

C. W. GREENSLITT.
APPARATUS FOR MEASURING TELEPHONE SERVICE.

APPLICATION FILED AUG. 26, 1908.

Patented July 26, 1910.

2 SHEETS—SHEET 1.

965,453.

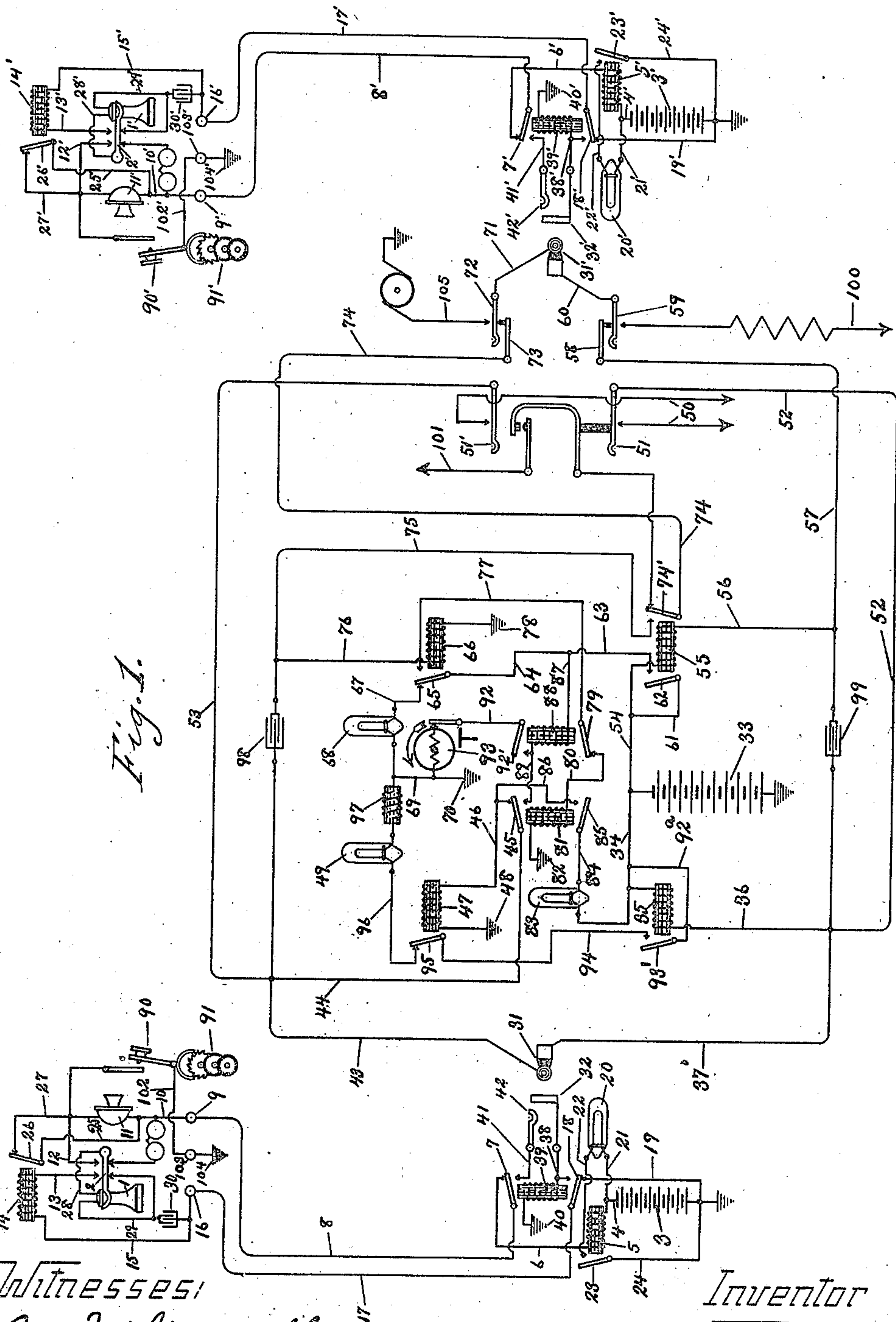


Fig. 1.

Witnesses:
Leota M. Gemmell
John J. Herig.

Inventor
C. W. Greenslitt.
By J. J. Gemmell. Attorney.

