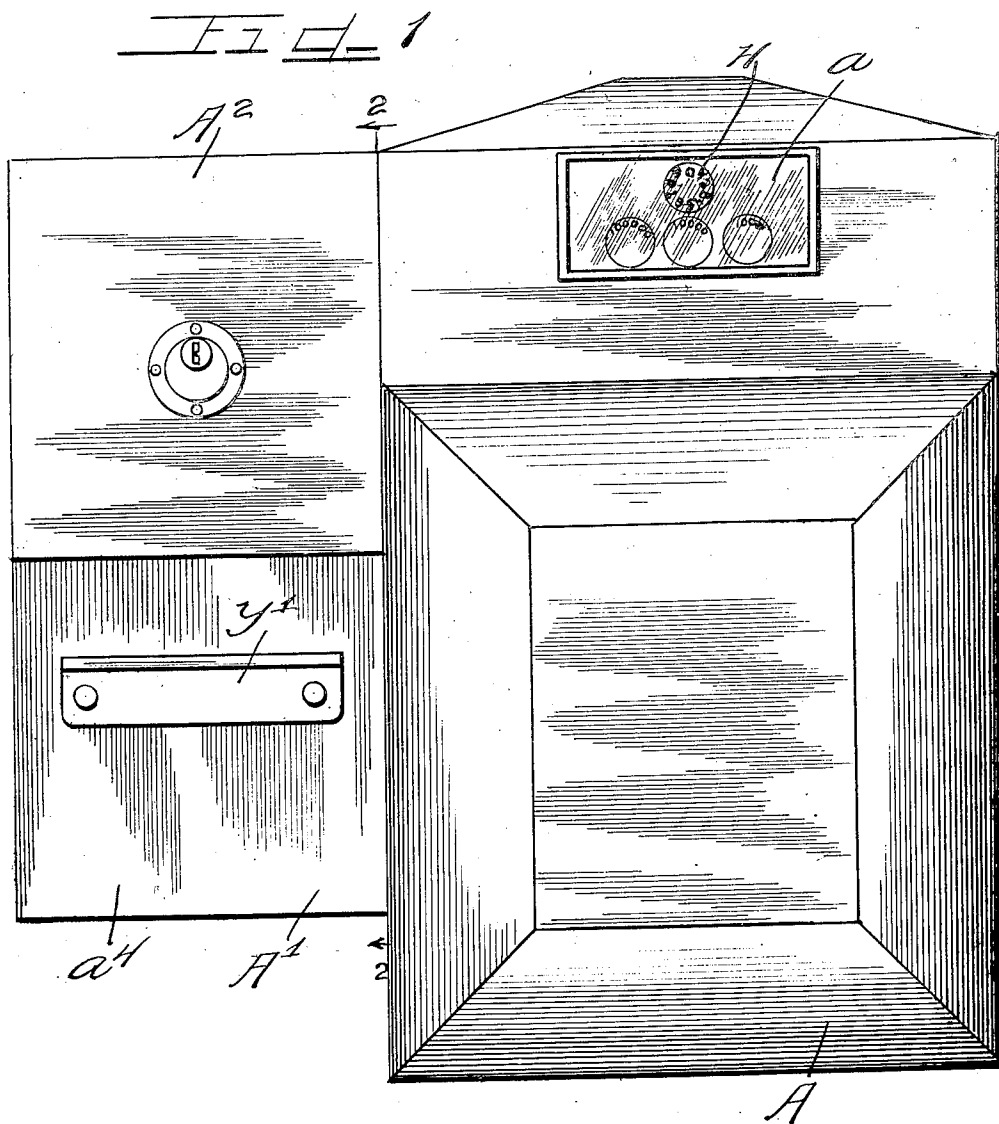


S. C. SHAFFNER.
 RECORDING MECHANISM FOR METERS.
 APPLICATION FILED JAN. 27, 1909.

1,054,720.

Patented Mar. 4, 1913.

11 SHEETS—SHEET 1.



WITNESSES

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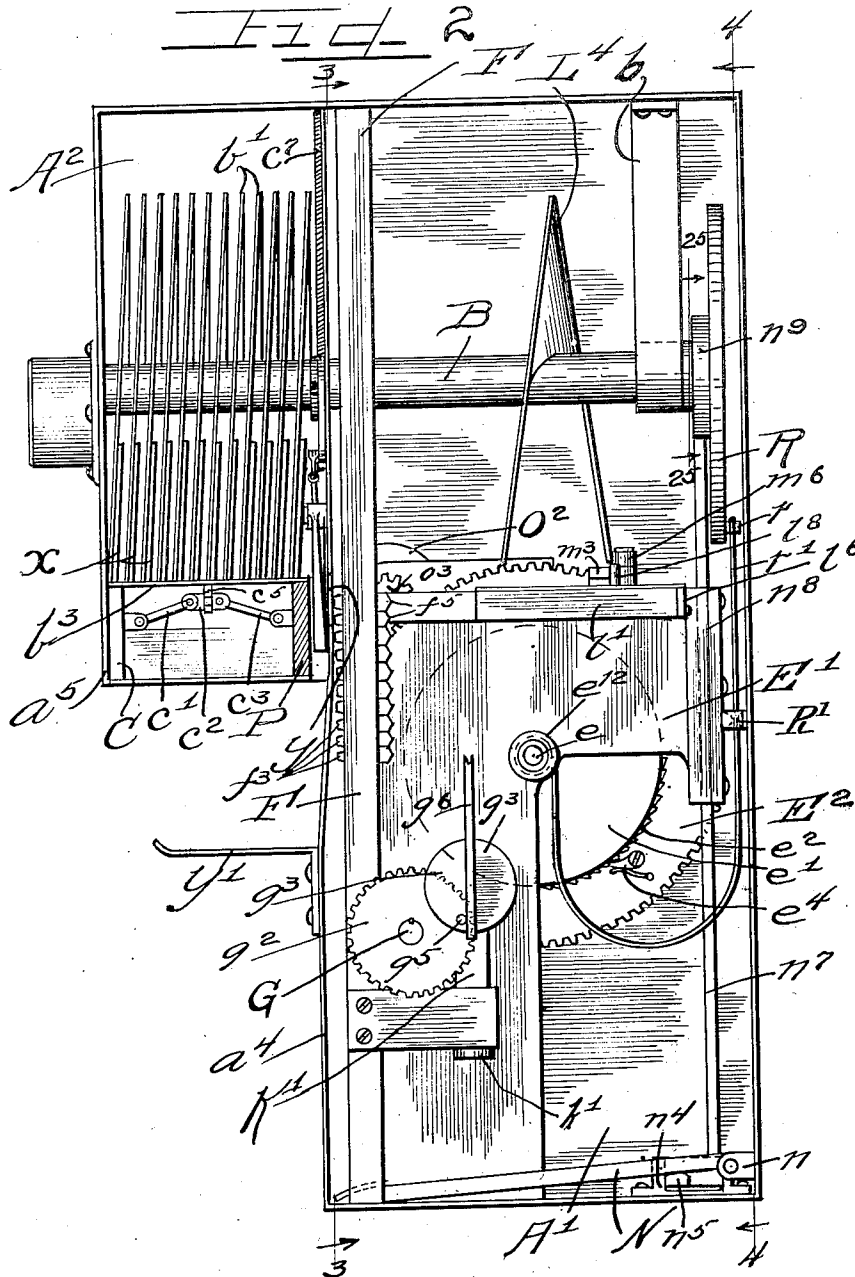
Charles W. Fries ATT.-

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11 SHEETS—SHEET 2.



WITNESSES

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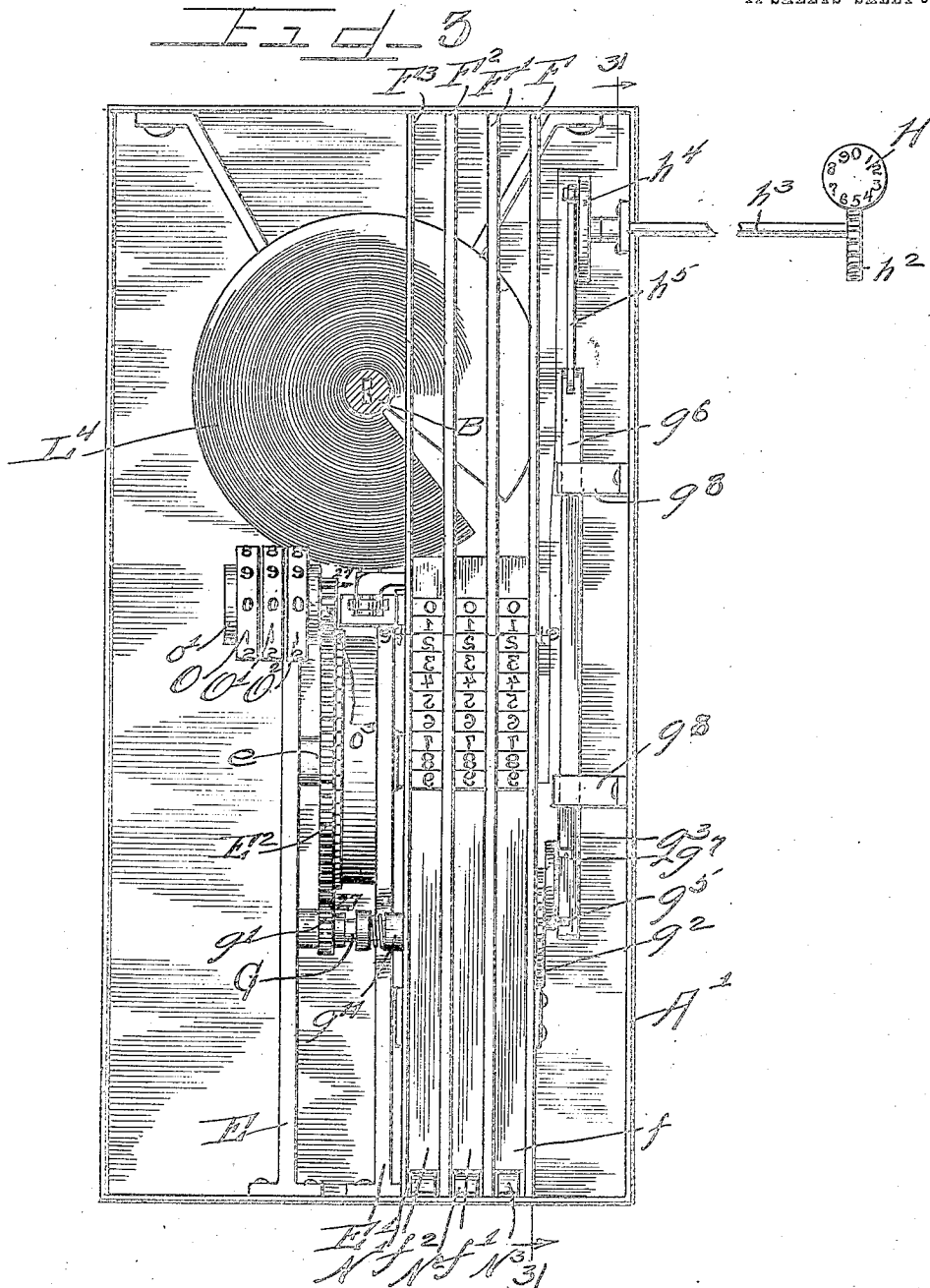
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11 SHEETS-SHEET 3.



