E. R. GILL.

ANSWER BACK SIGNAL.

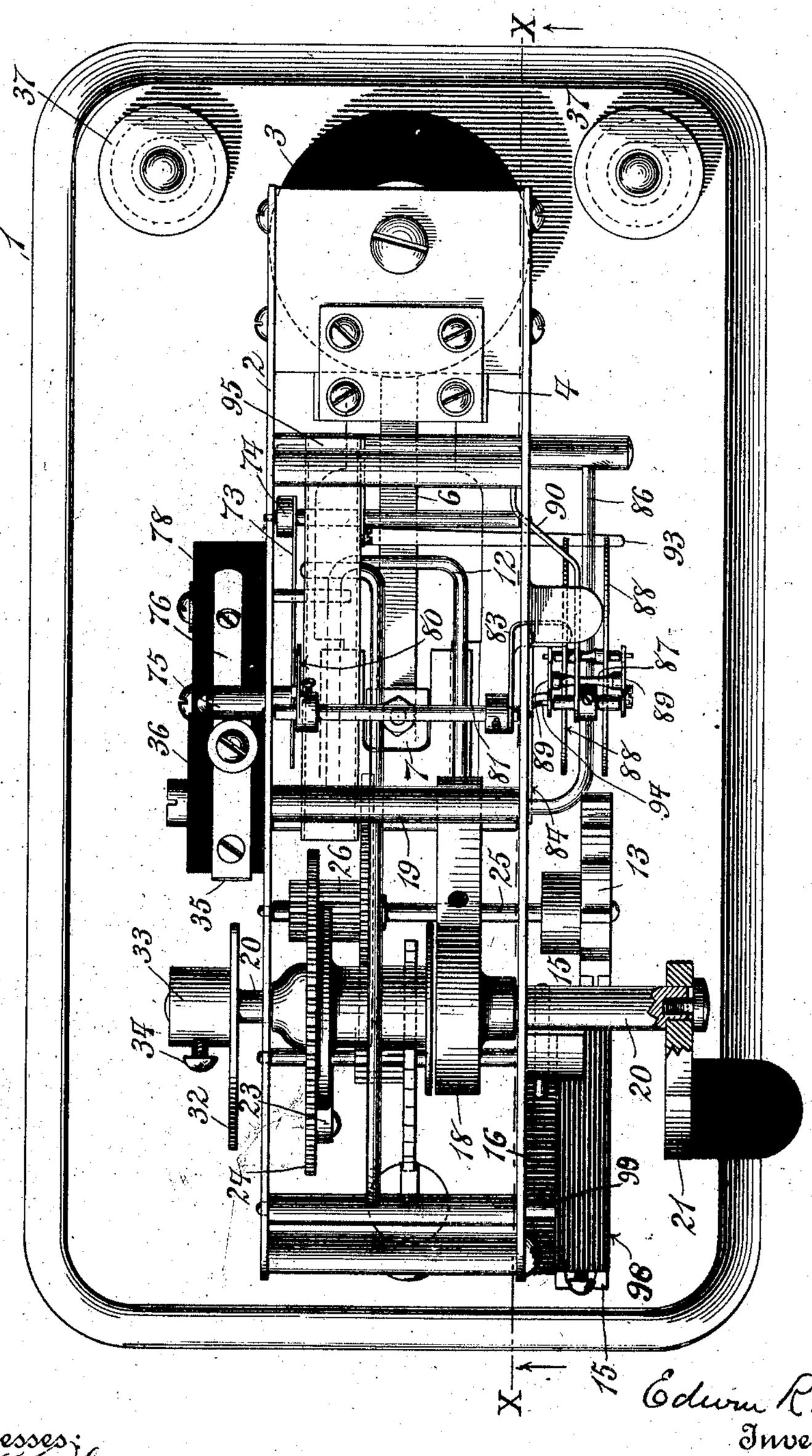
APPLICATION FILED JULY 27, 1907.

978,733.

Patented Dec. 13, 1910.

5 SHEETS—SHEET 1.

Fig. 1.



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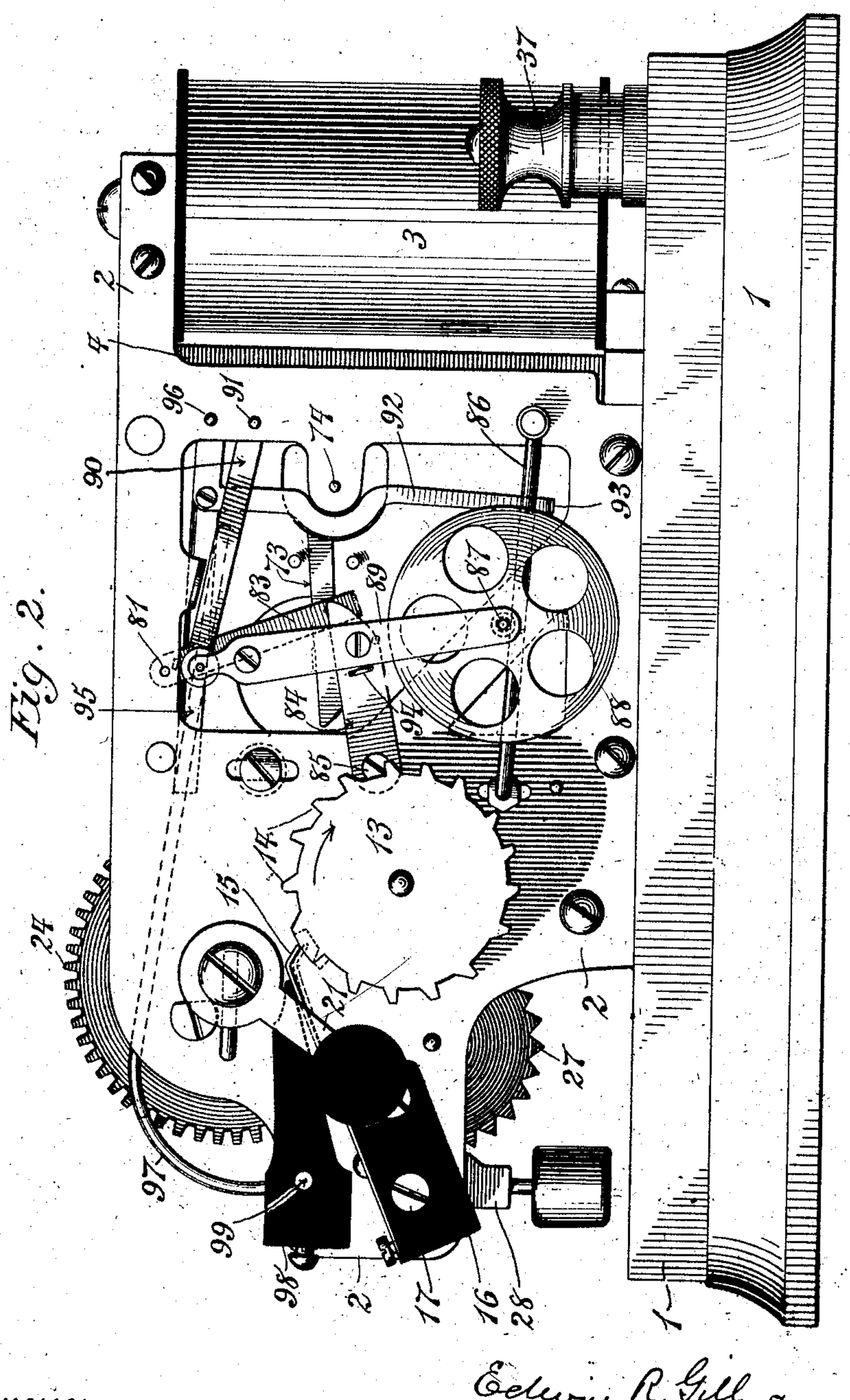
5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS—SHEET 3.