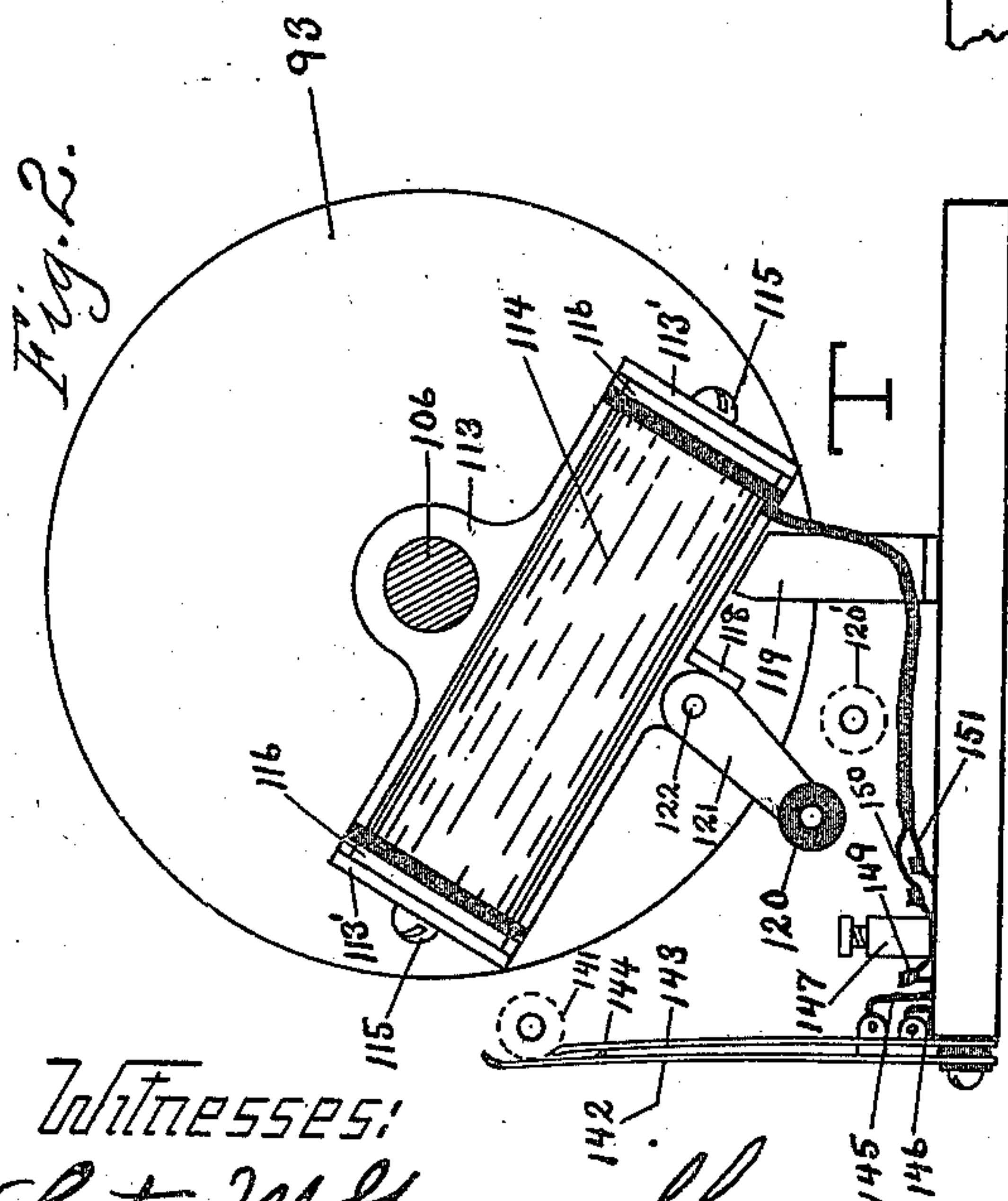
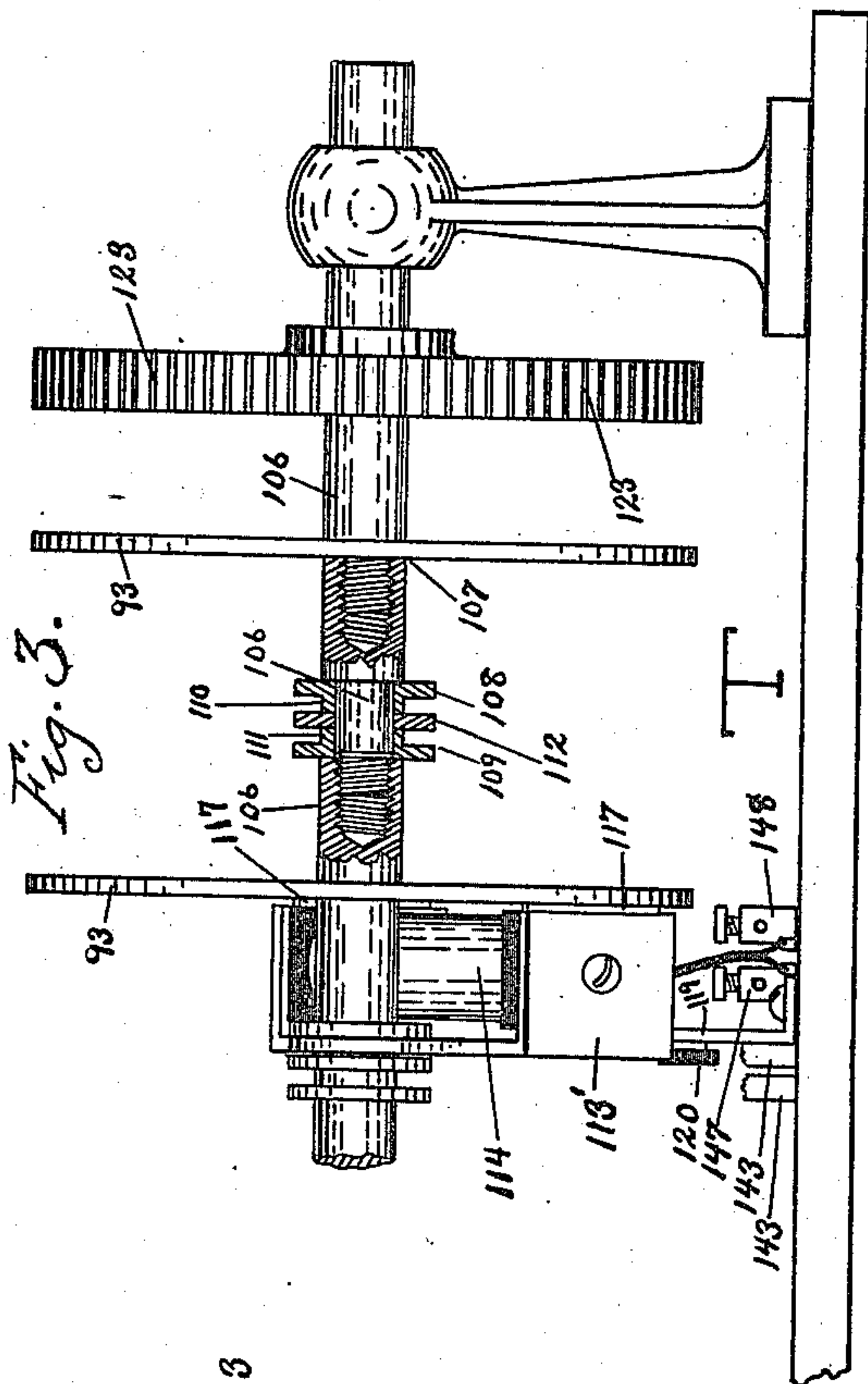
C. W. GREENSLITT.
APPARATUS FOR MEASURING TELEPHONE SERVICE.

