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PATENTED DEC. 26, 1905.

J. A. KENNY.

RECORDING APPARATUS FOR MEASURED TELEPHONE SERVICE.

APPLICATION FILED MAR. 1, 1902.

4 SHEETS—SHEET 1.

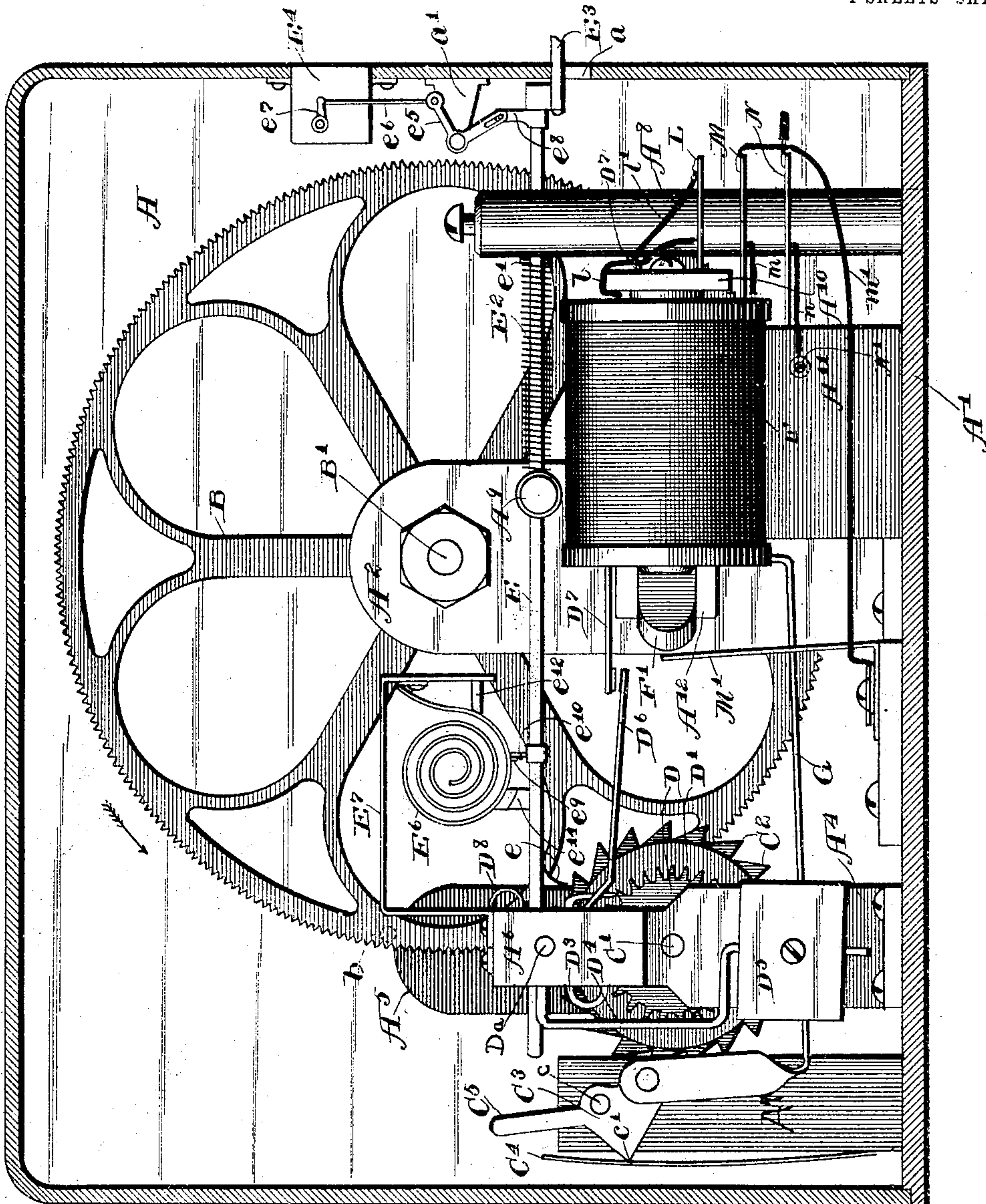
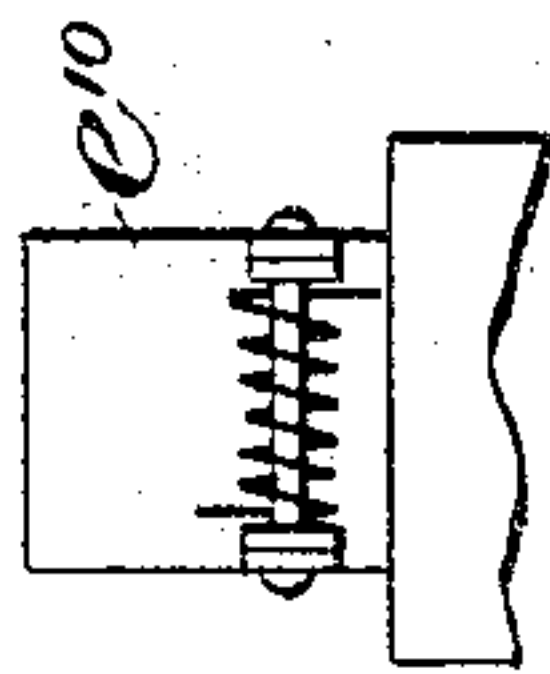