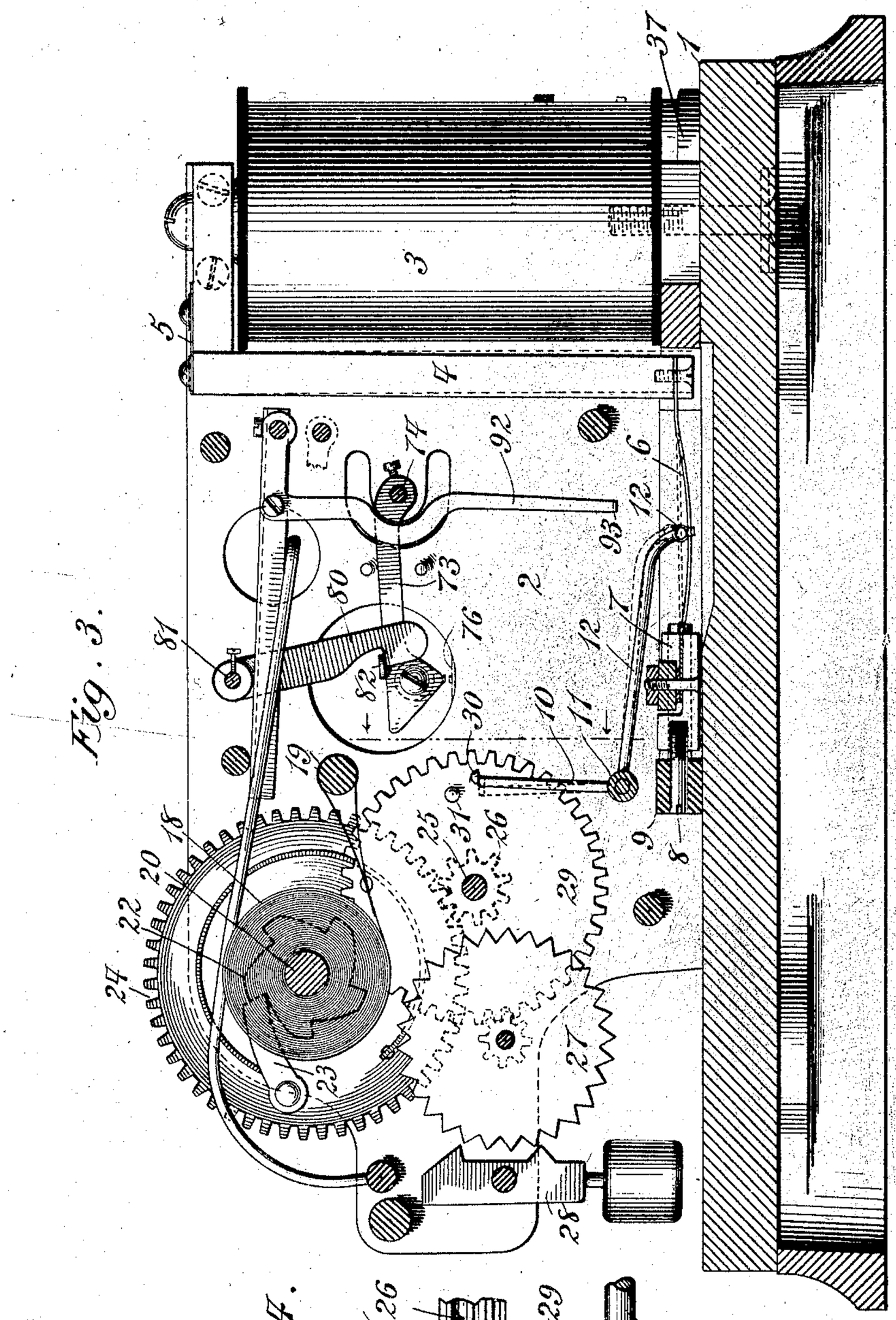

Fig. 3.

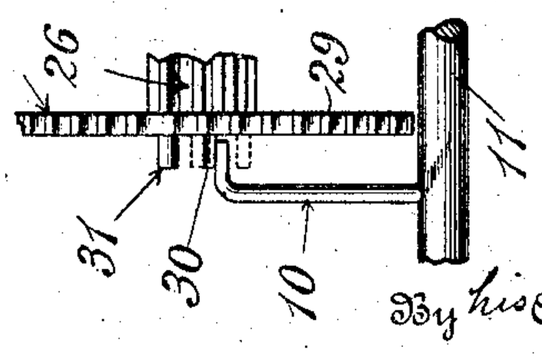

Fig. 4.

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5 SHEETS—SHEET 4.