WITNESSES
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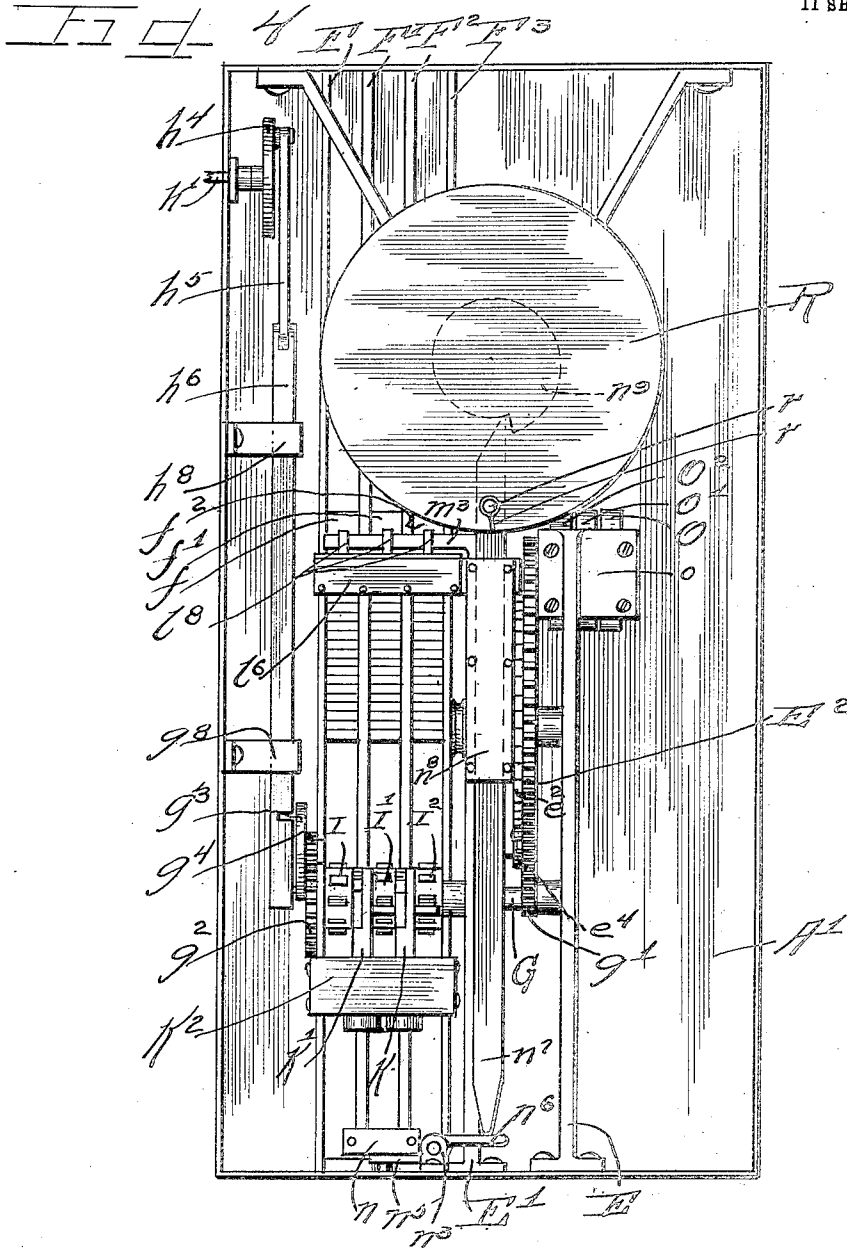
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11 SHEETS—SHEET 5.

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Fig 6

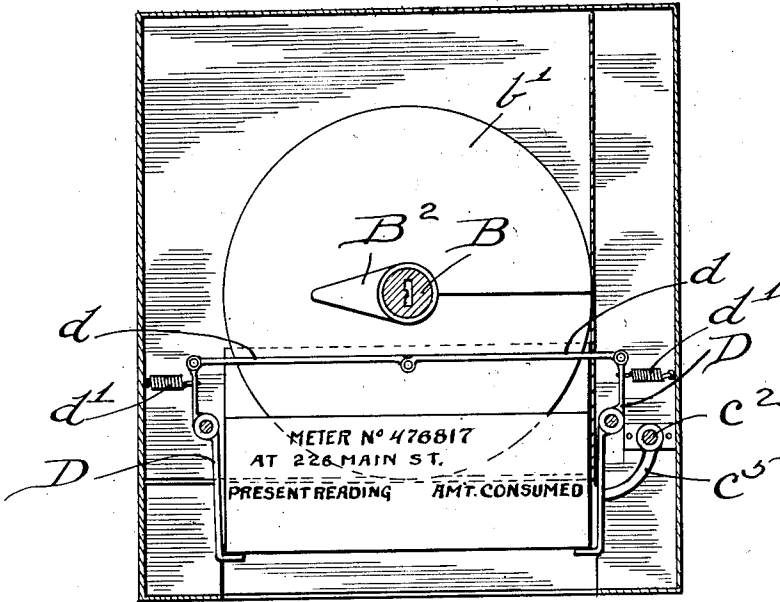
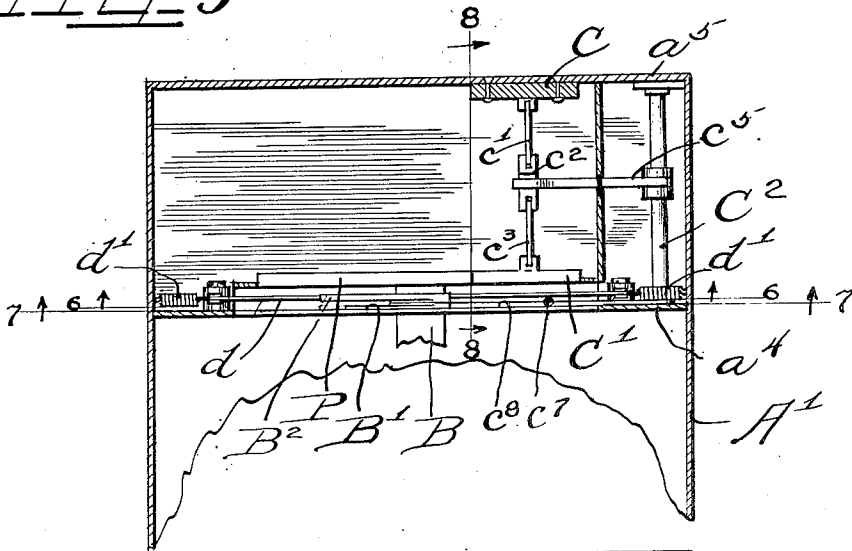


Fig 5



WITNESSES

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11 SHEETS—SHEET 6.

Fig 7

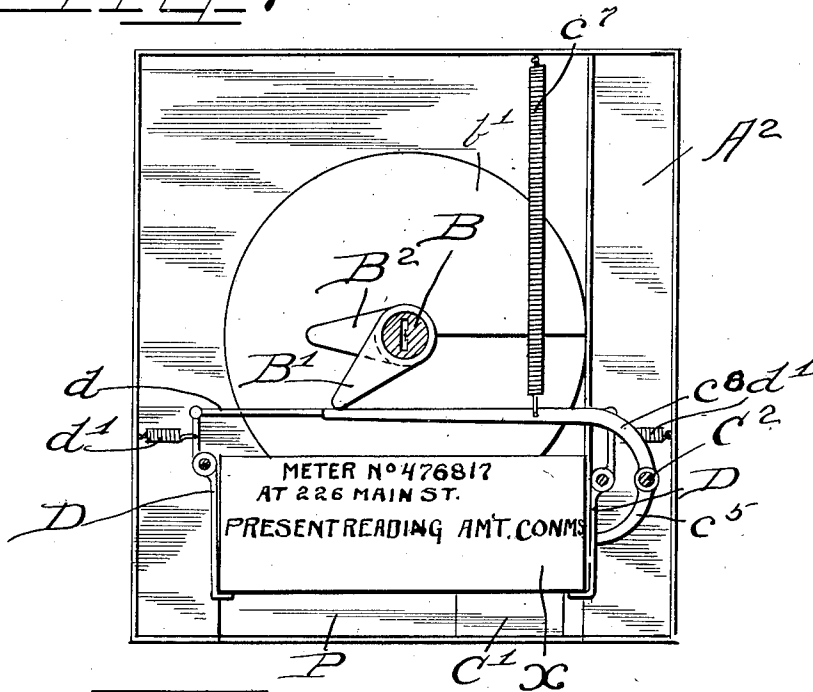
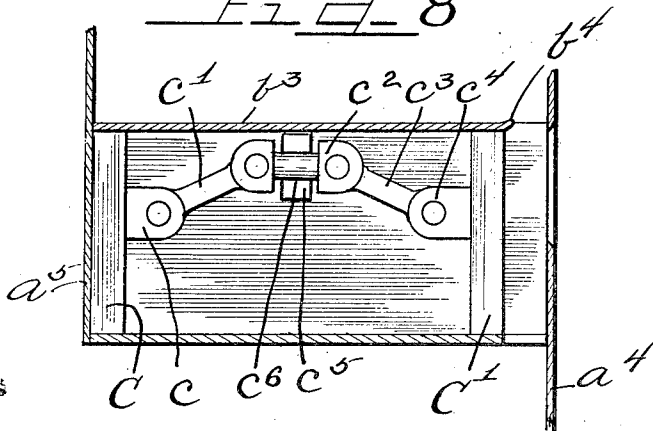