APPLICATION FILED AUG. 26, 1908.

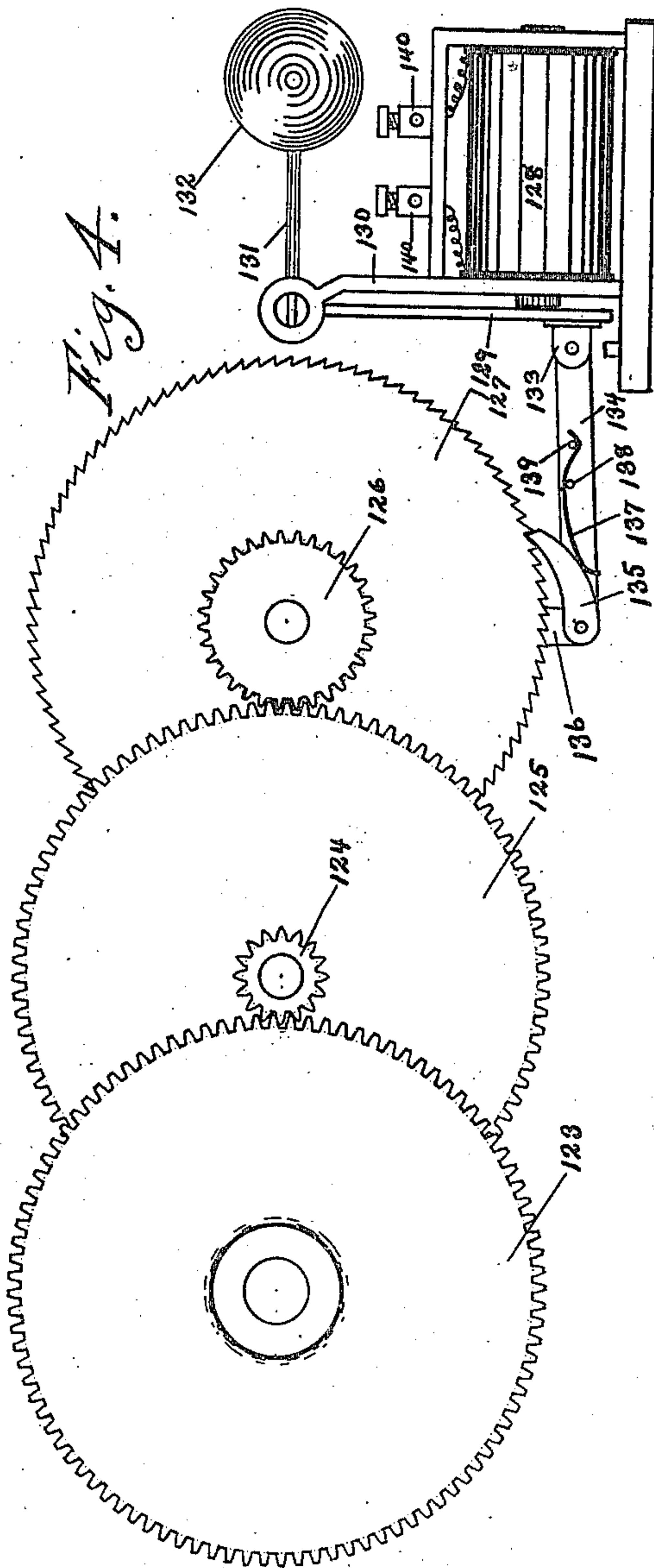
965,453.