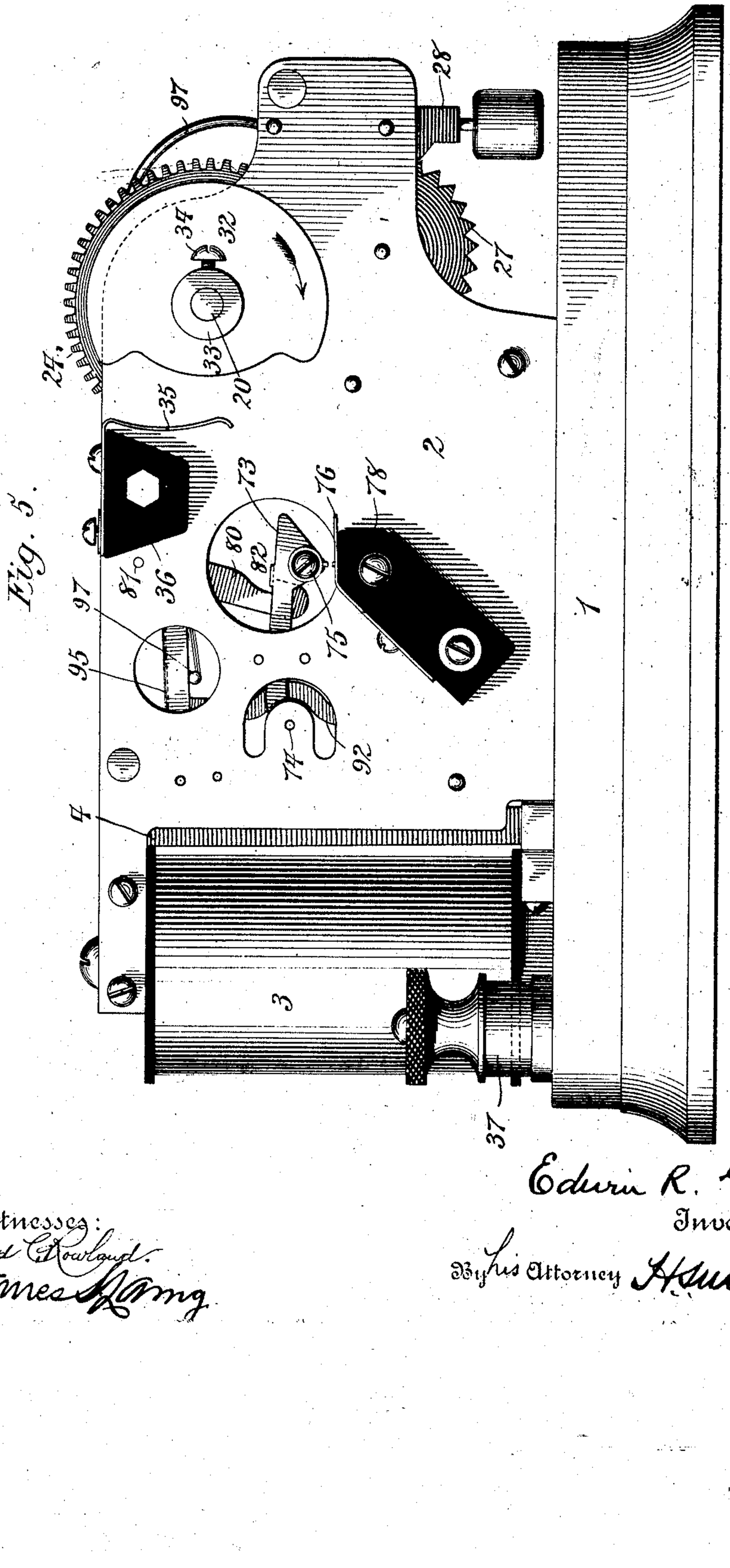

Fig. 5.

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5 SHEETS—SHEET 5.

