MALMGREN,

R. L. RODECK.