Patented July 26, 1910.

2 SHEETS—SHEET 2.



Witnesses:
Leta M. Gemmill.
John J. Herig.



Inventor
Chas. W. Greenslitt.
By J. S. Gemmill, Attorney.

UNITED STATES PATENT OFFICE.

CHARLES W. GREENSLITT, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-THIRD TO A. C. MORSE AND ONE-THIRD TO C. F. SAENGER, BOTH OF CLEVELAND, OHIO.

APPARATUS FOR MEASURING TELEPHONE SERVICE.

965,453.

Specification of Letters Patent.

Patented July 26, 1910.

Application filed August 26, 1908. Serial No. 450,376.

To all whom it may concern:

Be it known that I, CHARLES W. GREENSLITT, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Apparatus for Measuring Telephone Service, of which the following is a specification.

The object of the invention is to provide means whereby telephone service may be accurately measured and obtained at the option and will of the calling subscriber, after said subscriber has obtained the exchange connection; it being possible for the subscriber to continue the conversation by intervals, without suffering a disconnection, or in any way disturbing the switchboard operator.

The reasons for the production of this invention are obvious, but it may be proper to herein state that the general dissatisfaction on the part of subscribers to telephone service, due to the inevitable cut-off, or disconnect which he suffers at the expiration of his talking time limit, and the trouble and inconvenience, not only to the calling party, but also to the called as well, militates against the transaction of business over a telephone line with that facility which is so desirable at times and more especially is this true when the connection is through a busy section or position on the board and the operator is in not the best of humor.

In my device, none of the above enumerated difficulties are met, as the operator has no control over the subscriber with his talking time limit, as he controls that himself and does not commence to deplete his limited talking time until he gets his party, when he, himself, completes the connection and starts the recording of his time on that call; if perchance the conversation continues beyond the time limit, he gets a "click" in the ear and is then cut-off through his transmitter only, and he may continue his conversation by again completing the connection as before; this action gives him measured service, does not inconvenience or disconnect the called party and at the same time registers the serial number of the call made upon the telephone of the calling party and for which he is debited. In carrying out this, my object, I have made use of one of the many standard telephone switchboard

circuits now in use, with a few changes, made necessary so that it might conform to the requirements of this, my invention, and more particularly to the time limiting device as a part of same. These results are attained by the mechanism in connection with the circuit, all of which are shown and illustrated in the accompanying drawings, in the preferred form for the best results; said drawings forming a part of this specification.

Reference being had to the drawings at this juncture, Figure I, represents and discloses a circuit comprising one complete cord circuit on a switchboard, together with two complete subscribers' telephones as connected therewith. Fig. II is a transverse vertical sectional view of the timing device, Fig. III is a side elevation of the same partly broken away and partly in longitudinal section, and Fig. IV is a detail view in elevation of the driving mechanism for the timing device.

In a more particular consideration of the drawings, it will be found that similar figures refer to similar parts throughout the same, and again referring to the drawings, in Fig. I, calling attention to subscribers' set No. 1—the receiver being removed, the hook 2 moves upward and in so doing makes the usual contact connections, allowing a flow of current from battery 3 on wire 4, through line relay 5, on wire 6, through armature 7, on line wire 8 to binding post 9 thence on wire 10, and is shunted around transmitter 11, on wire 12, through hook 2, on wire 13, through controlling relay 14, on wire 15, to binding post 16, thence on line wire 17, through armature 18, on wire 19, back to battery 3, the shunt around transmitter 11 being broken as soon as relay 14 is energized. This closes line relay 5 and lights line lamp 20, which obtains current through wire 4 from battery 3, on wire 21, thence on wire 22 through armature 23, on wire 24 to battery; it also closes the controlling relay 14, which opens the shunt around the transmitter 11, by way of wire 25, armature 26 and wire 27. The subscriber No. 1, is now able to talk and hear with the transmitter and receiver in series and bridged across the line wires 8 and 17, by means of wire 10, transmitter 11, wire 12, hook 2, wire 28, receiver 1, wire 29, condenser 30. With the circuit as above, the