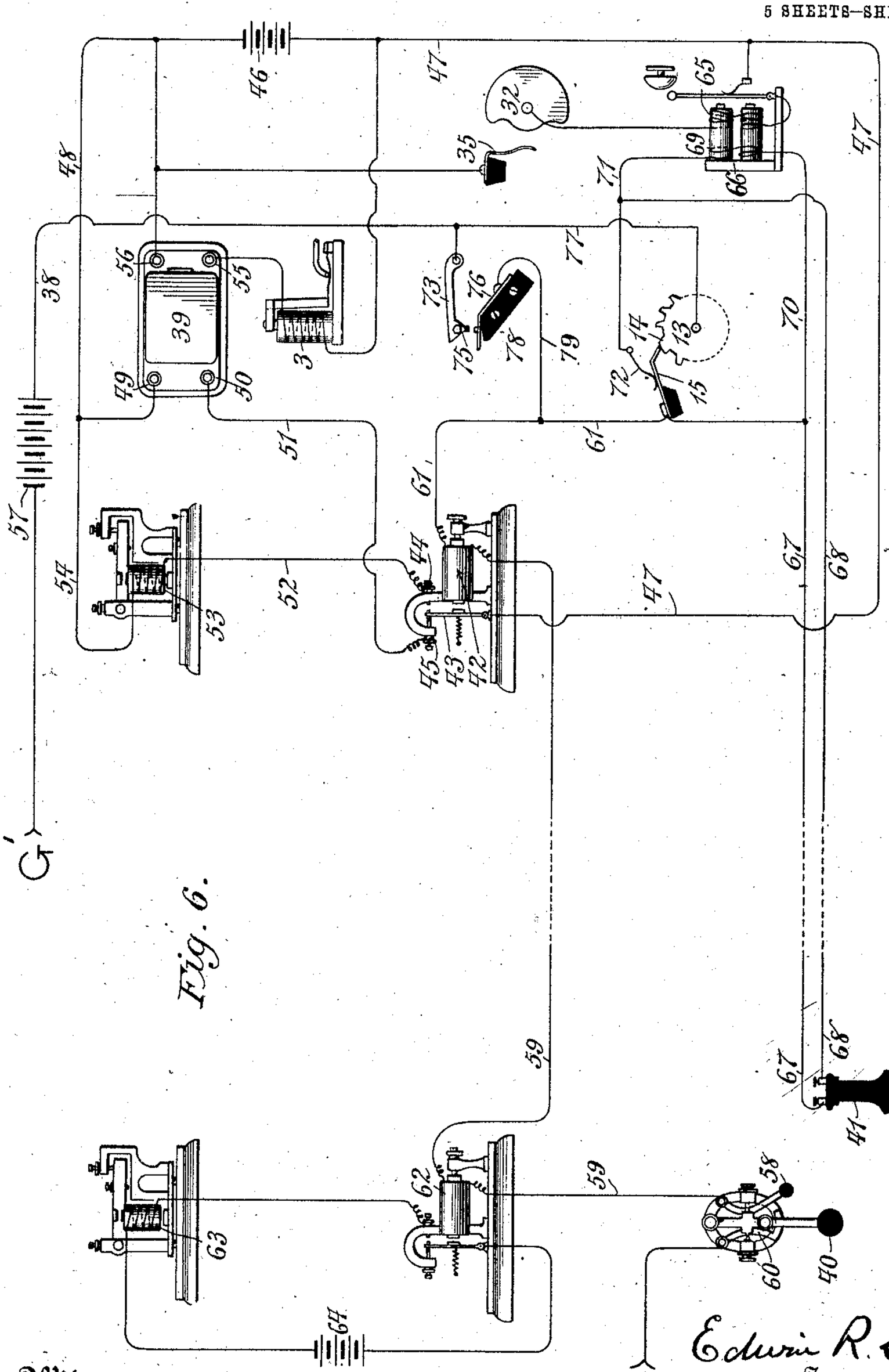

Fig. 6.

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UNITED STATES PATENT OFFICE.

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ANSWER-BACK SIGNAL.

978,733. Specification of Letters Patent. Patented Dec. 13, 1910.

Application filed July 27, 1907. Serial No. 385,844

To all whom it may concern:

Be it known that I, EDWIN R. GILL, a citizen of the United States, residing in the city of Yonkers, county of Westchester, and State of New York, have invented a certain new and useful Improvement in Answer-Back Signals, of which the following is a specification.

Many devices have been invented for the purpose of operating selectively at a distance any one of a number of signals for calling stations on a common main line circuit in such a manner that only the one station wanted shall receive a call. Where instruments of this kind are employed, it often becomes important to be able to ascertain positively whether or not the call has been successful and whether the right station instrument has responded to the main line impulses.

The present invention has relation generally to means for the purpose above named, and in its preferred form this invention is so organized that an intelligible signal is returned whereby the person sending the selective call may know whether or not the call bell or equivalent device is actually in working order.

One feature of my preferred invention is intended to insure preservation of the main line circuit in case of accidents happening to any one of the answer back devices, so that an accident to one instrument may not cripple any other.

Another advantage of my preferred invention is that, in case the operator called should be absent, the call signal will continue its operation indefinitely and such operation will not be interfered with by arrival of additional calls at the same station in the meantime.

It is also a feature of this form of my invention that the person called will know, on his return, how many calls have come in during his absence, by mere inspection of his instrument.

My apparatus may be used in connection with telegraph or telephone lines, and in the preferred form herein described, wherein are combined all of the advantages above named, I have shown the use of both telegraph and telephone instruments.

This invention also has relation to certain details of improvement hereinafter described and particularly referred to in my claims.

A preferred form of my invention is shown in the accompanying drawings, wherein—

Figure 1 is a plan view of the combined answer back and local signal operator, Fig. 2 is a side elevation of the same, Fig. 3 is a vertical section thereof on the plane *x*—*x* in Fig. 1, the armature spring abutment being shown in mid-section, Fig. 4 is a detail of the release for the operating train, Fig. 5 is a side elevation on the side opposite to that shown in Fig. 2 and Fig. 6 is a diagram of circuits.

It is to be understood that my present invention is intended for and adapted to use in connection with any desired form or style of selective signaling device, and may indeed be used in combination with any means for operating it from a distance, whether such means includes a selector or not. I have therefore omitted all description of the selector herein, and in Fig. 6 have indicated as an example merely, the type of selective call described and claimed in my Patent Number 906,523, dated December 15th, 1908.

While certain forms of my invention may be advantageously employed in connection with any appropriate motive power, it is most usefully employed on telegraphic and telephonic lines, and I have therefore shown herein a preferred embodiment of the invention as adapted to be operated by electricity.

In the form shown, the combined answer back and local signal is mounted upon a base 1 and supported by framework 2 at or near one end of which is placed the operating magnet 3, whose vertical swinging armature 4 is preferably supported by a thin spring 5. One extremity of a normally bowed strap spring 6 is fixed to the lower end of the armature 4 and the opposite end of this spring is fixed to a movable clamp 7 adapted to be moved back and forth for adjustment under the influence of the screw 8 passing through the abutment 9.

The spring 6 is intended to directly operate and release the retaining device for the answer back actuating train, which, in the form shown, preferably comprises a sub-

stantially upright rod 10 fixed to a revoluble shaft 11 to which is also fixed a bent arm 12 whose outer extremity lies across the middle portion of the spring 6.

When the magnet 3 is energized, by operation of the selective call or otherwise, the armature is attracted and the spring 6 is straightened, as shown in dotted lines in Fig. 3. This lifts the arm 12 and releases the driving train as hereinafter described.

The answer back signaling device, broadly considered, may have any construction adapted to produce a transmissible code signal whereby the person who seeks to energize the magnet 3 may be informed that the particular instrument corresponding to said code signal has been successfully called. In the preferred form shown this consists of a make and break wheel for an appropriate circuit. One suitable form of such a wheel is shown at 13 in Figs. 1, 2 and 6, said wheel carrying teeth 14 set around its circumference at suitable intervals. These teeth have inclined backs, so that when the wheel is turned in the direction of the arrow in Fig. 2 the tip of the contact spring 15 shall be lifted to the summit of each tooth in succession.

The contact spring 15 is carried upon a fixed insulating support 16, secured at 17, so that, when the wheel 13 turns, the tip of the spring 15 dips by its own resilience into each space between two teeth 14 in succession, but not far enough to make contact with the bottom of said spaces. This is shown in dotted lines in Fig. 2. The contact thus successively made and broken between the spring 15 and the wheel 13 is utilized to make and break the answer back circuit as described hereinafter in connection with Fig. 6.

In the form shown the wheel 13 is moved by a gear train as follows. One end of a coiled driving spring 18 is secured to a cross bar 19 fixed to the frame 2, while the other end of said spring is fixed to a main slow moving shaft 20, which is reset (winding the spring 18) by means of the handle 21, after operation of the answer back. The normal position of the handle 21 with the spring 18 fully wound is shown in Fig. 2.