Fig 8



WITNESSES
 J. St. Angell.
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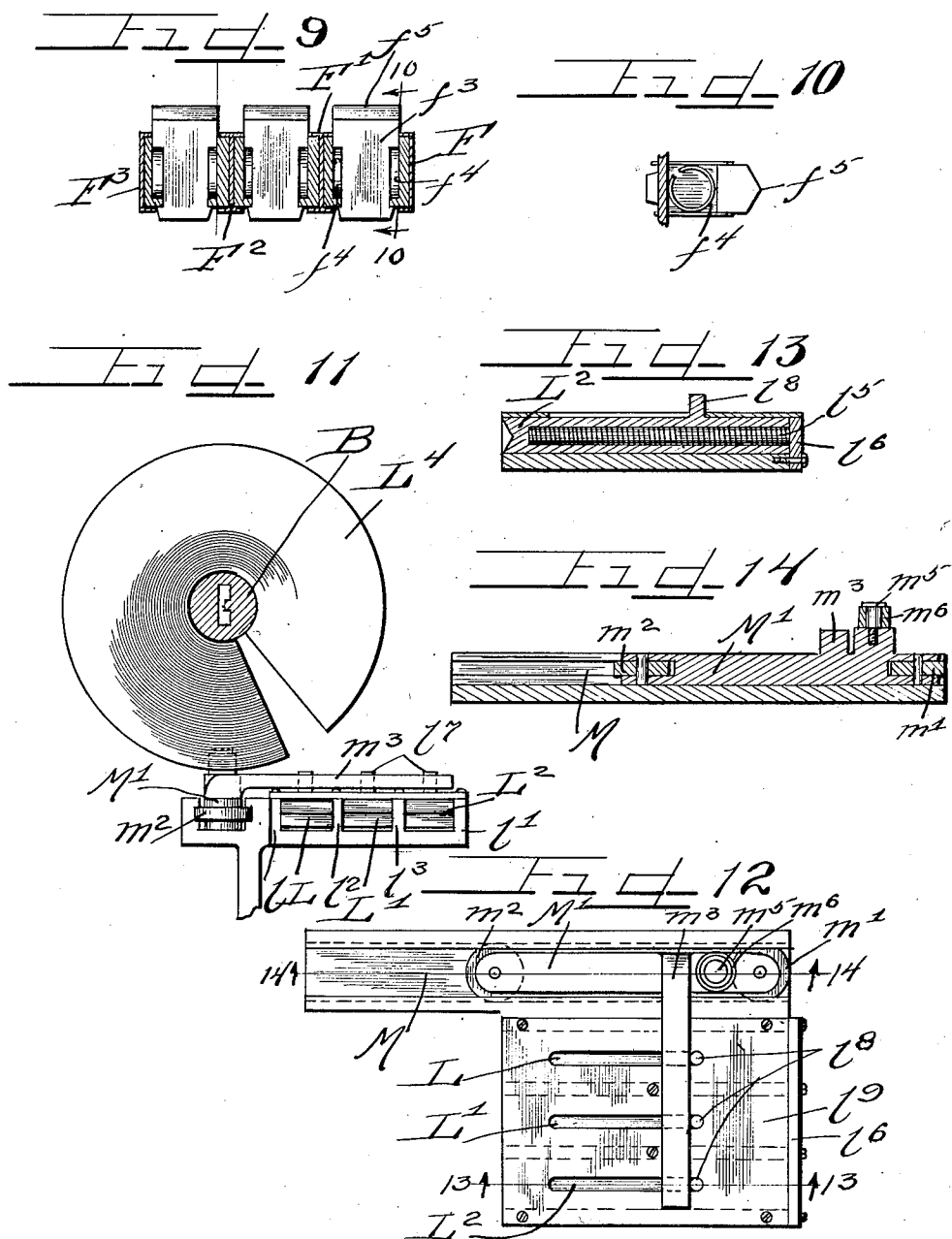
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11 SHEETS—SHEET 7.



WITNESSES

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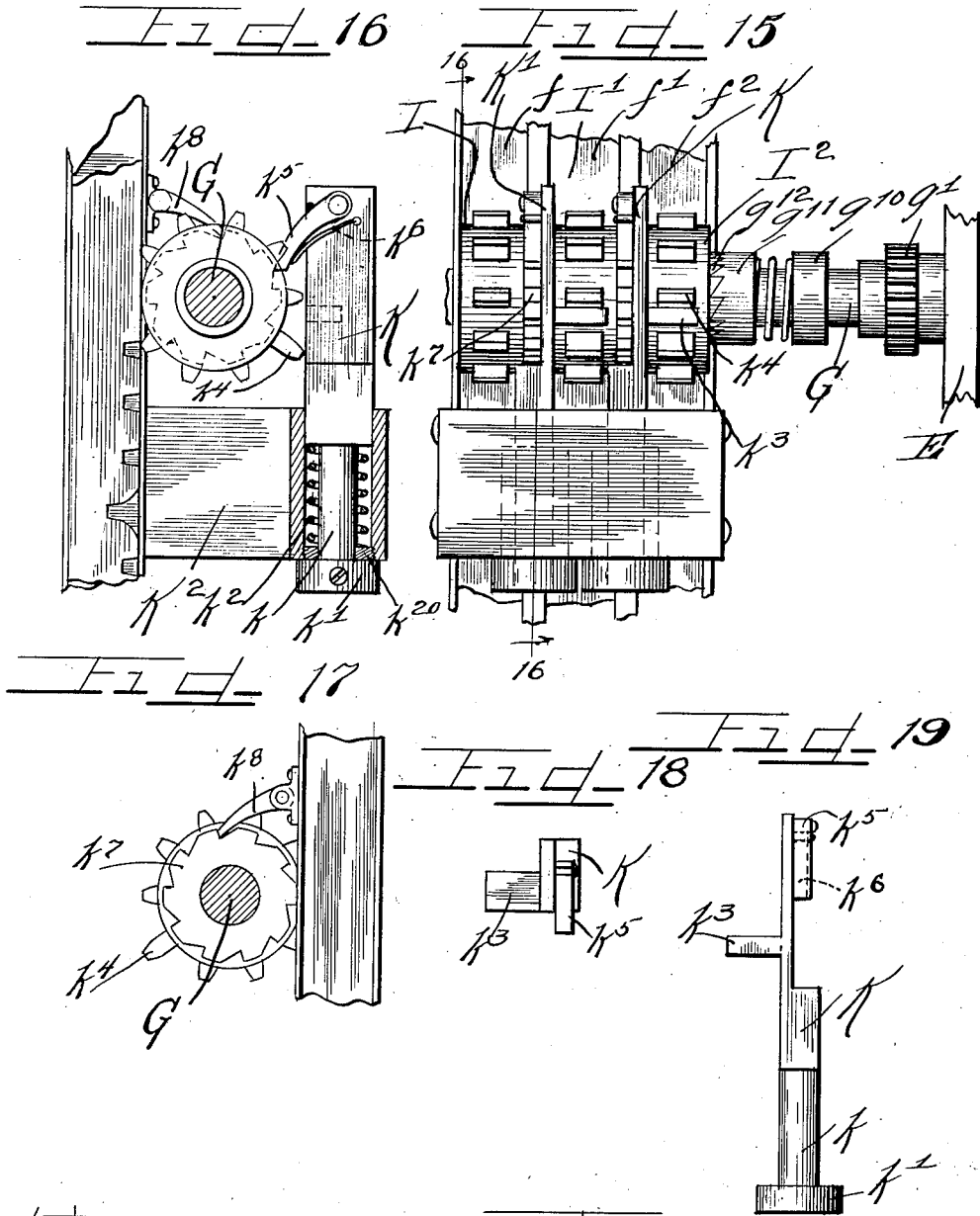
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11 SHEETS—SHEET 8.



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11 SHEETS—SHEET 9.



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11 SHEETS—SHEET 10.