transmitter will pass enough current to maintain the magnetic saturation in the core of the coil 14, and the shunt does not detract but rather the opposite, as it offers a path of travel for the current through a circuit that has no appreciable resistance, thus insuring a powerful initial pull on the armature 26 at the start, while in practice the transmitter is adequate as a passing medium for current for the coil 14 to enable it to retain the armature 26 after it is pulled up to a close relation with the core of said coil 14. The operator, by inserting the answering plug 31 into the jack 32, allows current from battery 33 to flow on wire 34, through relay 35, wire 36, wire 37 to sleeve side of plug 31 and jack 32; on wire 38, through cut-off relay 39 to ground 40, thus operating the cut-off relay 39 and opening the actuating circuit of line relay 5, and consequently opening the line lamp 20 and at the same time closing the sleeve and tip of plug 31, through the sleeve side of jack 32, through wire 38, armature 18 and line wire 17; feeding current from battery to the subscribers' set No. 1, by way of the cord of which wire 37 forms a part; the current returns by way of line wire 8, through armature 7, wire 41 and tip side of jack 32, which is disclosed as a spring member 42; then through tip of plug 31, wire 43, (which completes the cord) wire 44, armature 45, wire 46, relay 47 to ground 48. This operates relays 35, and 47, closing local contact on relay 35 and opening local contact on relay 47, thus keeping out supervisory lamp 49. The operator now connects the talking set, represented by wires 50, by depressing the listening key 51, and 51' thereby connecting on wires 52, and 37, sleeve, line and back to tip of plug 31, on wires 43, and 53 to other side of listening key at 51' and on wire 50. When the operator receives the number requested, she inserts the calling plug 31' in the proper jack, as at 32' and rings. This closes battery circuit from battery 33, on wire 54, through relay 55, on wires 56 and 57, spring contact 58, portion of key 59, part of cord as at 60, sleeve of plug 31' jack sleeve 32', wire 38', through cut-off relay 39' to ground 40'. This operates relay 55 and cut-off 39', closing a circuit from battery 33 by wires 54 and 61, through armature 62, wires 63 and 64, through armature 65 on relay 66, thence through wire 67, supervisory lamp 68, wire 69 to ground 70, thus lighting lamp 68 and closing tip and sleeve 31', through to line. Viewing this circuit in its present condition, relative to the position of the several different parts, both of the cut-off relays 39 and 39', controlling relay 14 and relays 47 and 55 are closed and the supervisory lamp 68 is lighted. When the called party answers by taking his receiver from off the

hook, a circuit is closed from sleeve of jack 32', by wire 38', through armature 18' wire 17', binding post 16', on wire 15', through controlling relay 14' wire 13', hook 2', on wire 12', through transmitter 11', to wire 10' and to binding post 9' to line 8', armature on cut-off relay 39' as at 7', through to tip connection 42', thence through tip of plug 31', wire 71, spring key 72, spring contact 73, wire 74, armature 74' wire 75 and 76, through relay 66 to ground 78; this closes relay 66, opening supervisory lamp 68 circuit, putting out the lamp, also closing a circuit from battery 33, through wires 54, 61, armature 62, wires 63, 64, armature 65, wire 77, armature 79, wire 80, through relay 81 to ground 82. This operates relay 81 and closes a circuit to battery 33 by wire 34 lamp 83, wire 84, armature 85, contact and wire 86, wire 46, through relay 47 to ground 48; thus lighting lamp 83 and thereby showing the operator that subscriber No. 1, has not registered, at the same time, closing a circuit from battery 33 by wires 54 and 61, through armatures 62, wires 63 and 87, through relay 88, on wire 89, armature 45, wires 44 and 43 to tip of plug 31, and to line; but as the same side or pole of the battery is on the sleeve, as shown through wire 34, relay 35, and wires 36 and 37, consequently no current flows and thus the relay 88 is not operated while the controlling relay 14 is deenergized and open and at the time, short circuiting the transmitter 11, by the circuit described by the wires 10, 25, armature 26, wires 27, 12, through hook 2, wires 28, 29, through condenser 30, binding post 16, line 17, which makes it impossible for the subscriber No. 1, to talk, although he can hear subscriber No. 2. Before subscriber No. 1, can talk, he must press the key 90, connected with an indicating register, shown at 91, and so arranged as to throw a momentary ground on the tip side of line and allow current from battery to flow through relay 88, by the circuit hereinbefore described, thus opening the circuit through relay 81, and in turn opening the circuit through the lamp 83, and thereby notifying the operator that subscriber No. 1, has registered.

Relay 88, is a lock-up type and locks through wire 92, by means of the armature 92' and the timing device T, shown conventionally in Fig. I, to ground 70.