The main shaft 20 carries the ratchet wheel 22 which engages with a spring pressed pawl 23 pivoted on one face of the driving gear 24 in a well known manner, said gear being loose on the shaft 20. The driving gear 24 drives the shaft 25 through the pinion 26, and the answer back wheel 13 is carried on said shaft 25. For obvious reasons it is advisable to apply a retarding device to the train so far described and I prefer for this purpose to employ a toothed wheel 27 and weighted swinging escapement 28 driven by a gear wheel 29 on the shaft 25, in the manner shown in Fig. 3. Movement of this spring driven gear train is normally prevented by a peg 30 on the face of the wheel 29 which rests upon a lateral bend at the end of the rod 10 (see Figs. 3 and 4). It will thus be seen that, when the rod 10 assumes the dotted line position (shown in Fig. 3) under the influence of the magnet 3, the train is liberated.

For the purpose of use in connection with selective calls on telegraph lines I prefer to arrange the train release so that it requires a double or forth and back movement of the retaining device to permit the train to move. For this purpose a second peg 31 is fixed on the check wheel 29, a little nearer the center and normally above the peg 30. As thus arranged, the magnet 3 acts to tilt the rod 10 as shown in dotted lines, when the train will move until the peg 31 touches the tip of the rod 10. This position is shown in dotted lines in Fig. 4. Then, as the magnet releases its armature, the rod moves back to the full line position and the train is free to move until a complete revolution of shaft 25 and wheel 13 is produced, when the peg 30 once more strikes the rod 10 and the movement is arrested.

Where, as in the form shown, the local call signal which is set in operation by the selective calling device is combined mechanically and electrically with the answer back mechanism, I prefer to mount a local circuit closing sector 32 on one end of the main driving shaft 20, as by means of the hub 33 and set screw 34. A stationary spring 35 is mounted upon an insulating support 36 in such a position that, as the sector 32 revolves (in the direction of the arrow in Fig. 5) it will make electric contact with said spring 35 to close the call circuit as described in connection with Fig. 6. By placing the long sector 32 on the slow moving main shaft, the shaft 25 and answer back wheel 13 may be given three or four revolutions without causing the sector to leave the spring 35. Thus, if the operator should be absent when a call is given and a second call comes while the signal is still in operation, such second and even third or fourth calls will not interrupt the signal. At the same time, when the operator returns, the position of the handle 21 will make clear how many calls have arrived during his absence. The spring 18 is accordingly made long enough to produce three or four (or any reasonable number of) revolutions of the wheel 13.

From what has been described above it is clear that if the two terminal binding posts 37 of the magnet 3 be connected respectively to the two sides of an electric circuit, and said circuit be alternately closed and opened, the actuating gear train will be released and both the answer back and the call signal circuit will be operated. These results may be secured by controlling the magnet circuit

from a distance either directly or indirectly without departing from my invention; but I prefer to accomplish this through a selective circuit closing apparatus in connection with a local battery. One way in which this may be done is shown in Fig. 6. This figure shows a preferred arrangement of apparatus for use on a telegraph line wherein a number of stations are connected to a single main line wire 38, each of which may be called from any other by means of an appropriate selective instrument, indicated in diagram at 39.

At 40 and 41 are shown respectively a telegraph key and a telephone receiver which are supposed to be located at the calling station. It is to be understood, of course, that the calling station is equipped in the same manner as the station called. Duplication of the total apparatus has been omitted for convenience and clearness.

At the station called the relay 42 is provided with the usual armature 43, playing between a forward contact making stop 44 and an electrically distinct insulated rear contact piece 45. One side of a local battery 46 is connected by the wire 47 to the armature 43, while the wire 48 connects the other pole of the battery 46 to one terminal 49 of the actuating magnet (not shown) of the selective instrument 39. The opposite terminal 50 of this actuating magnet is connected by wire 51 to the insulated rear contact piece 45.

The forward relay contact piece 44 is connected by the wire 52 to the usual sounder 53, the other side of which connects with the battery 46 by wire 54.

The terminals 55, 56 on the selector 39 are those through which this instrument closes circuit through the local battery in a well known manner, ordinarily for the purpose of directly ringing the call bell; and these terminals may also be utilized for said purpose in addition to that shown in Fig. 6 without departing from this invention, so far as relates to the answer back alone. I prefer, however, to operate the answer back and call signal circuit together as herein described, and for this purpose the main operating magnet 3 is connected on one side to the terminal 55 and on the other to the local battery 46, while the other terminal 56 is connected to the opposite pole of said battery.

From the above description it will be seen that each operation of the selector magnet connected to terminals 49 and 50 corresponds to open circuit on the main line, or pauses between depressions of the key 40, which pauses to permit the relay armature to touch the contact piece 45. Thus long and short pauses between depressions of the key produce long and short action of the magnet in the selector, which are utilized in any well known manner to operate the selector and close the local circuit through 55 and 56. Thus final closure of the main line circuit at the end of an operation deënergizes the selector magnet and releases the mechanism so as to break the circuit previously closed through 55, 56; a fact adverted to hereinafter. All these operations are well known and are producible by various highly complicated devices a description of which would not add to the elucidation of this invention and would merely increase the complexity of this description and of the drawings.

The mode of operation of the apparatus thus far described is as follows—The sending key 40 being grounded at G and one side of the main line battery 57 being likewise grounded at G′, the party calling first opens the main line as usual by throwing the switch lever 58 to the right and into the position shown in Fig. 6. Groups of circuit closures spaced in accordance with the combination corresponding to the station called are then produced by appropriately depressing the key 40, and the current being transmitted on the main line wire 59, actuates the relay 42, which operates the sounder 53 by making successive contacts at 44; at the same time operating the selector 39 by contacts made during each pause of the key 40, at the point 45. So soon as the proper combination is made, the selector closes the circuit of magnet 3, and thereupon the party calling closes the main line at the key 40 in the usual manner by throwing the switch lever 58 to the left and under the plate 60. As heretofore described, this closure of the main line circuit breaks circuit at 55, 56, and the magnet 3 thereupon liberates its armautre. There is thus produced that forward and back movement of the upright rod 10 (see Fig. 3) whereby the driving train is released, and at once the wheel 13 revolves under the spring 15, causing successive make and break of the main line from wire 38 to wheel 13, spring 15, wire 61, relay 42, main line 59, relay 62 at calling station, key 40, and through ground to main line battery 57.