Fig. 28

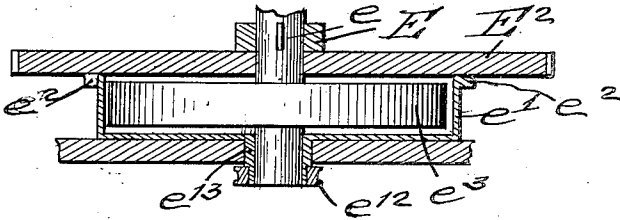


Fig. 27

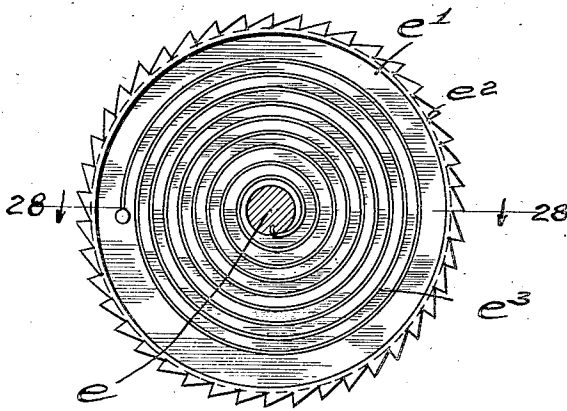


Fig. 29

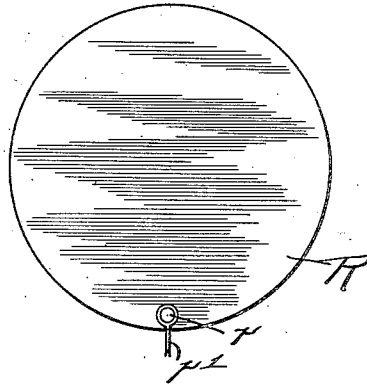
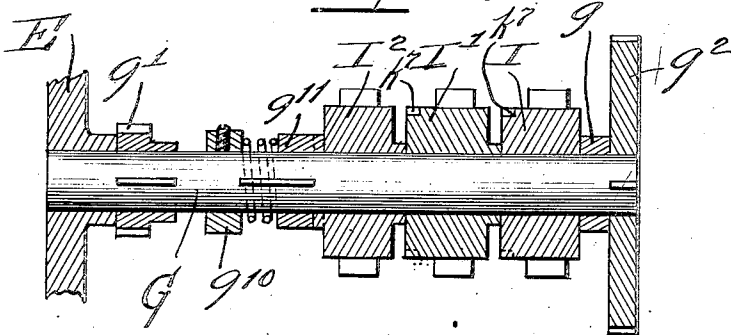


Fig. 26



WITNESSES

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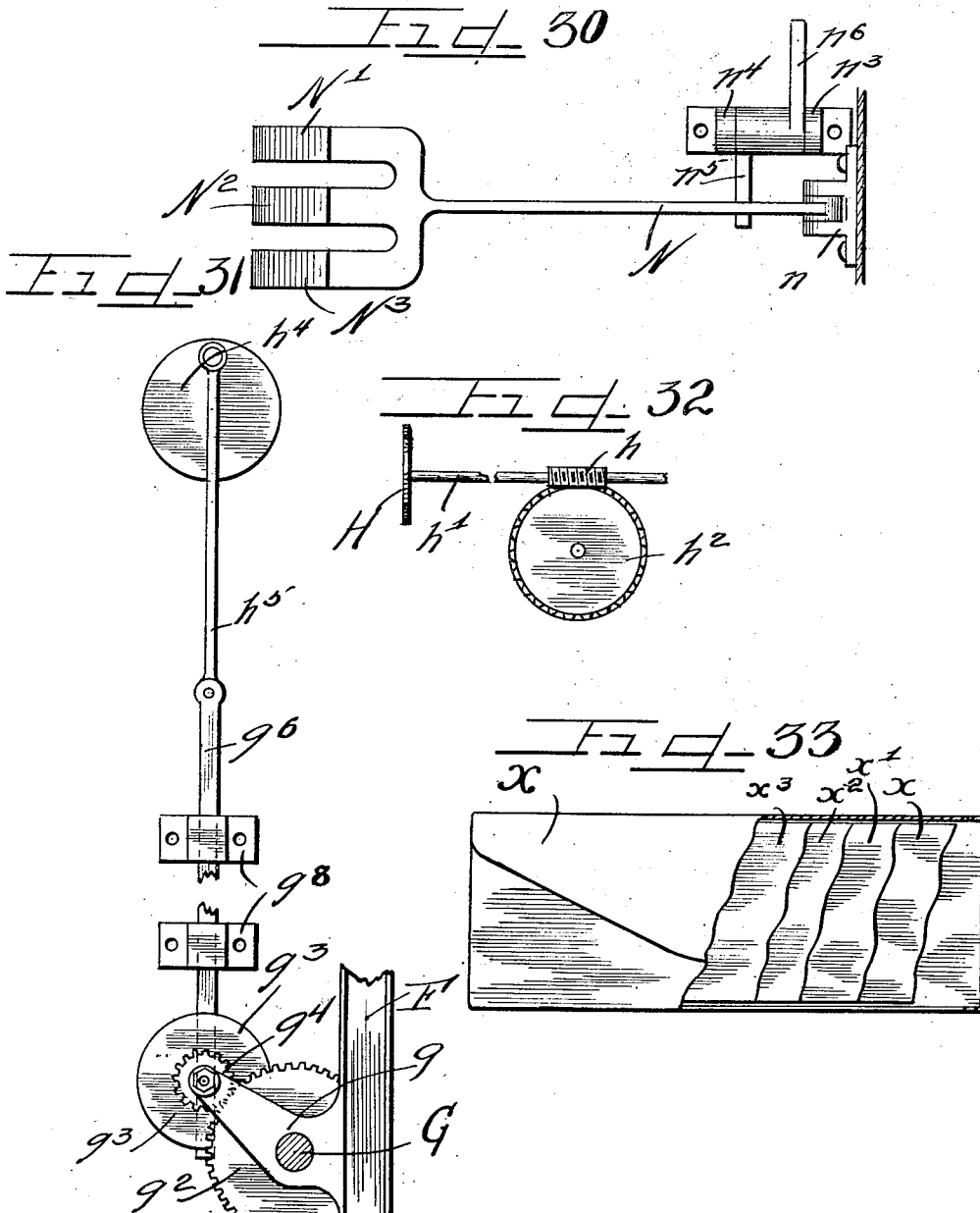
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Patented Mar. 4, 1913.

11 SHEETS—SHEET 11.



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UNITED STATES PATENT OFFICE.

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RECORDING MECHANISM FOR METERS.

1,054,720.

Specification of Letters Patent.

Patented Mar. 4, 1913.

Application filed January 27, 1909. Serial No. 474,370.

To all whom it may concern:

Be it known that I, SAMUEL C. SHAFFNER, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Recording Mechanisms for Meters; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

It has heretofore been the almost invariable practice of operating companies in the case of both gas and electric meters to employ inspectors to each month visit each meter installed to take the reading and to report the same to the company office where more or less complicated accounts are kept with the various meter users, and monthly bills rendered. Of necessity in cities of considerable size a very large force of men is thus required to take the meter readings and a large office force is required to keep the books and records, and in consequence, the operating expense of the company is large. Furthermore, many householders object to the periodical visits of unknown meter inspectors and are constantly exposed to the danger of unauthorized persons obtaining access to the premises by impersonating an inspector.

The object of this invention is to afford a recording mechanism adapted to be installed in connection with, or as a part of a gas, electric or any other type of meter and adapted to afford in connection with the usual visible meter record, an interior recording mechanism whereby the householder or user of the meter may at any time obtain a record sheet accurately showing the then meter reading.

It is also an object of the invention to afford a recording mechanism for meters adapted to enable the householder or meter user to obtain his bill for service from the meter whenever he may desire the same.

It is also an object of the invention to afford in a device of the class described a mechanism impelled independently of the meter register but the operation of which is controlled thereby.

It is further an object of the invention to afford an automatic recording mechanism associated with a meter and in which means other than the meter register are employed

to impel the mechanism, and in which the recording means are operated by a suitable key both in printing the bill and in returning the mechanism to normal.

The invention embraces many novel features and consists in the matters hereinafter described and more fully pointed out and defined in the appended claims.

In the drawings: Figure 1 is a front elevation of a meter of ordinary type with which is associated mechanism embodying my invention. Fig. 2 is a section on line 2—2 of Fig. 1. Fig. 3 is a section on line 3—3 of Fig. 2. Fig. 4 is a section on line 4—4 of Fig. 2. Fig. 5 is a view in horizontal section taken above the bill holding and total record mechanism. Fig. 6 is a section taken on line 6—6 of Fig. 5. Fig. 7 is a similar view taken adjacent the actuating mechanism for the total amount recorder. Fig. 8 is an enlarged section taken on line 8—8 of Fig. 5. Fig. 9 is a section on line 9—9 of Fig. 3. Fig. 10 is a reduced section on line 10—10 of Fig. 9. Fig. 11 is a fragmentary section with parts omitted illustrating the operation of the type carriage. Fig. 12 is a top plan view of the type carriage and ram case. Fig. 13 is a section on line 13—13 of Fig. 12. Fig. 14 is a section on line 14—14 of Fig. 12. Fig. 15 is an enlarged fragmentary detail elevation of the mechanism for shifting the type in the "present reading" recorder. Fig. 16 is a section on line 16—16 of Fig. 15. Fig. 17 is a view taken oppositely from Fig. 16, and showing the mutilated gear, the ratchet and the pawl for controlling the gear. Fig. 18 is a top plan view of one of the transferring or carrying posts. Fig. 19 is an inner side elevation thereof. Fig. 20 is an enlarged fragmentary side elevation of the master gear whereby both the recording mechanisms are actuated. Fig. 21 is an enlarged side elevation of the rotary Veeder recorder, from which the impression of the total reading is taken. Fig. 22 is an enlarged section taken on line 22—22 of Fig. 21. Fig. 23 is a section taken on line 23—23 of Fig. 22. Fig. 24 is a section taken on line 24—24 of Fig. 22. Fig. 25 is an enlarged detail on line 25—25 of Fig. 2, with parts omitted, and showing the trip mechanism whereby the type bars are returned to normal after each record. Fig. 26 is an enlarged fragmentary section taken longitudinally of the shaft for the mutilated gears;

the shaft being shown in elevation. Fig. 27 is an enlarged section on line 27—27 of Fig. 3. Fig. 28 is a section on line 28—28 of Fig. 27. Fig. 29 is an outer face view of the winding disk or plate. Fig. 30 is an enlarged detail plan view of the trip mechanism for returning the type bars to normal. Fig. 31 is an enlarged fragmentary section taken on line 31—31 of Fig. 3, and illustrating the general construction of the escapement. Fig. 32 is a fragmentary detail showing the connection between the escapement and the usual meter register. Fig. 33 is a view partly in elevation and partly in section and broken away, of the envelop containing the bill, and if desired, the duplicate and triplicate thereof together with the carbon sheets for preparing such duplicate and triplicate bills.