Fig. 1

Fig. 1a



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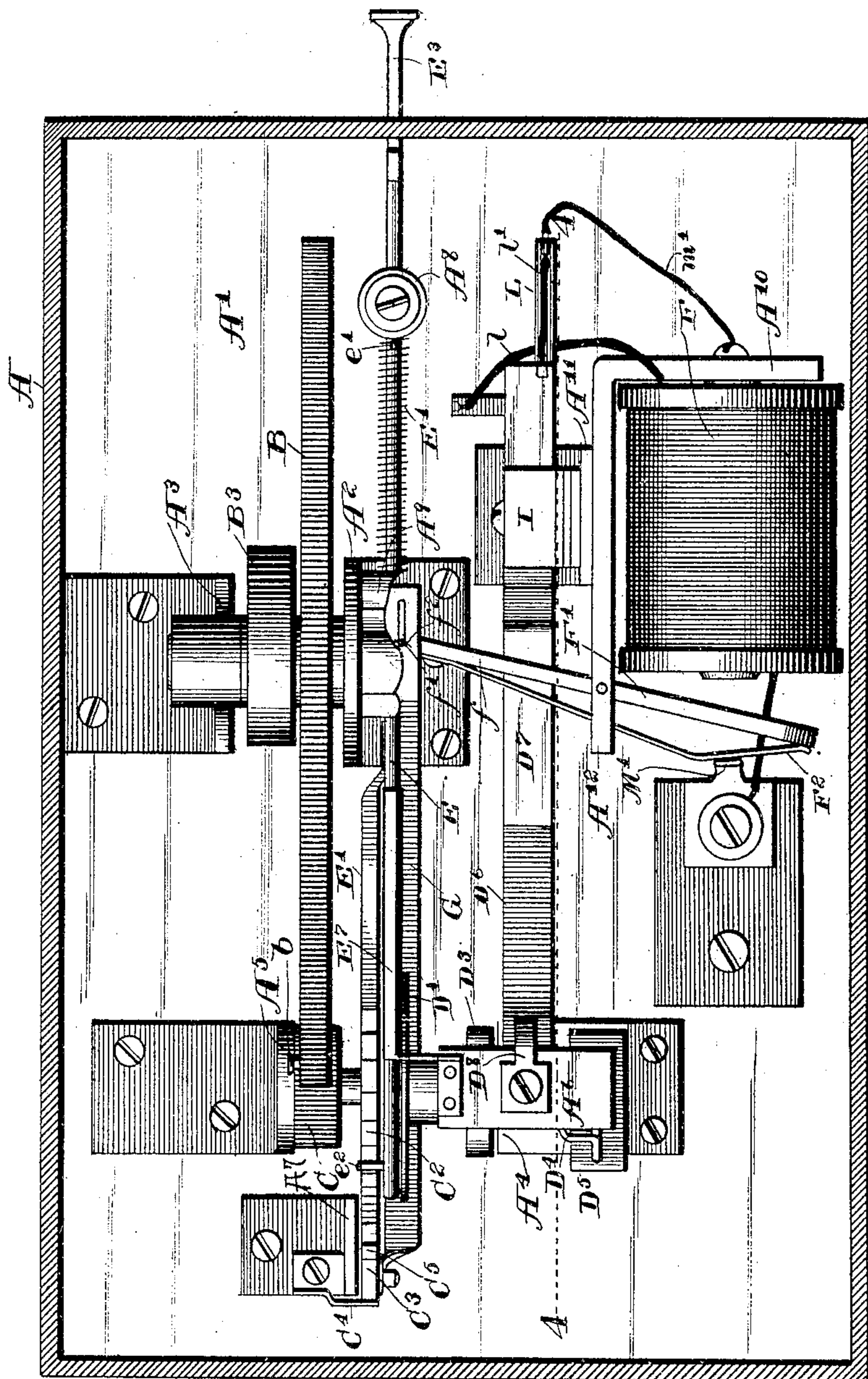
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4 SHEETS—SHEET 2.

Fig 2



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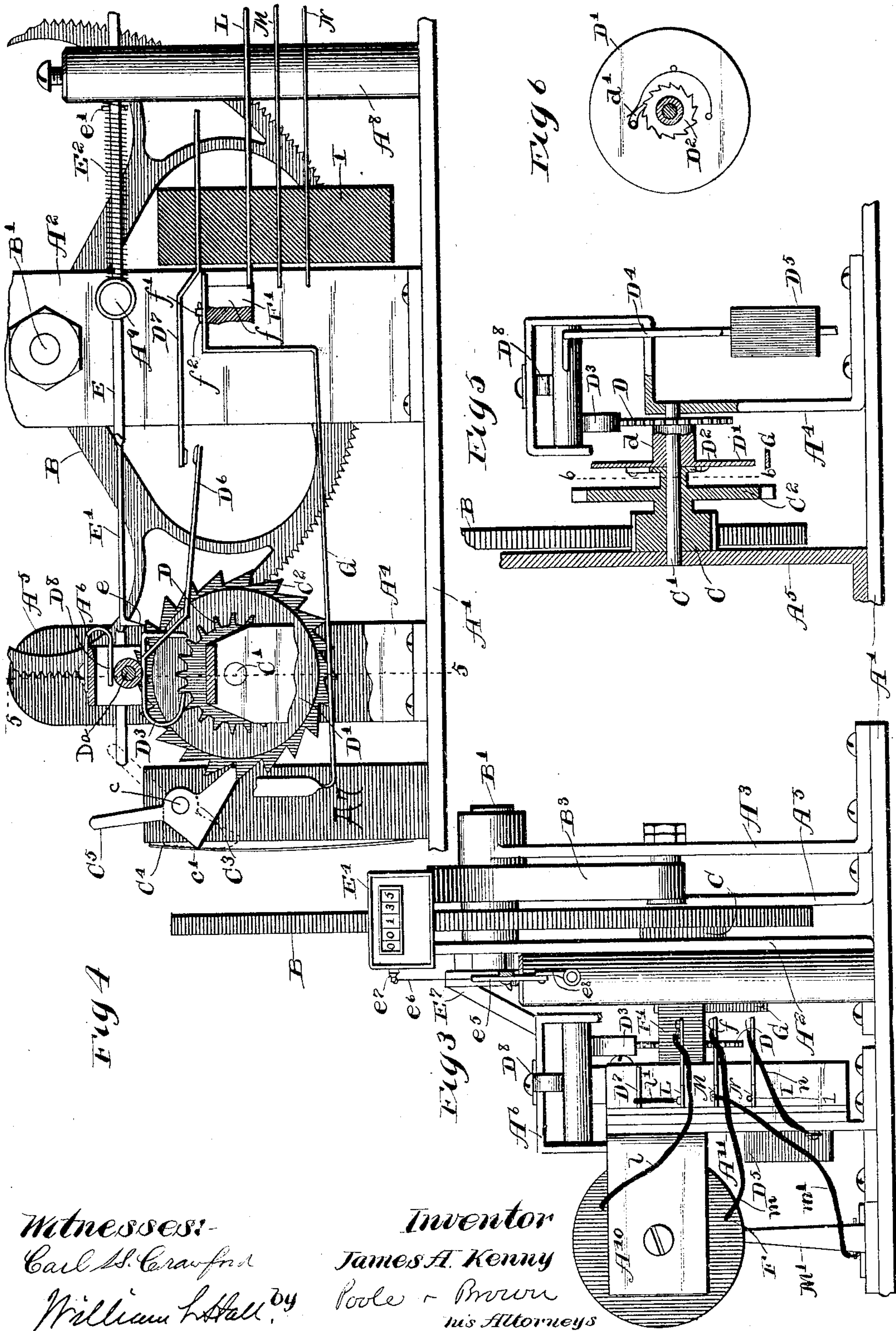
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