Each contact at 15 causes relay 62 to close the circuit of the sounder 63 through local battery 64 at the calling station, and, the proper combination of clicks being thus automatically produced in the sounder 63, the party calling is made aware that he has successfully operated the selective instrument 39 at the proper station. At the same time that the answer back is thus operating, the sector 32 is turning more slowly until contact is finally made with the spring 35, thus closing circuit through the local battery 46 and the coils 65 which energize the magnet 66 of the calling signal.

In order to provide means whereby the party calling may be assured that the call-

ing signal 66 is in working order and is actually in operation, I prefer to add to the organization of apparatus thus far described a telephonic instrument 41 at the calling station, connected by wires 67, 68, with a supplemental coil 69 wound on the magnet 66, or otherwise in operative inductive relation thereto. Since operation of the call bell is of course accompanied by rapid magnetic changes in the magnet 66, there will be produced corresponding electric undulations on the wires 67, 68, causing a buzzing noise in the telephone 41.

It is desirable to produce interruptions in the buzzing so caused having durations and a particular sequence corresponding to the code combination of the particular station where the signal bell is ringing. By this means the party calling can identify the station at which he has rung the bell. For this purpose, I prefer to provide a short circuit by wires 70, 71, connected to the extremities of the supplemental coil 69, and to the springs 15 and 72. This short circuit is closed whenever the spring 15 is raised by a tooth on the wheel 13, and at such times, the induced current being diverted by the short circuit, the telephone 41 is silent. Whenever the spring 15 descends between the teeth 14, however, the short circuit is broken and the induced current reaches the telephone and causes a buzzing. Thus a succession of long and short buzzes is produced at 41 which identifies the bell which is ringing.

It will be obvious to those skilled in the art that the benefit of the intermittent or pulsating current through the signaling device 66 may be made available substantially as herein described without actually winding the coil intended to receive induced current therefrom upon the magnet 66 itself, and my invention covers any combination or arrangement of parts whereby an instrument sensitive to induce alternating currents (such for instance as a telephone receiver 41) at the calling station is made to receive an answer back signal from a coil or winding placed in inductive relation to the circuit through the signaling instrument. It will also be understood that the word "circuit" when employed in this specification or in the claims is used in a broad sense and may include a complete circuit from battery back to battery, or only such portion of a circuit as may include the coils of one or more of the various devices forming a portion of the system disclosed herein.

The apparatus thus far described is sufficient by itself to accomplish all the objects had in view, assuming that the operation of the mechanism liberated by the magnet 3 is never interrupted. But inasmuch as the answer back wheel 13 and spring 15 are necessarily included in and operate directly upon the main line circuit, it becomes important to guard against a possible interruption of said circuit by accidental arrest of the wheel at a wrong time. It is clear that, if by any accident (as by breakage of the spring 18 or otherwise) the wheel 13 should be permanently arrested at a moment when the spring 15 was not touching it, the temporary break of the main line circuit would become permanent. This would involve, not only failure of the particular call being made, but the more serious disaster of rendering the entire main line wire useless from one end to the other. I therefore prefer to employ supplemental means for preventing such a catastrophe, in combination with the apparatus hitherto described. Broadly considered, the particular means herein shown for the above purpose, comprises a circuit closer for closing the main line circuit around the spring 15 and wheel 13, restraining means therefor, a device for releasing the circuit closer and means operated by the answer back device for controlling operation of said device.

In detail as shown the circuit closer comprises a lever 73 loosely pivoted at 74 and carrying a contact pin 75 which falls against the stationary contact spring 76, when the lever 73 is released. The lever 73 being in electric connection with the main frame 2 is connected electrically to the wheel 13 as indicated by the wire 77 in Fig. 6. The spring 76 is mounted upon insulation 78 and is connected by the wire 79 with the spring 15. It will thus be seen that when the lever 73 falls, the contact pin 75 touching the spring 76 will close a branch around the wheel 13 and spring 15.

In order to permit operation of the answer back, contact at 76 is normally prevented, and the restraining means above mentioned is provided for this purpose. In the form shown this consists of a hanging hook 80 fixed to a horizontal pivoted-shaft 81 and normally engaging the projection or lip 82 on the lever 73, whereby said lever is supported and prevented from falling, thus preventing contact of the pin 75 with the spring 76. Also fixed to the pivot 81, but at the opposite side of the apparatus, a depending releasing lever 83 is provided, the lower end of which is bent laterally so as to normally touch the stop plate 84, adjustably fixed to the frame 2 at 85 (see Fig. 2). These elements serve to adjust the extent of normal engagement between the hook 80 and the lip 82, and the lever 83 also provides means whereby the hook 80 may be moved out of engagement with said lip 82. The preferred mechanism for this purpose is constructed as follows: Outside of the frame 2 a stout wire or rod 86 forms an adjustable inclined track upon the top of which rolls the axis 87 of the two inertia wheels 88.

These are pivotally connected to the lower ends of the flat upright arms 89, which in turn are pivotally attached to the outer extremity of the lever 90, pivoted at 91 to the frame.

As shown in Fig. 1, the lateral extension of the releasing lever 83 projects into the path of the inner arm 89, so that, as the inertia wheels 88 slowly roll down the track 86, said arm will push against said extension and, by moving it and the hook 80 to the right in Figs. 2 and 3, will disengage the hook 80 from the lip 82, thus allowing contact to be made by the pin 75. Normally this action is prevented by the depending arm 92, whose lateral extension 93 projects across both wheels 88 and pushes them to the left in Fig. 2, so as to bring the arm 89 against the stop 94. The upper end of the arm 92 is rigidly fixed on the lever 95 pivoted at 96, and this lever is normally supported by a light curved finger 97 fixed to an insulating lever 98 pivoted at 99 and whose outer end bears upon the upper side of the spring 15 (see Fig. 2). As the wheel 13 revolves, and each time that the contact spring 15 dips downward between two teeth 14, the outer end of the lever 98 follows this downward movement, causing the extremity of the finger 97 to descend a distance as many times greater than that traversed by the spring 15 as the length of the finger 97 exceeds the length of the lever 98 by which it is carried. This permits the lever 95 to move downward by gravity and causes the arm 92 to move to the right in Fig. 2, freeing the inertia wheels 88, which thereupon begin to roll slowly down the track 86.