As shown in the drawings: A, indicates a meter of any kind or description and provided with the usual or any rotary dial register a , to enable the meter readings to be seen externally of the meter. Secured to the side of the meter either as a part thereof or rigidly attached thereto, in any suitable manner to prevent unauthorized interference, is a casing A' , the back of which conveniently is flush with the back of the meter and which is adapted to contain a part of the recording mechanism, the subject matter of this invention. Integrally connected with the casing A' , and projecting forward at the top thereof is a casing A^2 , adapted to contain the envelops or sheets for the successive statements and containing a mechanism for successively feeding the same to the point of delivery and discharge.

Extending transversely the casings A' — A^2 , and journaled on an inner bracket b , and in the outer face or wall of the outer compartment or casing, is a key actuated shaft B, on which within the compartment afforded by the casing A^2 , is a feeder comprising a spirally arranged metallic strip secured on said shaft and affording, as shown in said compartment, twelve whirls b' , between each of which, as shown in Fig. 2, is inserted through the side wall of said casing A^2 , an envelop X, as shown in Figs. 2 and 33, and in which is provided a carbon sheet x , an original x' , a duplicate carbon x^2 , and a duplicate sheet x^3 , or any desired number whether one or more of sheets of paper or other suitable material to receive the record or impression from the recorder. Below said spiral feeder and supporting said envelop is a horizontal plate b^3 , which extends from the outer face a^5 , of the casing A^2 , inwardly to near the outer face a^4 , of the casing A' , and at its inner end is inclined slightly upwardly, as shown in Fig. 8, affording a lip b^4 , adapted to hold the envelops in place on said table until pressed

therefrom by the feeder. Beneath said table and secured to the outer face a^5 , of the casing A^2 , is a plate or post C, on which is secured a bracket c , to which is pivotally engaged a toggle bar c' , the other end of which is engaged on a link c^2 , to the inner end of which is pivotally engaged a toggle bar c^3 , corresponding with the toggle bar c' , and connecting with a bracket c^4 , secured on a sliding impression plate C' , as shown in Figs. 2, 5, and 8. Extending parallel said toggle levers and journaled in the face plates a^4 — a^5 , of the respective casings A' — A^2 , is a rock shaft C^2 , on which is secured an arm c^5 , provided at its extremity with a fork which engages a central cylindrical shaft portion c^6 , in the link C^2 , whereby the depression of the end of the arm c^5 , acts to force the impression plate C' , inwardly toward the plate a^4 , abutting the face wall of the casing A' .

Secured on the shaft C^2 , is an upwardly and transversely extending lever c^5 , which extends beneath the shaft B, and is normally supported by means of a spring c^7 , engaged to the top of the casing A^2 , at one end and at the other is secured on said lever, and secured on said shaft B, is an arm B' , positioned normally, as shown in Fig. 7, and adapted as the shaft B, is rotated by the key to depress the end of the lever c^8 , and thereby actuate the toggle bars to force the impression head or plate C' , inwardly to strike the envelop X, shown in Fig. 7, to impress the "present reading" record thereon from a register hereinafter described. Said arm B' , is secured on the shaft approximately in position to require a rotation of approximately 45° before actuating the impression plate or head C' , to the limit of its travel, and also secured on the shaft B, as shown in Fig. 7, is an arm B^2 , corresponding with the arm B' , and arranged approximately 45° to the rear thereof, and adapted when all the impressions have been made upon the envelop to release the same to permit the envelop to fall from the machine. For this purpose, as shown, arms D, are pivoted one at each end of the envelop, as shown in Figs. 6 and 7, with the lower ends thereof hooked inwardly to support the envelop and the upper ends thereof above the pivot connected by means of bars d , pivoted thereon and hinged together below the shaft B, as shown in Fig. 6. Springs, d' , engaged to the upper ends of said arms and to the side walls of the casing, act normally to hold the arms thereof in position to support the envelop but permit said lower ends to be thrown outwardly by engagement of the arm B^2 , with the hinged connecting rods d , thereby releasing the envelop.

A very great variety of recording mechanisms may be employed in connection with the envelop feed and delivering mechanism

for the purposes of this invention. It is of the utmost importance, however, with devices of this class that the meter register be not required to drive such recording mechanisms, otherwise the resistance may cause false readings particularly in the more sensitive types of meters. I have provided recording mechanism impelled by spring mechanism, the operation of which is controlled by a simple escapement operated with very slight resistance by the meter register. For this purpose, as shown, standards E—E', are secured on the bottom of the casing A', and extend upwardly toward the shaft B, and journaled thereon horizontally and as shown, at a right angle with the shaft B, is a shaft e, on which is rotatably secured a master gear E², of large size. Also secured on said shaft is a spring drum or barrel e', having a flanged periphery e², which bears against the face of said gear and is provided with ratchet teeth, as shown in Figs. 2, 3, 4, 27, and 28, and secured within said spring barrel is a strong spiral spring e³, the inner end of which is rigidly engaged to the shaft e, and the outer end of which is engaged on the drum barrel, as shown in Fig. 27, said spring being secured in said barrel in such position that when wound up the stress exerted by the spring on the spring barrel and the ratchet is exerted in the direction of the pitch of the ratchet teeth. Secured on said master gear E², as shown in Fig. 2, is a spring pressed pawl e⁴, which is at all times in engagement with said ratchet teeth, and in consequence, acting to rotate the master gear and spring barrel from said spring. Said shaft e, is rigidly engaged to the standard E, by a key or any other fastening means suitable for this purpose, as shown in Fig. 20. Vertical type guides F—F'—F²—F³, arranged equal distances apart, and extending from the top to the bottom of the casing A', in parallel relation are rigidly secured therein. As shown, the type guides F—F³, are inwardly facing channels and the type guides F'—F², are channeled on both sides, as shown in Fig. 9, or in other words, are in the form of I bars. Vertically slidable in the type guides are type bars as shown in Figs. 3, 4, 9, 15, and 16. These, as shown, are three in number, though, of course, a greater number may be employed if required, and are indicated by f—f'—f², appropriated to units, tens and hundreds respectively, and as shown, each of the same is slotted at equal distances from the ends to receive therein a stack of type (ten in number) in each bar, and reading from the top downwardly as 0 and the nine significant digits in their order. As shown, the type faces of said type indicated by f³, are directed outwardly or toward the envelop supported against the face of said casing, as shown in Fig. 2, and

means are provided for yieldingly retaining said type with their faces in alignment, comprising, as shown in Figs. 9 and 10, a recess cut in each type on each side thereof, and a corresponding recess or channel in the adjacent inner side of the type bar. Springs, f⁴, are seated in said recesses, one on each side for each type and act when the type are struck outwardly in making the impression to immediately return the type to normal position in the type bar, and each of said type, as shown, is shaped on its rear end to afford a V shaped rib f⁵, adapted to be struck by suitable mechanism hereinafter described for forcing the type into operative position for the impression.

Means are provided for successively elevating the type bars by means of the master gear and with the type therein to indicate "present reading". For this purpose, as shown, a shaft G, is journaled below the master gear and parallel the shaft e, on the standard E, and upon a bracket g, rigidly secured on the type guide F, and rigidly secured on one end is a pinion g', in mesh with the master gear E², and rigidly secured on the opposite end or that adjacent the type guide F, is a gear g². Journaled also on the bracket g, before described is an escapement wheel g³. This, as shown, is provided on its inner side with a pinion g⁴, which meshes with the gear g², as shown in Figs. 3, 4 and 31. Said escapement wheel g³, is provided near its periphery on its outer side with a pin g⁵, which projects outwardly therefrom into position to bear against a vertical reciprocating rod or bar g⁶, provided at one point near its lower end with a notch g⁷, which permits the pin to pass therethrough.

Means are provided for reciprocating said bar from the meter register. For this purpose, as shown, a worm h, is secured on the shaft h', for the meter dial H, or any of the meter dials, and meshing with said worm is a worm gear h², secured on a shaft h³, which extends through the wall of the casing A, and is provided on its inner end with a disk, wheel, pin or any suitable crank h⁴. Secured at one end on said crank is a connecting rod h⁵, the lower end of which is pivotally engaged on said upper end of said reciprocating notched rod g⁶. In consequence, the rotation of said dial H, serves to slowly elevate and depress said rod g⁶, which moves through suitable guides g⁸, to hold the same at all times in proper alignment and the shaft G, and the master gear are at all times held from movement by said escapement except that at each limit of the reciprocation or movement of the rod g⁶, the escapement disk g³, is permitted one half a rotation, and in consequence, a corresponding movement is permitted under the action of the spring in the master gear and the shaft G, 130

and conveniently the gears and worms are so proportioned with reference to each other that with each one hundred feet or one hundred units indicated on the register dials, said movement occurs on the shaft G, impelled by the master gear, said movement being sufficient to indicate one on each of the recorders contained within the casing A', for this purpose the type bar f^2 , being first elevated one type space with each movement of the master gear until the nine digit having been elevated into recording position, the next movement permits the type bar f^2 , to fall to "0" position, and the "10" is carried by the elevation of the type bar f' , one space. For the purpose of accomplishing this movement mutilated gears I—I'—I², are rotatably secured on the shaft G, and positioned at the rear of the type bars f — f' — f^2 . Each of said gears is constructed as shown in Fig. 16, having nine teeth, each spaced one tenth of a circumference apart leaving a space one fifth of a circumference between the first and last tooth, and as shown, the corresponding type bar for each gear is provided with notches to afford a rack adapted to be engaged by said teeth to successively lift the type bar with the rotation of said gear.