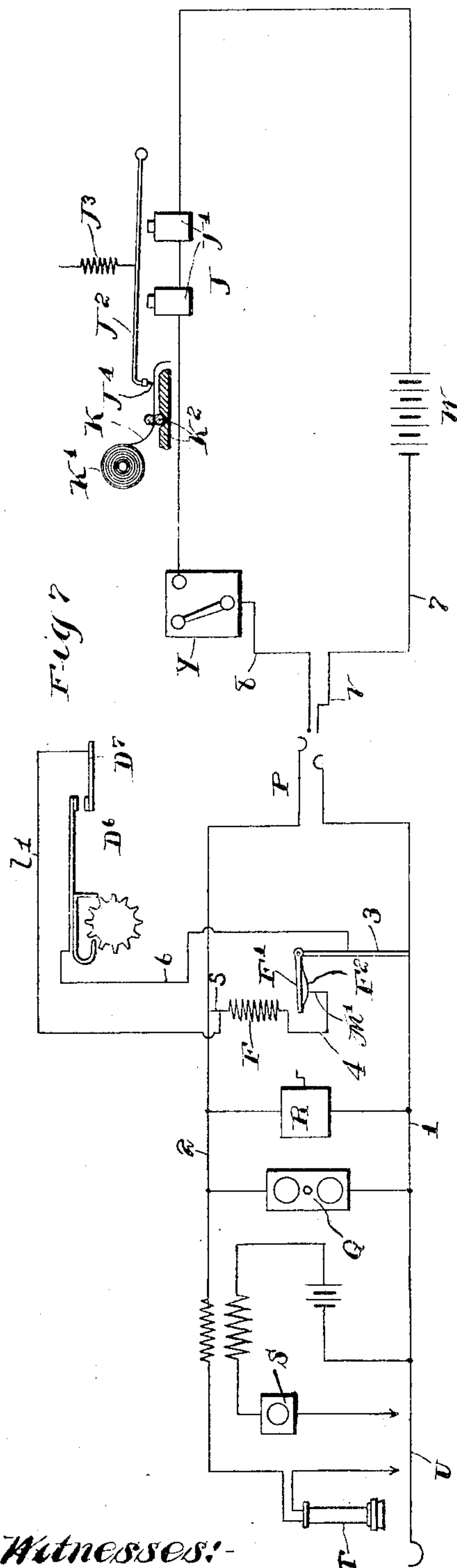


Fig 7

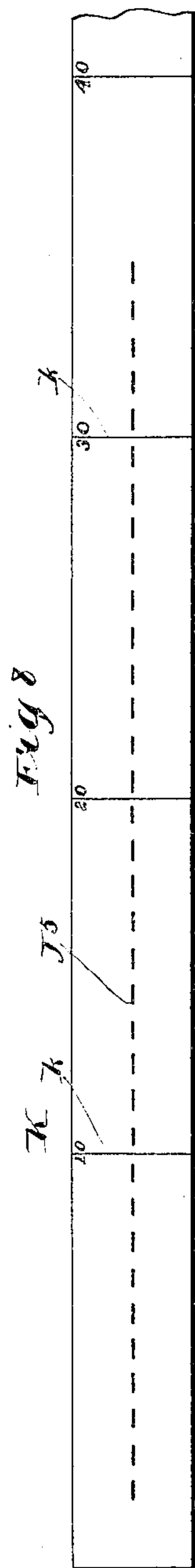


Fig 8

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RECORDING APPARATUS FOR MEASURED TELEPHONE SERVICE.

No. 808,383.

Specification of Letters Patent.

Patented Dec. 26, 1905.

Application filed March 1, 1902. Serial No. 96,321.

To all whom it may concern:

Be it known that I, JAMES A. KENNY, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Recording Apparatus for Measured Telephone Service; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to a recording device for measured telephone service, and is designed to produce at the central office at certain determined intervals a record of the number of calls which have been made on a telephone during such intervals. In other words, it is the purpose of this apparatus to register each telephone call at the time said call is made, the parts being so arranged that the subscriber is obliged to effect such registration before he is put in communication with another subscriber whom he desires to call, and the total of such registered calls for any given or determinable period are adapted to be recorded at the central station by an operator at such station and without the necessity of invoking the services of the subscriber for this purpose or necessitating a personal visit of an inspector to the subscriber's telephone for the purpose of examining a register thereat so long as the apparatus operates perfectly. Preferably the part of the apparatus at the subscriber's telephone is provided with an independent computing-register, which is operated when a call is set up or registered on the principal registering element of the subscriber's apparatus, said computing-register showing after any given call a total of all the calls previously registered. The subscriber's apparatus is also provided with a suitable signaling device whereby the operator at the central station may be apprised that each call has been properly registered.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a side elevation of the apparatus located at the subscriber's telephone, the box containing the same being shown in section. Fig. 1^a is a detail of the gong-actuating lug of the registering-device-actuating plunger. Fig. 2 is a plan view thereof. Fig. 3 is an end view. Fig. 4 is a vertical section taken on line 4 4 of Fig. 2. Fig. 5 is a vertical section taken on line 5 5

of Fig. 4. Fig. 6 is a detail vertical section taken on line 6 6 of Fig. 5. Fig. 7 indicates diagrammatically the several operative elements of the apparatus and the wiring by which they are electrically connected. Fig. 8 is a face view of the tape on which the total records are transcribed at the central office.

All of the mechanism at the subscriber's telephone is contained within a suitable casing A, having a bottom wall A' and provided with any suitable means (not shown) for inserting and removing the mechanism into and from said casing.

B designates what may be termed a "meter wheel or disk," which constitutes the principal registering element of the subscriber's apparatus. Said wheel is rotatively mounted on a shaft B', which is supported at its ends in the upper ends of standards A² A³, rising from the floor of the box A. Said wheel is placed under the influence of a spiral actuating-spring B³, which is attached at one end to the adjacent standard A³ and at its other end to said wheel in a manner to turn said wheel in the direction indicated by the arrow in Fig. 1. Said wheel B is provided with a toothed periphery and meshes with a gear-pinion C, which is mounted rotatively on a shaft C', which extends transversely between and is affixed to vertical standards A⁴ A⁵, rising from the floor of the box.