When the answer back is operating normally the intervals of time during which the spring 15 is depressed are so short that the finger 97 restores the lever 95 and arm 92 to the position illustrated before the slowly moving wheels 88 have time to bring the arm 89 into contact with the releasing lever 83. Thus the arm 92 pushes the arms 89 back to the position illustrated without the hook 80 being operated and so closure of the main line at the spring 76 is normally prevented. This normal return movement of the retarding mechanism is accomplished by sliding the axis 87 back along the track 86 without rotation of the inertia wheels 88, and this occurs instantly and without appreciable retardation.

If by any accident the wheel 13 either fails to turn or is arrested during its operation, one of two conditions is produced. If the spring 15 is riding on a tooth 14 at such a time, the main line circuit is maintained intact by contact between said spring and tooth. If, on the other hand, the wheel 13 stops while the spring 15 is depressed between two teeth, leaving the main line open at that point, the finger 97 will also be depressed and the arm 92 will leave the wheels 88 free to roll far enough so that the arm 89 strikes the lever 83, causing the hook 80 to release the lever 73 and permit the pin 75 to close the main line circuit at 76. Thus accidental failure of operation of the answer-back can at no time interrupt the main line circuit.

While I have shown my apparatus organized so as to transmit a code signal from the station called to the calling station both telegraphically and telephonically, either the telephonic or telegraphic communication may be used alone without departing from my invention. It is also to be understood that the particular arrangement and combination of instruments above described are merely illustrative and that many changes, modifications and additions can be made in the same without departing from my invention, which is not limited in its scope to these details.

I have used reference numerals in certain of the following claims, the better to identify the elements referred to, but the use of such numerals is not intended to limit the scope of such claims to the precise form of such element as illustrated herein.

What I claim is—

1. In apparatus of the class described, in combination, an electrically operated answer back signaling means, a local signal, a second answer back signaling means located in inductive relation to the local signal, selecting means for controlling the operation of both of said aniswer back signaling means and said local signal.

2. In apparatus of the class described, in combination, electrically operated answer back signaling means, a local signal, a second answer back signaling means located in inductive relation to said local signal, selecting means for controlling the operation of said answer back signaling means, and means for producing a number of operations of one of said answer back signaling means while continuing the operation of the local signal.

3. A device of the class described comprising an actuating gear train, a check wheel driven thereby, two pegs thereon on different radii and at different distances from the center of the wheel, a tilting rod adapted to engage successively with said pegs, an operating arm for said rod, a normally bowed spring in operative relation to said arm and an electro-magnet and armature arranged to straighten said spring for operation of said arm, substantially as described.

4. A device of the class described comprising an electrically operated local signal, an electrically actuated answer back, a circuit for the latter a section of which is

placed in inductive relation to said signal circuit, a short circuit across the ends of said inductively placed circuit-section and automatic means for opening and closing said short circuit, substantially as described.

5. A device of the class described comprising an electrically operated local signal, a circuit closer therefor, a second circuit closer, common operating mechanism for both circuit closers, an electrically actuated answer back device, a circuit for the latter a section of which is placed in inductive relation to said signal, and a short circuit across the ends of said inductively placed circuit-section and comprising the second above named circuit closer, substantially as described.

6. A device of the class described comprising a telegraphic answer back, a local signal, common operating mechanism for both, a telephonic answer back, means for supplying current to the latter controlled by said local signal, and means for producing prearranged modifications in said current controlled by said telegraphic answer back, substantially as described.

7. A device of the class described comprising an electro-magnetic signal, an operating magnet therefor, an inductively operated answer back signal, a circuit therefor comprising a coil upon said operating magnet, a short circuit around said coil, and means for making and breaking said short circuit, substantially as described.

8. In apparatus of the class described, in combination, a circuit for transmitting signaling impulses from a calling station, a local signal, a circuit for said local signal, selecting means for controlling the operation of said local signal, answer back means in inductive relation with the circuit of said local signal, and an answer back receiving device in the calling station.

9. In apparatus of the class described, in combination, a circuit for transmitting signaling impulses from a calling station, a local signal, a circuit for said local signal, selecting means for controlling the operation of said local signal, answer back means in inductive relation with the circuit of said local signal, an answer back receiving device in the calling station, a branch circuit about said answer back means, and means for momentarily opening and closing said branch circuit.

10. In apparatus of the class described, in combination, a circuit for transmitting signaling impulses from a calling station, a local signal, a circuit for said local signal, selecting means for controlling the operation of said local signal, answer back means in inductive relation with the circuit of said local signal, an answer back receiving device in the calling station, and means for rendering the action of said answer back means intermittent.

11. Apparatus of the class described comprising a circuit for transmission of signals, an answer back signaling device in said circuit, a circuit closer in a branch around said answer back, means for operating said circuit closer including reciprocating retarding means operative in one direction only and mechanism operated by movements of said answer back device for alternately releasing and pushing back said retarding means, substantially as described.

12. In combination an answer back signaling device, a circuit closer in a branch circuit around said device, a device for closing circuit through said circuit closer, means for applying operative pressure to said device, a retarding device for said last named means, and mechanism operated by movements of said answer back device for controlling the action of said retarded pressure applying means, substantially as described.

13. In combination an answer back signaling device, a circuit closer in a branch circuit around the same, a device for closing circuit through said circuit closer, a reciprocating means for applying operative pressure to said device, a retarding device for said last named means operative in one direction only, and mechanism operated by movements of said answer back device for alternately pushing said reciprocating means in its unretarded direction and releasing it to permit retarded movement thereof, substantially as described.

14. In combination an answer back signaling device, a circuit closer in a branch circuit around the same, a device for closing circuit through said circuit closer, means operated by gravity in one direction to propel said last named means, and mechanism controlled by said answer back device for returning said gravity-operated means to its upper position after each movement in an operative direction, substantially as described.

15. In combination an answer back signaling device, a circuit closer in a branch circuit around the same, a device for closing circuit through said circuit closer, a reciprocating means for applying operative pressure to said last named device and mechanism operatively connected with said answer back device for normally arresting movement of said reciprocating means before it reaches the circuit closing device and so arranged as to be inoperative when the answer back device stops on open circuit, substantially as described.

16. An answer back signaling device comprising a toothed wheel and a movable contact device adapted to alternately rise upon the wheel teeth and sink between them; in

combination with a circuit closer in a branch around said answer back and mechanism operated by the rise and fall of said contact device for controlling operation of said circuit closer, substantially as described.