At 98 and 99 are disclosed condensers, which are in the talking circuit for the purpose of preventing a flow of battery. Wires 100 and 101 go to battery and "busy" test respectively, while wires 102 and 102', binding post 103 and 103' and grounds 104 and 104' serve to connect battery through key 90, for the operator, as described. Wire 105 serves to connect ringing key to the generator and to ground.

The timing device is so arranged that at the end of any predetermined time, its local circuit is broken, releasing relay 88 and consequently closing relay 81, again, and lighting lamp 83, at the same time releasing the controlling relay 14, so that the subscriber No. 1, cannot talk until he again registers another call, when he can resume his conversation, his battery being restored as before described. At the close of the conversation, if the subscriber No. 2, hangs up first, or if he should accidentally, during the conversation, lower his hook, he will not thereby restore the timing device to zero, but only brings in his supervisory lamp in the regular manner, while upon subscriber No. 1, having hung up his receiver, it brings in his supervisory lamp and this arrangement makes it impossible for either of the talking parties to maliciously or carelessly restore the timing device, and thus necessarily, cause the calling subscriber to again register a useless call, all within his allotted time. So it is also impossible for the operator to give the subscriber No. 1, more than one call within the limits of the allotted time as determined by the timing device, as by the operator removing the calling plug, it releases the relay 55 and consequently releases the relay 88, which restores the timing device T, and the subscriber No. 1, must again register before he can talk to another party, as before described. When subscriber No. 1, hangs up first, that opens his line and takes battery off of the tip side of cord and deenergizes relay 47, which allows his supervisory lamp 49, to light, by making the circuit from battery 33, through wire 34, 92^a, armature 93', on relay 35; thence through wire 94, armature 95, on relay 47; thence through wire 96, lamp 49, and resistance 97, through wire 69 to ground 70; then the operator takes down the cord. If subscriber No. 2, retains the line after subscriber No. 1, has hung up his receiver, it will become incumbent upon the operator to notify him to "hang up" and "call again" or to simply "take down" the connection and let him call in in the usual manner, he becoming a calling party in that case and the call will come in on his position in the calling strip of jacks in the switchboard. The operator could not give him another call on that time just used, as the calling plug is in use at that time. Thus I have shown and described the working of this part of my device and I wish to here point out the fact that I do not wish to be restricted and limited to the single use of a register device in connection with the talking sets. The timing device will continue to be rotated as hereafter described, until both parties have hung up, or until the calling plug is removed, when it will restore to the normal position.

Referring to Figs. II to IV, showing the

details of my timing device I show a shaft 106, on which I have placed at intervals of fixed, equal distances, a plurality of soft iron disks shown as 93, for the purpose of identification with the same part as shown in Fig. I. This shaft is composite, as will be readily seen and is composed of a series of male and female threaded parts and as shown the disks are held in rigid place, by reason of their being clamped within the joints of the shaft, as at 107; intermediate, and midway between the disks, in pairs, I have introduced a series of separate pieces, three in number, only here being considered; they consist of right and left hand bushings 108 and 109, having their portions 110 and 111 respectively, of a diameter equal to the diameter of the shaft 106. The larger diameters of these bushings are of the same dimensions as the diameter of the divisional washer 112; the result being a series of two channels around about the shaft 106 as shown. These channels are for the purpose of retaining the members shown at 113 which are adapted to retain an electromagnet-coil, singular to each member, and which is disclosed as 114 and is adapted to be held in relation with said member by the screws 115 in connection with the end pieces of said member, shown at 113'; the coil is of such a length that there will be space to admit, at either end, of a pole piece 116, which extends diskward and in close proximity thereto, as shown at 117; a part of the duplication of this instrument only, is shown, as there must be as many of the coils mentioned as there are cord-circuits upon the switchboard to which it is adapted, and the limited space of the drawing militates against showing the instrument in its entirety. It will appear obvious that it is the intention to swing a pair of these coils, by means of their members 113 within the space between the disks 93 and in such a manner that they will be free to hang suspended upon said shaft, pendulumwise, and while they are adapted to rotate around said shaft, they will not do so ordinarily. To be definite, the member 113 is adapted to rotate within the confines of the channel formed by the bushes 108 and 109. As a part of the member 113, I show a portion at 118 which acts as a stop for the said portion sustaining the coil, and is adapted to engage the stop pin or lug 119; the coil is not shown in that position it will assume when in the normal position at rest, but when it is in that position, the said parts 118 and 119 will be in contact and the insulated roller 120 will have assumed the position shown in dotted lines in Fig. II at 120'; the arm 121 sustaining the roller 120 is attached to the member 113 in an operable position, being fulcrumed, loosely on a pin at 122 and is retained in the position shown, by the part