C² is a ratchet-wheel which rotates with the pinion C.

D designates the escape-wheel of an escapement mechanism, which is mounted on the shaft C', and to the hub d of said escape-wheel is affixed a disk D', which is connected with the adjacent ratchet-wheel C² in such manner that the disk rotates with the ratchet-wheel when traveling in one direction—to wit, the direction toward which it is impelled by the actuating-spring of the wheel B; but said ratchet-wheel moves in a reverse direction independently of said disk and the connected escape-wheel D. The connections between said ratchet-wheel and disk consist, as herein shown, of a small spur-pinion D², affixed to and rotating with said ratchet-wheel, and a spring-pressed pawl d', affixed to the disk D' and engaging the teeth of said spur-pinion in a manner to slip thereover in the reverse movement of the pinion, but to lock the disk and connected escape-wheel thereto in the forward or spring-impelled movement of said ratchet-wheel.

The verge D³ of the escapement mechanism

is affixed to a rock-shaft D^a , which latter has bearing in an extension A^6 of the standard A^4 , as shown in Fig. 5. Said escapement mechanism is provided with a pendulum D^4 , which
 5 is provided at its lower end with a vertically-adjustable weight D^5 . To said escapement mechanism is attached a vibratory arm D^6 of an electrical make-and-break device, which co-operates with a stationary strip D^7 , Fig. 4,
 10 to make and break the recording-circuit, as will hereinafter more fully appear.

The ratchet-wheel C^2 is locked from rotation by means of a pawl C^3 , which is pivoted between its ends on a pivot-pin c , which latter is affixed to a short standard A^7 , which
 15 rises from the floor of the box adjacent to and in rear of the standard A^5 . The said pawl C^3 is held in engagement with the ratchet-wheel by means of a flat leaf-spring C^4 . Said spring
 20 C^4 engages a pointed projection c' on the rear margin of the pawl below the pivot thereof in such manner as to hold the pawl in engagement with the ratchet-wheel, as shown in full lines in Fig. 4, and also out of engagement
 25 therewith when said pawl is swung backwardly, as shown in dotted lines in said figure.

The registering-wheel B is given a step-by-step movement by the subscriber each time a communication is had with another subscriber for the purpose of registering such
 30 call, and the pawl acting on the ratchet-wheel C^2 locks said registering-wheel after each step of its movement. When the pawl is released from the ratchet-wheel C^2 , the registering-wheel is restored to its starting position and
 35 acts on the escapement mechanism to vibrate the arm D^6 of the make-and-break device, whereby the recording-circuit is alternately opened and closed between the parts D^6 D^7
 40 of the make-and-break device to operate the recorder at the central station. The registering-wheel is provided with a stop pin or lug b , which engages the upper end of the standard A^5 , as herein shown, to arrest the move-
 45 ment of the wheel and determine its starting position. The registering-wheel B is given such step-by-step movement to successively register the subscriber's calls by the following mechanism.

50 E designates an endwise-reciprocating plunger, which has sliding engagement with a standard A^8 at the front of the box and a lug or projection A^9 , directed laterally from the standard A^2 , as shown in Figs. 2 and 4, and
 55 said plunger extends at its rear end over the ratchet-wheel C^2 . Said plunger is provided with a spring-bar E' , which extends parallel therewith, and is provided at its rear end with a downwardly-projecting detent e , located in
 60 position to engage the teeth of the ratchet-wheel C^2 in a manner to turn the latter and the wheel B one step when the plunger is thrust rearwardly. A spiral expansively-acting spring E^2 , surrounding the plunger and
 65 interposed between the stud A^9 and a pin e' ,

extending transversely through the plunger, acts to restore the plunger when pressure thereagainst is released, and in the return movement of the plunger the detent e rides
 70 over the teeth of the ratchet-wheel C^2 without imparting any movement thereto. When the plunger is thrust rearwardly to rotate the register-wheel B one step, the rear end thereof actuates the pawl C^3 to throw the same into
 75 locking engagement with the ratchet-wheel C^2 . For this purpose the plunger is shown as provided with a laterally-directed lug e^2 , which is adapted to engage an upwardly-projecting arm C^5 of the pawl. If the pawl be
 80 in its released position, as shown in dotted lines in Fig. 4, it will be swung into its locking position by the rearward movement of the plunger; but if it be in its locking position, as shown in full lines in said figure, the move-
 85 ment of the plunger will have no effect to move the same.

The registering-wheel B is turned one step by each reciprocation of the plunger, and the number of teeth on the escape-wheel D is so
 90 related to the distance traveled by the registering-wheel in each step of its movement that in the return movement of the registering-wheel the escape-wheel, which moves syn-
 95 chronously with the registering-wheel at this time, will move the distance of a number of teeth thereof equal to the total number of calls previously registered or "set up" on the
 100 registering-wheel, and the escape-wheel acting on the verge acts to produce a number of vibrations of the swinging arm D^6 equal to the number of calls so set up on the register-
 105 ing-wheel. In this manner, therefore, the make-and-break recording-circuit is closed during the restoring movement of the registering-wheel a number of times equal to the total number of step-by-step movements of the
 110 registering-wheel effected when the subscriber's calls were registered or set up on said wheel, and it is assured, therefore, that the record produced by the recording device at the central station will show the exact num-
 115 ber of calls made by the subscriber during the time since the last record was taken from the subscriber's registering apparatus.