Rigidly secured on the shaft G, is a collar g^{10} , and a clutch member g^{11} , which is feathered or splined on the shaft, and is shaped to engage a complemental clutch member forming, as shown in Figs. 15 and 26, a part of the hub of the gear I². Between said collar g^{10} , and the clutch member g^{11} , is provided a spring which yieldingly engages the clutch g^{11} , forcing the same into engagement with the clutch g^{12} , of the gear I², thereby forcing the gear in one direction, that is to say, the direction necessary to elevate the type bar f^2 .

For the purpose of carrying the amount from the type bar f^2 , to the type bar f' , and thence to the type bar f , posts K—K', are provided supported by a bracket K², secured to the guide bars F—F³, as shown in Figs. 4 and 16. Each of said posts is constructed as shown in Figs. 16 and 19, and at its upper end is approximately rectangular and at its lower end is cylindric, as shown, and is provided with a collar k' , rigidly secured thereon at its extremity. Said lower end of the post fits on a suitable seat k^{20} , in its bracket and secured on said cylindric portion k , thereof is a spring k^2 , the lower end of which bears upon said seat and the upper end of which bears against suitable shoulders on the post and acts to hold said post elevated to its fullest extent or, in other words, to bring the collar k' , into bearing beneath the bracket. Secured on the side of each of said posts and projecting outwardly and parallel with the shaft G, and toward the gear of the next lower denomination is

a finger k^3 , and as shown, adapted to be engaged by a long tooth k^4 , on the units gear I², or on the tens gear I', as the case may be. Also secured on said post on the opposite side thereof from the finger k^3 , is a pawl k^5 , and a spring k^6 , therefor which acts to hold said pawl outwardly into position to engage in a suitable ratchet k^7 , secured on each of said mutilated gears of a higher denomination than units. As shown, said long tooth k^4 , on said gears are each placed diametrically opposite the ninth or last tooth on the same gear so that as the ninth tooth releases the rack in its type bar, said long tooth engages the arm k^3 , on the corresponding post K, or K', forcing the same downwardly against the tension of its spring, its pawl k^5 , engaging the ratchet of the next succeeding gear and rotating the same one space thereby elevating the next succeeding type bar one space or carrying the ten, and as shown, as the long tooth slips from the arm k^3 , of said post, the first and ninth teeth on the actuating gear are in the position shown in Fig. 16, at which time the first actuated type bar may drop to indicate "0."

As shown, each of the type guides is provided with a pawl k^8 , which at all times engages the ratchets of the corresponding type wheel and serves to hold the same from reverse rotation. In this manner the successive intermittent rotations of the master gear acts to successively elevate the respective type bars to recording position, the horizontal row of type corresponding in position with the recording aperture Y, in Fig. 2, at all times reading correctly to indicate the number of hundred feet or hundred units consumed.

Rams L—L'—L², are provided, one opposite each type bar and positioned to strike the respective type when in recording position outwardly to make the record. For this purpose a casing or frame is secured in horizontal position at the rear of said type bars and slidably secured therein by the side walls l — l' , and suitable guides l^2 — l^3 , are rectangular bars such as shown in Fig. 13, each of which is provided at its outer end or that adapted to strike the rear end of the type, with a V shaped seat complemental with the V shaped rib on said type. As shown, each of the arms is provided with a longitudinal central bore adapted to receive a coiled spring l^5 , therein one end of which is engaged against the back plate l^6 , of said ram frame and which acts to impel the ram forwardly into striking relation with the type when released.

Means are provided for retracting the rams from the type and holding the same out of engagement until the shaft B, is rotated to obtain the meter readings. For this purpose, as shown, a spiral cam plate

L^4 , is rigidly secured on the shaft B, as shown in Figs. 2, 3, and 11, said spiral plate having a considerable pitch consisting of but a single whirl, the ends of which terminate in radial lines on the cam, as shown in Fig. 11, affording a narrow open space between the ends.

Slidably secured in a laterally channeled horizontal track M, secured to the ram frame and extending parallel the rams is a carriage M' , comprising a bar provided with horizontal rollers $m'-m^2$, one at each end thereof and extending into the lateral channels in the track. Integrally secured on said carriage M' , is an arm m^3 , which extends transversely the ram frame, as shown in Figs. 11 and 12, and is adapted to engage on its rear side an integral pin l^8 , secured on each ram and extending upwardly through a suitable longitudinal slot in the top plate l^9 , for said ram frame. Also secured on said carriage is an upwardly extending stud m^2 , on which is journaled an anti-friction roller m^6 , positioned to be engaged by the spiral cam L^4 , as shown in Figs. 2, 3, and 11, so that as said spiral cam is rotated, said carriage is forced rearwardly to the position shown in Fig. 12, to be released at the open radial slot in said cam whereupon the springs impel the rams and the carriage forwardly, the rams striking the horizontal line of type then in recording position, and the roller on said carriage coming into position to be again engaged by the cam and forced rearwardly with the next rotation of said shaft B, and cam thereon.

Means are provided for immediately returning all the type bars to naught (0) or their last position immediately after the type have been rammed in making the impression or record. For this purpose, all the type bars are simultaneously forced upward to transferring or carrying position, the same being the limit of their upward travel at which point none of the teeth on the mutilated gears for actuating the type bars are in engagement, hence the type bars from this position fall freely to their lowest or naught (0) position as before described. To effect this movement a lever N, is pivoted at one end in a suitable bearing n , near the bottom of the back of the casing A' , as shown in Figs. 2 and 30, and extends forwardly therefrom across the bottom of said casing and is provided at its forward end with parallel forks or arms $N'-N^2-N^3$, which extend respectively beneath the respective type bars, and as shown, are slightly curved convexly on their upper surfaces which engage said bars. Journaled in suitable bearings n^3-n^4 , on the bottom of said casing and close to the rear wall is a lever, one arm n^5 , of which extends beneath the lever N, not far from its pivot bearing,

and the other arm n^6 , of which extends oppositely therefrom and normally supports a bar n^7 , one end of which rests on the lever arm n^6 , and the other end of which extends upwardly through suitable guides n^8 , into engagement with a cycloidal cam n^9 , rigidly secured on the rear or inner end of the shaft B, and adjusted so that at the termination of each rotation of the shaft B, said cam strikes said bar n^7 , downwardly thereby throwing the free end of the lever N, upwardly to an extent to carry said type bars on said prongs $N'-N^2-N^3$, to the upper limit of their travel. Said cam, however, at the peripheral point corresponding with the greatest radius is cut away, as shown in dotted lines in Figs. 4 and 25 to permit said bar n^7 , to again rise impelled by the weight of the type bars at the moment the shaft B, has completed its rotation, thus permitting the type bars to descend to naught (0) position, as shown in Fig. 3.

Secured on the upper end of the standard or post E, as shown in Figs. 2, 3, 4, and 20, is an ordinary or any rotary Veeder register for the total readings. As shown, for this purpose an integral or other plate o , is secured on the upper end of said standard and secured thereon and extending forwardly are brackets o' , in which is journaled the Veeder shaft o^2 . Rigidly secured on the end of said shaft and meshing with the master gear E^2 , is a pinion o^3 , whereby said shaft is rotated. Rigidly secured on said shaft is the units wheel O, or that appropriated to the last denomination recorded and arranged rotatably and successively on said shaft are the "tens" wheel O' , and "hundreds" wheel O^2 . As shown, each of said wheels is marked on its periphery successively with the ten digits spaced equal distances apart. Secured at its ends in said brackets o' , is a shaft o^4 , arranged adjacent the periphery of the counting wheels and parallel the Veeder shaft o^2 . Rotatably secured on said shaft is a ten toothed gear, the periphery of which extends between the counting wheels O and O' , and meshes with a similar ten toothed gear of equal size integral with the counting wheel O' . Said gear o^5 , is of a thickness to project beyond the inner face of the gear o^6 , on said counting wheel sufficiently to adapt the same to be engaged by a finger o^7 , rigidly secured on the hub of the gear O, in position to mesh in said gear o^5 , when said counting wheel O, is in position for the digit 9, to register, thus with the next succeeding movement of said counting wheel rotating the counting wheel O' , one space or digit and simultaneously turning the counting wheel O, to naught (0) position, or, in other words, carrying the ten. In a similar manner the gear o^8 , on said shaft o^4 , projects between the count-

ing wheels O' and O^2 , and likewise engages a gear o^6 , integral with the inner face of the counting wheel O , and is adapted to be engaged by a finger o^7 secured on the hub of the counting wheel O' . In consequence, when the counting wheel O' , is positioned for nine to register, the next movement brings said counting wheel to naught (0) position and shifts the counting wheel O^2 to carry the "tens". Of course, in the same manner any desired number of counting or registering wheels may be employed, and if necessary or desirable any suitable detents may be employed in addition to the gears before mentioned to serve as a brake to prevent said counting or registering wheels rotating in either direction except when and to the extent impelled by the rotation of the master gear. Said permanent or total register is positioned for the digits in recording position to project slightly through an opening in the front wall a^4 , of the casing A' , directly opposite the impression plate C' , in the casing A^2 , before described. The type carried in the type bars when in recording position also project through a corresponding opening in said front plate A^4 , and approximately at the same level with the Veeder register. Rigidly secured in said casing A^2 , substantially in alinement with the impression plate C' , is a rigid impression plate P , against which the envelop X , containing the paper and carbon sheets for the impression rests, and against which the same is driven by the type and under the impulse imparted by the rams in recording.