118, before described, as for another purpose. The gear wheel 123 is for the purpose of rotating the whole mechanism, and is shown in Fig. III in connection with a train of gears, operated by a ratchet wheel, and indicated in their order by, 123, 124, 125, 126 and 127 respectively; this ratchet wheel, last mentioned, is adapted to be rotated intermittently by the arrangement, (electrical), which I will describe as a coil magnet 128, operating a pendulum armature 129 which is fulcrumed at its topmost part, in the frame 130 adapted for that purpose and is also counter-balanced by the member 131 and the weight 132; I show a joint lug 133 as a part of said armature and to which I adapt a link 134 which carries a pawl 135, and the whole being suspended in an operable position with regard to the said ratchet wheel, and pendulumwise with regard to the shaft of said wheel, by the lever, a part of which is seen at 136; the pawl 135 is held in close relation to the said wheel by the spring 137, which is in turn held in place by the pins 138 and 139. Binding posts 140 serve to terminate the winding of the coil magnet. This device is intended to be operated by intermittent impulses of electric current as may be supplied by a master clock adapted for that purpose, and to that end I have designed the magnet coil and the ratchet movement, so that when operated it will advance the ratchet wheel but one tooth space at and for one impulse as described; the speed of these electric impulses desired, gives a frequency of sixty, (60) per minute, and the ratio of the gearing is such that with this speed the wheel 123 and the shaft 106 will make one revolution for every thirty, (30) minutes; the distance between the assumed position of the wheel 120, as at 120' and the finishing position as at 141, is equivalent to sixty degrees or one sixth of a complete circle or revolution; hence if the wheel 123, shaft 106 and disks 93 travel one revolution in one half hour, then it will require but five minutes for the mechanism to travel the prescribed distance as noted.

The springs 142 and 143 are in contact, normally, all of the time at 144 and are connected to wires 145 and 146 respectively; wire 145 goes to binding post 147 and wire 146 goes to solder clip at 149 and thence to wire 150 forming a part of the flexible cord to coil 114 and thence back to clip 151 which goes to binding post 148. This local connection puts the springs 142 and 143 together with the coil 114, in series with the binding posts. Upon the coil being energized, it clamps, magnetically, to the slowly revolving plate or disk and commences to advance to the position where the wheel 120 will pass over the spring 143 and allow it to break connection, when the magnet will let go and it will settle in to its normal starting position

as hereinbefore described; this action is made permissible by the flexibility of the wheel arm 121.

It will be observed by reference to Fig. I that the disk 93 is shown to travel backward, (counter clockwise) and carrying a coil and contact point operatively related to the spring shown at the upper extreme end of the wire 92, are also shown with a view to designate the timing device which is shown in large detail in Figs. II to IV. The binding posts 147 and 148 shown in Fig. III are connected in the cord circuit in such a manner that they become terminals for the wires 69 and 92 respectively.

In showing this my invention and in connection therewith, I have made use of a circuit that is in the greater part, protected by patents, to others, and to those parts I disclaim any right, having used them in my disclosures simply to show connection of thought; it might be well to here state that I am not limited to the use of this particular circuit as shown, as my device is applicable to a number of other circuits as well.

Having shown and described this my invention, fully and clearly, so that to those who are skilled in the art to which it appertains, it will appear sufficiently obvious, so that they might construct and use same, what I wish to particularly point out and claim is:

1. In a system of the character described, the combination with a calling subscriber's set; of a receiving switch-board set comprising a complete cord circuit, and means connected therewith, whereby the time consumed by the calling subscriber is accurately spaced, and means whereby when the time is so spaced the calling subscriber is automatically shut off from communication with the called party.

2. In a system of the character described, the combination with a receiving switch-board set; of a calling subscriber's set, means whereby the time consumed by the calling subscriber is accurately spaced, means whereby when the time is so spaced the calling subscriber is automatically shut off from communication with called party, and means therewith connected, whereby the calling subscriber may reestablish communication and resume conversation with the called party and registers for the said reestablished communication.

3. In a system of the character described, the combination with a receiving switch-board set; of a calling subscriber's set, means whereby the time consumed by the calling subscriber is accurately spaced, means whereby when the time is so spaced the calling subscriber is automatically shut off from communication with the called party, and means therewith connected, whereby the calling subscriber may reestablish communication and resume conversation with the

called party, together with means whereby the said calling subscriber registers for the said reestablished communication and resumed conversation.

4. In a system of the character described, the combination with a calling subscriber's set; of a receiving switch-board set comprising a complete cord circuit, and means connected therewith, whereby the time consumed by the calling subscriber is accurately spaced and means whereby when the time is so spaced, the calling subscriber is automatically shut off from communication with the called party without affecting the calling subscriber's ability to hear, telephonically, over the set so shut off from communication, and means therewith connected, whereby the calling subscriber may reestablish communication and resume conversation with the called party.