The plunger E terminates inside of the end
 115 wall of the box A and is adapted to be forced inwardly by means of a key E^3 , similar to an ordinary door-key blank and which is adapted to be inserted through a suitably-shaped
 120 opening a in the wall of the casing located out of line with the plunger, as shown in Fig. 1. When said key is inserted through said opening, it is rotated to turn the bit upwardly in the manner shown in Fig. 1 to bring the same
 125 in line with the plunger, and thereafter the plunger is actuated to effect the operations above described by thrusting the key inwardly. This construction prevents accidental or unauthorized operation of the register-
 130 ing device. It is intended that each person

authorized to use the telephone shall be provided with a key, and the construction is such that no one not having a key can use the telephone. Other forms of safety-keys may of course be employed. The means for releasing said pawl to permit the restoration of the registering-wheel B are made as follows: F designates an electromagnet, which is supported at one end on the arm A^{10} of a standard A^{11} , rising from the floor of the box. The armature F' of said electromagnet is pivoted to a second arm A^{12} of the standard A^{11} . Said armature is extended beyond its pivot to provide an arm f , which is loosely connected at its inner end with the end of an endwise-reciprocatory bar G, the other end of which bar is pivoted to or loosely connected with the pawl C^3 below the pivot thereof. The intermediate portion of said bar is deflected downwardly to bring the same below the escapement-wheel D. The connection between the extended arm f of the armature F' and said forward end of the bar G consists in the present instance of a pin or stud f' , projecting upwardly from said arm and extended through a slotted opening in the horizontal front end of the said bar. The bar is held from rising by means of a split or cotter pin f^2 , inserted through the stud above said bar. With this construction when the pawl is in its locking position and the armature retracted from the magnet the energizing of the magnet acts to attract said armature and the armature acts, through its extension-arm f and the bar G, to release the pawl C^2 and permit the registering-wheel B to return to its starting position under the action of its spring B^3 . When the pawl is returned to its locking position by the plunger, it acts, through the bar G, to retract the armature from its magnet, and the slotted connection with the bar of the armature-arm permits subsequent movement of the plunger and pawl without disturbing the position of the armature.

The stationary strip D^7 of the make-and-break device is supported in a vertical bar I, made of insulating material, which is attached to the inner side of the standard A^{11} , and said strip extends forwardly of said insulating-support for attachment thereto of one of the circuit-wires, as will hereinafter more fully appear. The standard A^4 is in electrical connection with the frame-plate A' or floor of the box, and in order to establish a good connection between the said standard and the vibratory arm of the make-and-break device a contact-spring D^8 is attached to the horizontal part of said standard and bears against the bearing-sleeve of the verge D^3 .

L, M, and N designate terminal strips which are seated in said insulating bar or strip I. The terminal strip N is connected by a wire n with a binding-screw N' on the magnet-supporting standard A^{11} and is therefore electrically connected with the frame-plate or floor

of the box. The contact-strip M is connected by a wire m with one end of the coil F and is also connected by a wire m' with a contact-piece M' , insulated from the frame of the device and the upper end of which contacts with a strip F^2 , carried by the armature F' . The contact-strip L is connected by a wire l with the other end of the coil and also by a wire l' with the stationary strip of the make-and-break device. One of the line-wires 1 of the talking-circuit is attached to the lower contact or terminal strip N. The other line-wire 2 is attached to the strip L.

In addition to the record produced at the central station I have provided means for producing a permanent record of the calls at the subscriber's telephone. Said means consists of a computing-register E^4 , of any common form, located at the front wall of the box and provided with a dial, which is exposed at front of the box. The mechanism of said register is operatively connected with the plunger, said connections being made as follows: e^5 designates a bell-crank lever which is hinged at its angle to a bracket a' , affixed to the adjacent wall of the box. Said bell-crank lever is connected by a link e^6 with the operating-arm e^7 of said register, and the other end of said bell-crank lever is connected by a pin-and-slot connection with a rigid arm or lug e^8 on said plunger. With this construction when the plunger is thrust inwardly it acts to draw downwardly the operating-arm e^7 and operates the register in a familiar manner.

In order to inform the operator that a call has been registered, a suitable signaling device is operated at the time the plunger is thrust inwardly. Said signaling device consists in the present instance of a suitable gong E^6 , which is attached to a bracket E^7 , supported on the extension A^6 of the adjacent standard A^4 . Said gong is provided with a lug e^9 , which is located in the path of a contacting lug e^{10} on the plunger E, whereby when said plunger is thrust inwardly it acts to swing the gong rearwardly, and just before the plunger reaches its innermost position the lug e^{10} thereof slips off the lugs e^9 of the gong and permits the gong to swing backwardly under the action of its own resiliency, and in the backward swing of said gong it strikes a stationary abutment e^{12} , projecting inwardly from the bracket e^7 , whereby a signal is produced. The lug e^{10} on the plunger is jointed and spring-pressed, so as to flex when moving backwardly to permit the same to pass the lug of the gong, as most clearly shown in Figs. 1 and 1^a. Desirably a cushioned lug e^{14} is located on the plunger in position to engage the gong after the same has struck the lug e^{12} and the plunger is retracted, said cushioned projection being provided to deaden the sound of the gong after the initial signal has been effected. The signal produced by the gong is transmitted through the transmitter and the

talking-circuit to the operator at the central office. Other suitable forms of signaling device may, however, be employed as found convenient and desirable.

5 J, Fig. 7, indicates as a whole in a diagrammatic way a simple form of the recording device located at the main or central office which receives and records the calls registered at the subscriber's telephone. Said recording device
10 consists of magnets J' , a pivoted armature J^2 , and a spring J^3 acting on the armature in opposition to the magnets. Said armature J^2 carries at its outer end a pencil J^4 or other marking instrument, which acts to record the
15 several electrical impulses transmitted thereto on a strip of paper K. Said strip is unwound from a roll K' between feed-rolls K^2 , and the end of said paper passes freely out of the recorder, so that said strip may be cut to
20 divide one record from another. The feed-rollers K^2 are adapted to be operated by the recording-circuit in a manner (not shown) to move in synchronism with the pencil.

In Fig. 7 is indicated in a diagrammatic manner the subscriber's telephone-circuit and the recording-circuit, including the parts at the subscriber's telephone and those at the central station. For sake of clearness only the parts
25 necessary to an understanding of the circuits are illustrated, the mechanical details being omitted. As shown in said figure, 1 and 2 designate the line-wires of the talking-circuit which are connected at the switchboard with a spring-jack, (indicated diagrammatically as
30 P.) Q and R designate, respectively, the magnet to call-bells and an open generator, which are bridged between the lines in the usual manner; S, the transmitter located in the primary circuit; T, the receiver included in the second-
40 ary circuit, and U the automatic switch by which the primary and secondary circuits are closed and which serves as a support for the receiver in the usual manner. In said figure, 3 indicates the metallic connection between line-
45 wire 1 and the armature F' , such connection in the device as shown in the other figures including the strip N, wire n , binding-screw N, and the support for the armature F' .