17. In combination an answer back signaling device, a circuit closer in a branch circuit around the same and comprising a gravity lever and coöperating contact piece, a pivoted hook for supporting said lever and an arm for tripping said hook; in combination with an inclined track, a substantially horizontal pivoted lever (as 90) an upright lever (as 89) pivoted to said horizontal lever so as to swing against said tripping arm, a retarding wheel pivoted to said upright lever and rolling on said track, and means operated by said answer back device for controlling the movements of said wheel and its attached levers, substantially as described.

18. An answer back signaling device comprising a wheel having teeth, and a coöperating contact piece adapted to alternately ride upon and dip between said teeth, a pivoted lever (as 98) bearing upon said contact piece, a circuit closer in a branch circuit around said answer back, a restraining device therefor, retarding tripping means for said device, a substantially horizontal pivoted lever (as 95), an arm fixed thereto and impinging upon said retarded tripping means for its operation, and a finger fixed to said lever 98 and bearing against said lever 95 for operating the latter, substantially as described.

19. A device of the class described comprising in combination an answer-back wheel capable of short initial movement without operation of the answer-back, a starting device capable of successive forward and backward movement, means connected with said wheel and coöperating with said starting device for producing short initial movement of said device and complete liberation of the wheel on the next backward movement of said device, an electro-magnet governing said starting device, and selectively operated mechanism for successively making and breaking the circuit of said magnet, substantially as described.

20. In combination, a calling station, a main line connected therewith, a number of sub-stations connected with said main line, a selective signal operator and local signal circuit at each sub-station, a signal operated thereby at each station arranged to produce rapid potential changes when operated, an answer back receiving device at the calling station and a circuit connected to said answer-back receiving device and arranged in inductive relation to the signal circuits in said substations, substantially as described.

21. In combination, a calling station, a main line connected therewith, a number of sub-stations connected with said main line, a selective signal operator and local signal circuit at each sub-station, a signal operated thereby at each station arranged to produce rapid potential changes when operated, an answer-back receiving device at the calling station, a circuit connected to said answer-back receiving device, a local inductive circuit at each sub-station in inductive relation to said local signal circuit, means controlled by said selective signal operator for producing identifying changes in the condition of each of said local inductive circuits.

22. In a signaling system in combination, a signaling circuit, a local signal, answer back means combined with said local signal and located in inductive relation with said signaling circuit, means for impressing impulses upon said signaling circuit, and selecting mechanism for controlling said last named means.

23. In a signaling system in combination, a signaling circuit, a local signal, a circuit for said local signal, automatically operated answer back means combined with said local signal and located in inductive relation with said signaling circuit, means for impressing impulses upon said signaling circuit, and selecting mechanism for controlling said last named means.

24. In a signaling system, in combination, an instrument for impressing signaling impulses upon the line, a local signal, answer back means located in inductive relation with the local signal, an answer back receiving instrument, and selecting means operated by the signaling impulses impressed upon the line from the signaling station for controlling the operation of the local signal.

25. In a signaling system, the combination with a line connecting a calling and a called station, of an instrument at the calling station for impressing signaling impulses on the line, a selector at the called station selectively operated by definite, predetermined signaling impulses, an electro-magnetically operated signal including a vibrating member at the called station, the electro-magnet of said signal directly operating said vibrating member and having a normally open local circuit controlled by said selector, and an electrically actuated answer back receiving instrument at the calling station arranged in circuit to receive a flow of current varied by the operation of the vibrating member of said local signal.

26. In a signaling system, the combination with a line connecting a calling and a called station, of an instrument at the calling station for impressing signaling impulses on the line, a selector at the called station selectively operated by definite, predetermined signaling impulses, impressed on the line by said instrument, an electro-magnetically op-

erated local signal at the called station having its circuit controlled by said selector, and an electrically actuated answer back receiving instrument at the calling station arranged in circuit to receive induced currents resulting from the operation of said electro-magnetically operated local signal.

27. In a signaling system, the combination with a line connecting a calling and a called station, of an instrument at the calling station for impressing signaling impulses on the line, a selector at the called station selectively operated by definite, predetermined signaling impulses, an electro-magnetically operated local signal at the called station having its circuit controlled by said selector, and an electrically actuated answer back receiving instrument at the calling station, responsive to a current flow of varying potential, said answer back receiving instrument having its circuit operatively related to the circuit of said local signal, whereby the continued and rapid interruption of the current flow of the circuit of the local signal resulting from the operation of said local signal produces a current flow of varying potential through said answer back receiving instrument.

28. In a signaling system, the combination with a line connecting a calling and a called station, of an instrument at the calling station for impressing signaling impulses on the line, a selector at the called station selectively operated by said definite, predetermined signaling impulses, an electro-magnetically operated local signal at the called station having its circuit controlled by said selector, and an electrically actuated answer back receiving instrument at the calling station, the coils of the electro-magnet of said local signal being operatively related to the circuit of said answer back receiving instrument to produce therein a variable current flow.

29. In a signaling system, the combination with an instrument at the calling station for impressing electrical signaling impulses and a selector at a called station responsive to definite, predetermined signaling impulses produced by the operation of said instrument, of an electro-magnetically operated signal including a vibrating member at the called station, the electro-magnet of said signal directly operating said vibrating member and having a normally open circuit arranged to be closed by the operation of said selector, an electrically actuated answer back receiving instrument at the calling station responsive to currents of variable potential produced by the operation of the vibrating member of said signal, and a system of circuits electrically connecting said instrument for impressing electrical impulses on the line and said selector, and for also electrically connecting said electro-magnetically operated signal and said answer back receiving instrument.

30. The combination with a system of circuits, of an instrument for impressing electrical signal impulses and a selector operatively responsive only to definite, predetermined signaling impulses connected in said system of circuits at a calling and called station, respectively, an electro-magnetically actuated signal at the called station having its circuit controlled by said selector, and an answer back receiving instrument at the called station electrically connected by means of said system of circuits with the coils of the electro-magnet of said signal.

31. In a signaling system, the combination with a main line connecting a calling and a called station, of a local signaling circuit at the called station, means for selectively controlling said signaling circuit, a signal in said signaling circuit arranged to produce rapid potential changes when operated, and an electrically actuated answer back receiving device at the calling station having its circuit operatively related to the circuit of said local signal, whereby rapid potential changes in the signaling circuit produce corresponding potential changes in the circuit of said answer back receiving device.

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Witnesses:
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