All the operation herein described with the exception of a part of the operation of the escapement is effected either by the rotation of the shaft B , when rotated once by means of a suitable key or is effected continuously by the rotation of the master gear E^2 , driven by its spring, and, inasmuch as practically all the work normally performed by the machine is accomplished by the action of said spring, it follows that means must be provided adapted to unfailingly wind up said spring after each record has been taken. For this purpose, a disk or wheel R , of relatively large diameter is secured on the inner end of the shaft B , and secured near the periphery thereof is a pin r , on which is engaged a strap, cable or any suitable flexible connection or cord r' , which depends into the casing A' , and the lower end of which is wound about a suitable sheave e^{12} , rigidly secured upon a sleeve or hub e^{13} , integral with the spring barrel e' , as shown in Figs. 2 and 28, said cable being wound around said sheave by the normal rotation of the master gear under the impulse of the spring and being unwound therefrom thereby winding up the spring with each rotation of the shaft B .

A guide R' , is rigidly secured to the casing A , through which the cord r' , passes.

The operation is as follows: When the meter is installed the envelops or sheets X , for a sufficient number of monthly bills are inserted one between each of the whirls of the spiral feeder and supported upon the table or plate b^3 . At this time, of course, both the meter register and both the recording mechanisms in the casing A' , stand at naught (0). The spring e^3 , is, of course, wound up to the required tension by means of the shaft B , and the instrument is sealed from unauthorized interference. As the dial or wheel H , of the meter register rotates the worm gear h^2 , is rotated by means of the worm h , on the shaft h' , and in consequence the escapement bar g^6 , is slowly reciprocated up and down on the crank h^4 , and at the upper and lower limit of the movement of said bar the notch near the lower end thereof comes into register with the escapement pin g^5 , on the escapement disk g^3 . This pin at all other times presses lightly against the escapement bar under the pressure of the spring e^3 , which is communicated to said escapement disk by means of the shaft G , the gear g^2 , and the pinion g^4 , on the escapement disk. When the pin registers with said notch in said bar it immediately passes through the notch and the disk rotates until the pin again engages on the bar. In other words, said disk revolves 180° , and permits consequently the gear g^2 , and shaft C , to rotate proportionately, or enough to raise the units type bar one digit or type space in height by the engagement of the mutilated gear therefor in the rack in said type bar. Of course, the proportion of said gears of necessity will vary dependent upon which of the meter register wheels or dials actuates the escapement bar. If, for instance, the meter wheel or dial H , indicates units, the proportion of said gears may be such as to count one, or, in other words, raise the units type bar one type space with each rotation of the meter wheel, thus one complete rotation of the meter wheel or ten units would be indicated by raising the type bar f^2 , one type space to register one ten and similarly if the proportions be such that the meter register wheel H , may rotate ten times before raising the type bar f^2 , one space, each digit in said type bar would indicate hundreds. Of course, the requirements in this respect may vary to suit the rules of the owners of the meter. When the type bar F^2 , has been raised to its fullest extent, or, in other words, to indicate at recording position nine units of the required denomination, the next movement, as before described, results in the long finger or tooth h^4 , on the mutilated gear for said type bar striking the arm h^3 , on the spring supported post K , striking the same downwardly and

in consequence of such downward movement rotating the next succeeding gear one space because of the engagement of the pawl h^5 , on said post with the ratchet wheel secured on such succeeding gear, and consequently carrying the tens to the next higher recording wheel. While this is transpiring and the respective type bars are successively rising and falling under the intermittent impulse imparted to the master gear by the shaft G, the intermittent rotations of said master gear each rotate the units wheel O, on the total recording Veeder one space or digit, and, as the registering progresses said Veeder carries the tens, as is usual, at all times pressing opposite the impression plate C', the correct register of the number of units registered by the meter. During this registering period the shaft B, with all the parts attached thereto remains at rest and is capable of being impelled only by the key of the meter user who is required to periodically obtain his bill from the meter, retain the same for future reference and send the duplicate thereof to the company with payment.

When the key is inserted the shaft is rotated once around producing the following operations: The spiral feeder forces an envelop X, with one or more sheets of paper and carbon copy sheets therein, over the edge of the table b^3 , whereupon the same drops to the position shown in Fig. 6, and is supported on the arms D, with the face of the envelop pressed against the raised type on the Veeder register and also against the horizontal line of type in recording position in the respective type bars. Continued rotation of the shaft acts to force the carriage M', rearwardly, retracting the rams $L-L'-L^2$, against the tension of the spring and before said retraction is complete to releasing position, the finger B', presses the lever c^6 , downwardly, thus throwing the lever c^5 downwardly and forcing the impression plate C', inwardly by means of the toggle bars $c'-c''$, thereby jamming the envelop with its contents or bill sheets against the type of the feeder and producing the impression. Further rotation of said shaft B, carries the finger b' , past the lever c^6 , and brings the carriage M' to the rearward limit of its travel at which point the roller m^6 , is released from the spiral cam and under the impulse of the springs in the rams is thrust forwardly together with the rams, said rams striking a sufficient blow on the respective type in registering position to drive said type positively against the envelop resting against the rigid impression plate, thereby producing the temporary or "present reading" record. Continued rotation of the shaft B, now brings the finger B², into engagement with the hinged bars d , pivotally engaged at the upper end of the

levers D, in consequence throwing the lower ends of said levers outwardly and against the tension of the spring d' , and permitting the envelop or bill or bills containing the record to fall from the slot in the bottom of the casing A^2 , and upon a shelf Y', secured on the front of the casing A', in position to receive the same. Immediately following the release of the carriage and the impression of "Present reading" on the bills, the spiral cam again engages the carriage and slightly retracts the same to release the envelop from all pressure from said type and thereupon the cam n^5 , forces the bar n^7 , downwardly, thus elevating the free end of the lever N, sufficiently to carry all the type bars to the upward limit of their movement or to the nine recording position, rotating all the mutilated gears on the shaft G, on the spring clutch g^{11} , and bringing all the teeth of said mutilated gears out of engagement with the type bars. At this moment the cam releases the bar n^7 , whereupon the type bars descend to their lowest position by gravity carrying the lever N, downwardly therewith and again elevating the bar n^7 , and setting said type bars in naught (0) position to begin the registering for the next reading.

Of course, with each rotation of the shaft B, the disk or wheel R, thereon draws upon the cable or cord r' , which, during the preceding registering period has been wound upon the sheave e^{12} , and by such draft reversely rotates the spring barrel on the master gear, thus winding up the spring for the next registering period. The master gear during this operation, of course, is rigidly held from movement by the escapement which locks the shaft G, and consequently by means of the pinion g' , the master gear E², from movement.

I am well aware that the particular mechanisms for accomplishing the projection of the record or bill may be varied to a very great extent to afford a printing or recording meter and that many different devices and expedients may be employed to enable the work of recording and printing the bill and the returning of the recording mechanism to normal to be effected by energy other than that generated in the meter itself. I have, for convenience, shown an independent spring entirely disassociated from the meter except for the control thereof exercised by the escapement and adapted to actuate the recording register. Unquestionably, however, weights could be utilized for this purpose or even a motor other than a spring motor may be employed to obtain equally accurate results. I have, therefore, shown but one of numerous constructions embodying this invention, and I therefore do not purpose limiting this application for patent otherwise than necessitated by the

prior art, but intend instead to claim broadly any mechanism for the purpose described whereby the work of actuating the recording registers is accomplished by the energy of mechanisms or a motor other than the meter register and to afford in connection with such meter register an independent source of energy, and timing and synchronizing mechanism controlled from the meter register but requiring such slight expenditure of energy as not to affect the most sensitive meter.

I claim as my invention:

1. A recording register adapted for use in connection with meters embracing a recording register mechanism, a motor set under tension for actuating the same, mechanism adapted to automatically impress the record, discharge the bill or record, and set one of the registers at starting position and a manually actuated releasing mechanism adapted to release said mechanism to permit said operations to be performed:

2. A meter and its register, a recording mechanism, a feeding mechanism adapted to contain and to successively deliver in recording position the material upon which the record is to be made, pivotal levers for supporting the material, a spring motor controlled by the meter for impelling the recording mechanism, and mechanism acting to swing the levers oppositely to permit the discharge of the completed record.

3. In a machine of the class described a plurality of recording registers, an independent source of energy for actuating the same, a meter, an escapement operated from the meter, mechanism adapted to automatically impress the record, discharge the bill or record, and set one of the registers at starting position, and a manually actuated releasing mechanism adapted to release said mechanism to permit said operations to be performed.

4. In a machine of the class described recording registers, an independent source of energy for actuating the same, a meter, an escapement operated from the meter, mechanism adapted to automatically impress the record, discharge the bill or record, and set one of the registers at starting position, a manually actuated mechanism adapted to release said mechanism to permit said operations to be performed and means for restoring the energy in the independent source.

5. In a machine of the class described a feeding mechanism adapted to contain and to successively deliver in recording position the material upon which the record is to be made, pivotal levers for supporting the material, and mechanism acting to swing the levers oppositely to permit the discharge of the completed record.

6. A recording mechanism for meters embracing a source of power other than the

meter, a register actuated thereby, a manually actuated feeder for delivering the material upon which the record is to be made, to the register, key operated means for producing the impression or record, synchronizing means operatively connected with the meter register and with said independent source of power, and means also operated by the key for renewing the energy in said source of power after each record is taken.

7. Recording mechanism adapted for use for association with a meter and embracing a casing adapted to be sealed from interference, a motor, a plurality of registering mechanisms in said casing, and actuated by the motor, a feeder for materials upon which the record is to be made, mechanism for impressing the record upon said materials from said registers, mechanism automatically returning one of the registers to normal after the record, mechanism for restoring the energy in the motor after each record, said feeder and said impression mechanism being manually actuated, and operative connections with the meter for synchronizing the motor in said recording apparatus from the meter register.