4, in Fig. 7, indicates the connection between the contact-strips M' and one end of the coil F, said connection 4 corresponding to
50 wire m' , contact-strip M, and wire m . (Shown in the other figures.) The wire 5 in Fig. 7, connecting the other terminal of the coil with line-wire 2, corresponds with the wire l and
55 strip L, and said wire 5 is connected by the wire l' with the stationary contact-strip D^7 of the make-and-break device. The wire 6, connecting the metallic contact 3 with the pallet
60 of the escapement mechanism in the machine, corresponds to the metal base and the standard A^4 , supporting the escapement mechanism.

7 indicates one of the wires of the recording-circuit, connected with one side of the
65 plug V and with one pole of the battery W,

and 8 indicates the return-wire of the recording-circuit, which is connected with the other pole of the battery and with the plug V. Said wire 8 includes the magnets J' of the recorder and the switch Y, by which latter the record-
70 ing-circuit is opened and closed.

The spring-contact F^2 of the armature F' is in contact with the terminal M' when the apparatus is not in operation, so that as soon as the plug V is inserted into the spring-jack
75 and the switch Y closed the magnet-circuit is closed and the magnet F draws the armature and its contact-strip F^2 away from the contact-piece M' and opens the magnet-circuit. In practice, the plug is first inserted into the
80 spring-jack and the switch thereafter closed, so as to insure perfect closing of the recording-circuit before the make-and-break device begins to operate. When the parts are in the position shown in Fig. 7, with the talking-
85 circuit open at the automatic switch u , the contact-strip F^2 in contact with the contact-piece M' , and the plug V of the recorder-circuit is inserted into the spring-jack P and the switch Y closed, the circuit is closed through
90 wire 1, metallic contact 3, armature F' , contact-strip F^2 , contact-piece M' , wire 4, coil F, wire 2, and then back to the battery. As soon as the magnet is energized it attracts the armature F' and draws the contact-strip of said
95 armature away from the contact-piece M' and opens the magnet-circuit. The movement of the armature when the same is attracted by the magnet acts through the mechanical devices associated therewith to release the pawl
100 C^3 from the ratchet-wheel C^2 , and thereby permits the restoration of the registering-wheel to its starting-point under the action of its impelling-spring B^3 . Said registering-wheel acts, through the escapement mechanism de-
105 scribed, to operate the make-and-break mechanism, and when the elements of said make-and-break mechanism are in contact the circuit is momentarily closed through wire 7, plug V, spring-jack P, wire 1, metallic con-
110 tact 3, wire 6, vibratory arm D^6 , stationary contact-piece D^7 , wire l' , wire 5, and wire 2 back to plug, from thence to the switch, and through the magnets J' of the recorder to the battery W. The make-and-break current al-
115 ternately energizes and deenergizes the recording-magnets. When said magnets are energized, they act to attract the armature J^2 , and thereby swing the pencil J^4 into contact with the strip of paper K. When said mag-
120 nets are deenergized, the spring J^3 acts, through the armature, to draw the pencil away from the paper. The feed-rollers K^2 are movable synchronously with the pencil, as before stated, so that said strip is continuously fed
125 forward, and the movement of the strip at the time the pencil is retracted from the sheet divides the line made by the pencil into a number of short dashes—each constituting the record of one call translated from the regis-
130

ter and all of said dashes indicate the total number of calls "set up" on the registering-wheel during the period just ended. Said strip as it is moved forwardly passes out of the recorder, so that each record after it is completed may be detached from the strip and properly marked for identification, and from these strips the subscriber's monthly statements are rendered. When the registering-wheel has stopped at the limit of its return movement, the make-and-break device and the recorder cease operation. The plug V of the recording-circuit is then removed from the spring-jack P, so as to clear said jack for the plugs of the switchboard-circuit.

In the use of a magneto-generator for the call-bell circuit the magnet F of the recording device will not be operated by the magnet R used to call the central office, because the call-bell current is an alternating one, while the magnet F is operated by a direct current. If necessary in any case, the resistance of the said magnet F may be made much greater than the resistance of the call-bell circuit, so that it shall be impossible for the alternating current from the magneto in the call-bell circuit to energize the said magnet F sufficiently to attract its armature. In each case a portion of the direct current in the recording-circuit will pass through the call-bell circuit; but this would be unobjectionable, because the direct current would not ring the bell, but would merely draw the clapper to one limit of its movement and hold it there.

The operation of the apparatus will be obvious from the foregoing, but may be briefly recapitulated as follows: After the subscriber has informed the operator at the exchange of his desire to communicate with another subscriber connected with said exchange and the connection between the subscribers' telephones is effected the operator instructs the calling subscriber to register the call, which said subscriber proceeds to do by inserting the key E³ into the casing and thrusting inwardly the plunger E in the manner before described. Such operative registers of the subscribers' calls are successively set up on the registering-wheel as the calls are made. At the time each call is set up on the wheel B the plunger actuates the computing-register E⁴ and also the gong E⁶. The sounding of said gong apprises the operator that the proper registration of the call has been made, and the registering of said call in the computing-register produces a permanent record of the call and informs the subscriber of the total number of calls made. At the end of certain determinable periods—as, for instance, at the end of each month—the operator at the central station records the total number of calls set up on the registering-wheel at the subscriber's telephone. This work will usually be done at night or at any other time when few calls are being made. One recording de-

vice J will be used for a number of telephones, the records being successively taken from the subscriber's registering device by inserting the plug V of the recording-circuit into the spring-jacks of the several talking-circuits. The work of taking the records from the several registering apparatus of the different telephones may be conveniently accomplished by two persons, one to insert the plug into the spring-jacks of the several circuits and to close the switch Y and the other to remove the record-strip from the recorder after each complete record is made and to mark the strips with the number given to him by the person who handles the circuit-closing plug of the recorder-circuit. In this manner it will be seen that under ordinary circumstances the complete record may be taken from the subscribers' registering devices without the necessity of an inspector visiting the several telephones. If, however, by reason of inaccurate operation of the apparatus or by reason of a question arising between the subscriber and the central office as to the accuracy of the monthly statement of the office, the record produced by the office may be verified by an inspection of the record shown by the computing-register located at the subscriber's telephone. Said record of the computing-register may become very important should for any reason the mechanism of the electrical recorder fail to produce a complete record at the central station of the calls made by the subscriber, as in that case the central office would be enabled by inspection of the record of the computing-register to know exactly the number of calls which have been made and registered on the subscriber's apparatus. Moreover, the use of such computing-register acts to prevent tampering with the principal registering device at the subscriber's telephone in a manner to return the registering-wheel B at a time when the same is not in circuit with the recording device at the central station. If such attempt be made, a discrepancy would appear between the record of the computing-register and that of the recorder at the central station, and if said computing-register shows a greater number of calls than the central-office recorder it would be apparent that either the apparatus has failed in some of its parts to accurately record such calls or that some one has tampered with the apparatus at the subscriber's telephone.