5. In a system of the character described, the combination with a calling subscriber's set; of a receiving switch-board set comprising a complete cord circuit, means connected therewith, whereby the time consumed by the calling subscriber is accurately spaced and means whereby, when the time is so spaced the calling subscriber is automatically shut off from communication with the called party; said last action, in no way, however, affecting the calling subscriber's ability to hear, telephonically, over the set so disconnected.

6. In a system of the character described, the combination with a switch-board circuit; of an instrument comprising, primarily, a shaft, composed of a plurality of jointed sections, together with a plurality of soft iron disks mounted thereon and revolving therewith, one of the said disks to each cord circuit in the said switch-board circuit.

7. In a system of the character described, the combination with a switch-board circuit; of an instrument comprising, primarily, a shaft, and a plurality of soft iron disks mounted thereon at fixed, evenly spaced distances, and revolving therewith, one of said disks to each cord circuit in the said switch-board circuit.

8. In a system of the character described, the combination with a calling subscriber's set, of a switch-board circuit comprising complete cord circuits, one of which is adapted to be connected to said subscriber's set and with which is included in combination, a timing device including a plurality of soft iron disks mounted at even distances thereon, together with a plurality of parts intermediate, and midway between said disks and mounted on said shaft in such a manner as to form channels or guide ways around about said shaft.

9. In a system of the character described, the combination with a calling subscriber's set, of a switch-board circuit comprising

complete cord circuits, one of which is adapted to be connected to said subscriber's set and with which is included in combination, a timing device including a shaft with soft iron disks mounted thereon at even distances and a plurality of parts so arranged as to form a series of channels around about said shaft and means whereby electromagnetic coils are suspended therein in an operable position with regard to the said disks.

10. In a system of the character described, the combination with a calling subscriber's set, of a switch-board circuit comprising complete cord circuits, one of which is adapted to be connected to said subscriber's set and with which is included in combination, a timing device including a series of electromagnetic coils, a revolving shaft around which said coils are mounted in an operable position; means whereby said coils are electrically energized and thereby magnetically attached to the said shaft, by means of a soft iron disk as a part of said shaft, and intermediate between said shaft and coil.

11. In a system of the character described, the combination with a switch-board circuit of the character described; of a timing device including a series of electromagnet coils, a shaft around about which said coils are mounted pendulumwise in an operable position and adapted to revolve with said shaft and disks intermediate said shaft and whereby said coils are electrically and magnetically energized and thereby attached to the shaft, and means in combination therewith whereby when said attachment is effected, the circuit so effecting the said energization of the said coils is electrically and automatically locked and a continuously connected circuit is maintained until said coil has traversed its complete predetermined distance through a portion of one revolution of the said disks and shaft.

12. In a system of the character described, the combination with a calling subscriber's set; of a switch-board circuit comprising complete cord circuits, one of which is adapted to be connected to the said subscriber's set and with which is included in combination therewith a timing device including a series of electromagnet coils mounted pendulumwise with regard to a shaft, all in an operable position adapting said coils to be operated to revolve with said shaft or to hang pendulumwise in their normal positions as effected by gravity and means whereby said coils are electrically and magnetically energized and thereby attached rotatively to said shaft by means intermediate between said shaft and coils, said means consisting of soft iron disks and means in combination therewith, whereby when said attachment is effected, the circuit so effecting the said energization of the said coils, is electrically and automatically locked and

a continuously connected circuit is maintained until said coil has traversed its complete predetermined distance through a portion of one revolution of the said disks and shaft and means for the disconnection of said circuit at the finishing point of said travel through said predetermined distance, whereby the locking means is thereby released and in turn effecting a disconnection for the calling subscriber.

13. In a system of the character described, the combination of a calling subscriber's set, with a switch-board circuit, an instrument as a part of said circuit and adapted to automatically determine and regulate the interim of time used over the calling subscriber's set and including a shaft, soft iron disks on said shaft, and means in connection therewith, means whereby said shaft and disks are rotated and revolved at a fixed speed.

14. In a system of the character described, the combination with a calling subscriber's set, of a switch-board circuit comprising complete cord circuits, one of which is adapt-

ed to be connected to said subscriber's set, and with which is included in combination, a timing device for automatically regulating and registering the service to a subscriber's set and which comprises a rotatable shaft with soft iron disks thereon as a part of said instrument, together with a gear wheel mounted on said shaft, together with a train of gear wheels and a ratchet wheel, means, whereby said ratchet wheel is operated rotatively by means intermediate between said ratchet wheel and an electromagnet coil and means whereby a circuit may be attached to a master clock, for the purpose of transmitting electrical impulses to said coil and thereby actuating said mechanism and train of gears, to rotate said shaft and disks.

In testimony whereof I have signed these specifications in the presence of two subscribing witnesses, done at Cleveland, Ohio, this 22nd day of August, A. D. 1908.

C. W. GREENSLITT.

Witnesses:

A. C. MORSE,
J. I. GEMMILL.