8. In a machine of the class described a motor, means synchronizing the same from a meter register, key operated means for discharging the record from said mechanism, and renewing the energy in said motor, and operative connections with said key actuating mechanisms for setting the device at normal after each record.

9. In a device of the class described an independent motor, connections synchronizing the same from the meter register, and mechanisms adapted to be actuated by a key for affording a permanent record of the meter readings and discharging the record from the machine and setting the motor to normal.

10. Recording mechanisms for meters embracing a casing adapted to be sealed from interference, a motor therein, a total register and a "present reading" register actuated by said motor, synchronizing means operated from the meter register and controlling the motor, manually operated rotatable means for delivering the material for the record before said registers, producing the record, discharging the same, and setting the "present reading" register at normal, all of said mechanisms acting independently of the motor and meter.

11. An attachment for a meter embracing recording devices, mechanism for actuating the same, a spring motor, and operative connections between the meter and motor acting to control the recording from the meter register.

12. An attachment for a meter embracing recording mechanisms adapted to show the readings of the meter independently of the meter registers, impression plates, pivoted

members for supporting the record material between the plates and recording mechanism, key operated means for taking the readings and releasing the pivoted members after the reading to release the record material, and operative connections controlling said recorders from the meter register.

13. A device adapted for use in conjunction with meters embracing recording devices comprising reciprocating type bars having type carried thereby, means controlling the operation thereof from the meter register, and manually operated means acting to reciprocate the appropriate type to impress the record upon a suitable record sheet.

14. The combination with a meter and its registers of automatic recording devices adapted to show the condition of the meter since the last reading, means operatively connecting said recorders with the meter register for controlling the operation thereof therefrom automatically acting rams for making the record, manually operated means for releasing the rams, and means for automatically setting one or more of the recorders back to naught (0).

15. In combination with a meter and its registers, a plurality of recording devices associated therewith, and controlled from the meter registers, a key operated feeder adapted to carry a record sheet into recording position, means impressing the record thereon, and mechanism also operated by the key for setting the mechanism at normal after the taking of the record.

16. In a machine of the class described a feeder for a succession of record sheets, recorders, impression devices associated therewith and adapted to press the record sheets thereon, operative devices for setting the mechanism back to normal after the impression, and a shaft with which said mechanisms are operatively associated to permit all said functions to be performed by a single rotation of the shaft.

17. In a device of the class described a meter, a register thereon, recording devices showing the meter reading at any time since last reading, a motor independent of the meter for actuating the recording devices, means synchronizing the recorders with the meter register and manually operated means for taking the record, setting back one recording device to normal and reenergizing the motor.

18. Recording mechanism for meters embracing in connection with a meter and its register, recording mechanisms controlled by the register, a spring motor for actuating the same, and key actuated means for taking the record from said recorders.

19. A mechanism of the class described comprising an attachment for a meter embracing recording devices, actuating means

independent of the meter for actuating said recording devices, synchronizing means for said recording devices controlled by the meter, said recorders showing at all times the condition of the meter since last reading and manually operated means for simultaneously taking the record from the recorders and setting the device back to normal.

20. In a recording device for meters registers for making an impression, mechanism controlled by the meter for actuating the registers correspondingly to the consumption indicated by the meter, mechanism for successively advancing material to receive the impression from the registers, pivotal levers for supporting the material while receiving the impression and release mechanism acting to swing the levers oppositely to discharge the completed record.

21. In a recording device for meters registers for making an impression, mechanism controlled by the meter for actuating the registers correspondingly to the consumption indicated by the meter, mechanism for successively advancing material to receive the impression from the registers, coacting members for supporting the material while receiving the impression, a reciprocating member for forcing the material against part of the registers and a rigid member against which the remaining registers are forced when making the impression.

22. In a recording device for meters, registers for making an impression, mechanism controlled by the meter for actuating the registers correspondingly to the consumption indicated by the meter, mechanism for successively advancing material to receive the impression from the registers, coacting members for supporting the material while receiving the impression, and means for actuating the coacting members to release the material after the impression is made.

23. In a meter recording device, a plurality of sets of registers, mechanism for actuating the same to indicate the consumption indicated by the meter, means for adjusting material into position to receive the record, means for actuating one set of registers to make an impression on the material and means for forcing the material against the other set of registers for making the impression on the material.

24. In a meter recording device, a plurality of sets of registers, mechanism for actuating the same to indicate the consumption indicated by the meter, means for adjusting material into position to receive the record, means for actuating one set of registers to make an impression on the material, means for forcing the material against the other set of registers for making the impression on the material, and means for automatically setting one of the sets of registers to normal after the impression.

25. In a meter recording mechanism sets of registers, mechanism controlled by the meter for setting the same to indicate the consumption indicated by the meter, a spiral member for successively advancing envelopes of impression material to receive the impression of the registers and mechanism for simultaneously actuating one set of registers to make the impression and for forcing part of the envelop against the other set of registers to receive the impression.

26. In a device of the class described the combination with a meter, a spring motor set under tension, registering devices, mechanism actuated by the motor to operate the registering devices, mechanism operated from the meter for releasing the motor to actuate the registering devices, a feeding mechanism adapted to contain and to successively deliver in recording position the material upon which the record is to be made, pivotal levers for supporting the material and mechanism acting to swing the levers oppositely to permit the discharge of the completed record.

27. In a device of the class described the combination with a meter, a spring motor, means for locking the motor from movement, means actuated from the meter for releasing the locking means to permit rotation of the motor, a registering mechanism actuated by the motor, a feeding mechanism adapted to contain and successively deliver in recording position the sheets upon which the record is to be made, pivotal levers for supporting said sheets, means automatically actuating the register to make the record on the sheets, and mechanism acting to swing the levers oppositely to permit the discharge of the completed record.

28. In a device of the class described the combination with a meter, a spring motor, means for locking the motor from movement, means actuated from the meter for releasing the locking means to permit rotation of the motor, a registering mechanism actuated by the motor, a feeding mechanism adapted to contain and successively deliver in recording position the sheets upon which the record is to be made, pivotal levers adapted to support the sheets, means for automatically actuating the register to make the record on the sheets, release mechanism acting to swing the levers oppositely to discharge the completed record, mechanism for rewinding the motor after each impression by the registers has been made, and means for setting the registers to zero.

29. In a recording device for meters a register, a spring motor, mechanism adapted to be actuated by the motor for actuating the register, means for locking the motor from unwinding, a mechanism operated by the meter for releasing the locking mechanism

to permit the motor actuating the register correspondingly with the meter, mechanism for taking a permanent record from the registers and automatically returning the registers to normal after such record.

30. In a recording device for meters a register, a spring motor, mechanism adapted to be actuated by the motor for actuating the register, means for locking the motor from unwinding, a mechanism operated by the meter for releasing the locking mechanism to permit the motor actuating the register correspondingly with the meter, mechanism for taking a record, a pulley operated by the motor, a cable wound thereon when the motor unwinds and means for actuating the cable to wind up the motor after each record is taken.

31. In a recording mechanism the combination with a meter, a spring motor, mechanism for locking the same from movement, reciprocating mechanism controlled by the meter for releasing the locking mechanism at each limit of reciprocation thereof, a registering mechanism actuated by the motor when the locking mechanism is released, mechanism for positioning material to receive a permanent record, mechanism for actuating the register to make an impression thereon, means for automatically releasing the material after the record is impressed thereon and means for returning the register to normal.

32. In a device of the class described the combination with a meter, of a register comprising reciprocating type bars, type carried by said bars, a motor controlled by the meter, mechanism operated thereby for reciprocating the type bars to adjust the type to register, and rams for automatically actuating the proper type to make a record.

33. In a device of the class described the combination with a meter, of a register comprising reciprocating type bars, type carried by said bars, a motor controlled by the meter, mechanism operated thereby for reciprocating the type bars to adjust the type to register, rams for automatically actuating the proper type to make a record, an impression member, means for delivering record envelop between the type and impression member, and means for supporting the envelop in position to receive the impression.

34. In a device of the class described the combination with a meter, of a register comprising reciprocating type bars, type carried by said bars, a motor controlled by the meter, mechanism operated thereby for reciprocating the type bars to adjust the type to register, rams for automatically actuating the proper type to make a record, an impression member, means for delivering a record envelop between the type and the impression member, means for supporting the envelop

in position to receive the impression, and mechanism for returning the type bars to normal after the record is taken.

35. In a recording device for meters the combination with a motor, means for controlling the operation thereof actuated by the meter, type bars, type set therein, means for actuating the same from the motor, means for actuating the type to make an impression, means normally holding the same retracted, a shaft, and mechanisms thereon for delivering material to receive the impression and for actuating the holding means to release the type actuating means.

36. In a recording device for meters the combination with a motor, means for controlling the operation thereof actuated by the meter, type bars, type set therein, means for actuating the same from the motor, means for actuating the type to make an impression, means normally holding the same retracted, a shaft, mechanisms thereon for delivering material to receive the impression, and for actuating the holding means to release the type actuating means, and mechanism operated from said shaft for reciprocating the type bars to normal.

37. In a device of the class described a motor, a register comprising type bars, type set therein, a wheel operated from the motor for reciprocating one of the type bars, a mechanism for transferring a count from one type bar to another, and reciprocating plungers for actuating the type to make a record.

38. In a device of the class described a motor, a register comprising type bars, type set therein, a wheel operated from the motor for reciprocating one of the type bars, a mechanism for transferring a count from one type bar to another, reciprocating plungers for actuating the type to make a record, an oscillating member for reciprocating the type bars adapting the same to return the type to neutral and manually operated mechanism for actuating said oscillating member.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

SAMUEL C. SHAFFNER.

Witnesses:

C. W. DENNISON,
C. W. HILLS.