In Fig. 8 I have shown a convenient form of the recording-tape K, and which has been designed to facilitate the counting of the record-marks on said tape. For this purpose the tape is divided by transverse lines $\frac{1}{2}$ into a plurality of sections, and each section is adapted to receive a certain number, as ten, record-marks of the pencil J⁴. By this means the operator will be able to quickly calculate the total number of calls recorded on the tape, it only being necessary to multiply the num-

ber of sections filled by ten and add to the result the number of marks in the unfilled section.

The box A, inclosing the mechanism at the subscriber's phone, will be made strong and provided with a lock, and only persons authorized by the telephone company will have access thereto.

The apparatus described is adapted to be used with any of the types of telephone service now in use, and while the general arrangement and relation of the parts will be preserved the structural details and the manner of closing the circuits may be varied to suit the requirements in each case. I do not wish to be limited to such structural details except as hereinafter made the subject of specific claims. Moreover, certain of the features herein shown may be employed in connection with other apparatus where it is desired to produce at a central station records from a number of registering devices located at a number of outlying stations.

I claim as my invention—

1. A recording apparatus comprising a registering device located at an outlying station upon which temporary records are adapted to be severally made, an electrically-actuated recording device located at a central station, and electrical connections between said registering and recording devices, which are set in operation solely from the central station to transfer all of the temporary records from the outlying register to the recording device at the central station.

2. A recording apparatus for measured telephone service comprising a registering device at the subscriber's telephone by which the subscriber's calls are severally registered at the time the said calls are made, an electrically-actuated recording device at the central office and electrical connections between said registering and recording devices which are actuated solely at the central office to record at the recording device all the calls indicated by the said registering device.

3. A recording apparatus for measured telephone service comprising a registering device located at the subscriber's telephone by which the subscriber's calls are severally registered at the time they are made, an electrically-actuated recording device at the central office electrically connected with said registering device and adapted to produce in a single operation a record of all the calls indicated by said registering device, and means set in operation solely at the central office for producing at the recording device a record of the calls indicated at the registering device.

4. A recording apparatus for measured telephone service comprising a registering device located at the subscriber's telephone and embracing a registering element which is given a step-by-step movement at the time the calls are made to temporarily register the calls, a

recording device located at the central office, electrically-controlled means for restoring said registering element, and circuit-controlling devices which are set in operation solely at the central station for restoring said actuating means and producing in the recorder a record of the calls indicated by the said registering element.

5. A recording apparatus for measured telephone service comprising a registering device located at the subscriber's telephone by which the subscriber's calls are severally registered as they are made, an electrically-actuated recording device at the central office, circuit-controlling means actuated solely from the central office including a make-and-break device which is actuated by the registering device for producing at the recording device a record of the calls indicated by the registering device.

6. A recording apparatus for measured telephone service comprising a registering device located at the subscriber's telephone and embracing a registering element which is given a step-by-step movement at the time the calls are made to temporarily register the calls, a recording device located at the central office, electrically-controlled means for restoring said registering element, a make-and-break device operated by the restoring movement of the said registering element and circuit-controlling devices which are set in operation solely at the central office for actuating said restoring means and electrically connected with said make-and-break device and the recorder, whereby, upon the restoration of said registering element, the make-and-break device acts to produce in the recorder a record of the calls indicated by the registering element.

7. A recording apparatus for measured telephone service comprising a registering element located at the subscriber's telephone by which the subscriber's calls are severally registered at the time they are made, an electrically-actuated recording device at the central office adapted to produce in a continuous operation a record of all the calls indicated by said registering device, means operated solely at the central office for producing at the recording device a record of the calls indicated by said registering device, and a signaling device at the subscriber's telephone which is operated as each call is registered.

8. A recording apparatus for measured telephone service comprising registering devices at the subscribers' telephones by which the subscriber's calls are severally registered at the time they are made, an electrically-actuated recording device at the central office adapted to produce a record of the calls indicated by the several registering devices and electric connections between said registering and recording devices, embracing a closed loop in which is included the recording device

and a single plug, the latter being adapted to be inserted into either one of the several spring-jacks of the central switchboard associated with the several subscribers' telephones.

5 9. A recording apparatus for measured telephone service comprising a registering device located at the subscriber's telephone and embracing a registering element by which the subscriber's calls are severally and temporarily registered at the time they are made, an
10 electrically-actuated recording device at the central office electrically connected with said registering device, means operated at the central office independently of manually-operable
15 parts at the subscriber's telephone for producing in a continuous operation a record of the calls indicated by the said registering device, and a computing-register located at the subscriber's telephone which produces a permanent record of the calls at the time they are
20 registered upon the said registering device, said permanent record being undisturbed by the transference of the temporary records from the registering device to the recording
25 device.

10. A recording apparatus for measured telephone service comprising a temporary registering device having a manually-operable
30 registering element which is advanced step by step to register the calls at the time they are made, an electrically-actuated recording device at the central office adapted to produce in a continuous operation a record of the calls indicated by said registering device, electrical
35 connections between the registering and recording devices operated at the central office independently of manually-operable parts at the subscriber's telephone for restoring said registering element and operating said recording device to produce at the central office a
40 record of the calls set up on the registering device.

11. A recording apparatus for measured telephone service comprising a temporary
45 registering device located at the subscriber's telephone, manually-operable means for operating said registering device at the time the calls are made to temporarily register said calls, an electrically-actuated recording device at the central office electrically connected
50 with the registering device, means operated at the central office independently of manually-operable parts at the subscriber's telephone to produce in a continuous operation a record of the calls indicated by the registering device, a computing-register located at the subscriber's telephone for making a permanent record of the calls and means operatively connected with the manually-operable
55 means for said temporary registering device for operating said computing-register.

12. A recording apparatus for measured telephone service comprising a registering-wheel which is given a step-by-step movement to temporarily register the subscriber's
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calls, means for locking the wheel after each step of its movement, a recording device, electrically-actuated means for releasing said locking means to permit the wheel to return to its starting-point, and circuit-controlling
70 devices operable solely at the central station for actuating said releasing means and producing at the recorder a record of the calls indicated on said registering-wheel.

13. A recording apparatus for measured
75 telephone service comprising a registering-wheel which is given a step-by-step movement to temporarily register the subscriber's calls, means for locking said wheel after each step of its movement, a recording device,
80 electrically-actuated means for releasing the locking-wheel to permit the wheel to return to its starting position, a make-and-break device actuated by the return movement of said wheel, and circuit-controlling devices which
85 are set in operation solely at the central station for actuating said releasing means and for electrically connecting said make-and-break device with the recording device.

14. A recording device for measured tele-
90 phone service comprising a registering element which is given a step-by-step movement to register the subscriber's calls, means for locking the registering element after each step of its movement, a magnet, the arma-
95 ture of which is operatively connected with said locking means, a recording device, circuit-controlling means which are set in operation at the central office, independently of manually-operable parts at the subscriber's
100 telephone for energizing said magnet to release, through said armature, said locking means and permit the restoring element to be returned to its starting position, and electrically-controlled means for producing at the
105 recording device in the return movement of the registering element a record of the calls indicated on said registering element.

15. A recording apparatus for measured
110 telephone service comprising a registering element which is given a step-by-step movement to register the subscriber's calls, means for locking the registering element after each step of its movement, a magnet, the armature of which is operatively connected with said lock-
115 ing means, a recording device, circuit-controlling means for energizing said magnet to release through its armature said locking means and permit the registering element to be restored to its starting position, electrically-controlled means for producing at the recording
120 device in the return movement of the registering element a record of the calls indicated on said registering element, and means for imparting a step-by-step movement to said registering element and constructed to restore the locking means and to retract said armature from the magnet in the first step after the return movement of the registering-wheel.

16. A recording apparatus for measured
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telephone service comprising a registering element, means for imparting thereto a step-by-step movement to register the subscriber's calls embracing a reciprocating spring-pressed
 5 plunger, means for locking said registering element after each step of its movement, a magnet, the armature of which is operatively connected with said locking means, a recording device, circuit-controlling means for energizing
 10 said magnet to release through its armature said locking means and permit the registering element to be returned to its starting position, electrically-controlled means for producing at the recording device a record of the calls indicated on said registering element, and operative connections between the plunger and said locking means acting to restore the locking means when the plunger is thrust rearwardly.

17. A recording apparatus comprising a registering element, means for imparting thereto a step-by-step movement, means for locking the registering element after each step of its movement, a recording device at the central office, electrical connections between said registering and recording devices, electrically-controlled means for releasing said locking means and producing at the recording device a record of the calls as the registering element is restored, and a computing-register which is
 30 operatively connected with the means for imparting the step-by-step movement to the registering element, whereby each call is simultaneously registered on the registering element and the computing-register, said computing-register being unaffected by the release of the registering element.

18. A registering apparatus comprising a registering element, means for imparting thereto a step-by-step movement, means for
 40 locking the registering element after each step of its movement, a recording device which is electrically connected with the registering device, electrically-controlled means for releasing the locking means and producing at the recording device a record of the calls indicated on said registering element as said registering element is restored, a computing-register which is operatively connected with a means for imparting the step-by-step movement to the registering element whereby each call is simultaneously registered on the registering element and the computing-register, said computing-register being unaffected by the release of the registering element and a signaling device which is operated when a call is
 55 registered.

19. A registering device comprising a spring-actuated registering-wheel having a toothed periphery, a gear-pinion meshing
 60 therewith, a ratchet-wheel rotating with the gear-pinion, a pawl engaging the ratchet-wheel to lock the registering-wheel from movement, electrically-actuated means for releasing said pawl, a reciprocating plunger provided with a detent adapted to engage said ratchet-wheel

when moved endwise to turn the same step by step, said plunger being adapted when moved endwise to turn said ratchet-wheel to move the pawl into its locking position, and a make-and-break device, the movable member of which is
 70 operatively connected with said ratchet-wheel.

20. A registering device comprising a motor-actuated registering-wheel having a toothed periphery, a gear-pinion meshing therewith, a ratchet-wheel rotating with the gear-pinion,
 75 an escapement mechanism operated by said ratchet-wheel, an electrical make-and-break device, the movable member of which is connected with the escapement mechanism, a pawl engaging the ratchet-wheel to lock the registering-wheel from movement, electrically-actuated means for releasing said pawl and a reciprocating plunger provided with a detent adapted to engage said ratchet-wheel to turn
 80 the same step by step, said plunger being adapted, when moved endwise to turn the ratchet-wheel, to move the pawl into its locking position.

21. A recording apparatus for measured telephone service comprising registering devices located at the several subscribers' telephones and each embracing a registering element which is stepped forward to register the subscribers' calls at the time they are made,
 90 electrically-actuated means which are in electrical connection with the line-wires of the talking-circuits for restoring said registering elements, a recording-circuit which includes a recording device and a single plug, which latter is adapted to enter either one of the spring-jacks associated with said talking-circuits, and means operated by the restoring movement of each registering element to produce a record of the calls at said recorder indicated by said
 105 registering element.

22. A recording apparatus for measured telephone service comprising a registering device at the subscriber's telephone by which the subscriber's calls are severally registered as they are made, an electrically-actuated recording device at the central station, and electrical connections between the registering and recording devices including the spring-jack at the central switchboard associated with the subscriber's telephone and actuated at the central office independently of manually-operable parts at the subscriber's telephone.
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23. A recording apparatus for measured telephone service comprising a registering device at the subscriber's telephone by which the subscriber's calls are severally and temporarily registered, a computing-register at the subscriber's telephone which produces a permanent record of the calls at the time they are registered in said temporary registering device, a recording device at the central office, and electrical connections between the registering and recording devices including the spring-jack at the switchboard associated with the subscriber's telephone and actuated at the
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central office independently of manually-operable parts at the subscriber's telephone for producing a record of the calls indicated by said registering device, said permanent record
5 being undisturbed by the transference of the temporary record from the registering to the recording device.

In testimony that I claim the foregoing as

my invention I affix my signature, in presence of two witnesses, this 26th day of February, 1902.

JAMES A. KENNY.

Witnesses:

WILLIAM L. HALL,
GERTRUDE BRYCE.