No. 782,029. PATENTED FEB. 7, 1905.

F. HOLDEN.

PREPAYMENT ATTACHMENT FOR ELECTRIC METERS.

APPLICATION FILED SEPT. 4, 1902.

3 SHEETS—SHEET 1.

Fig. 1.

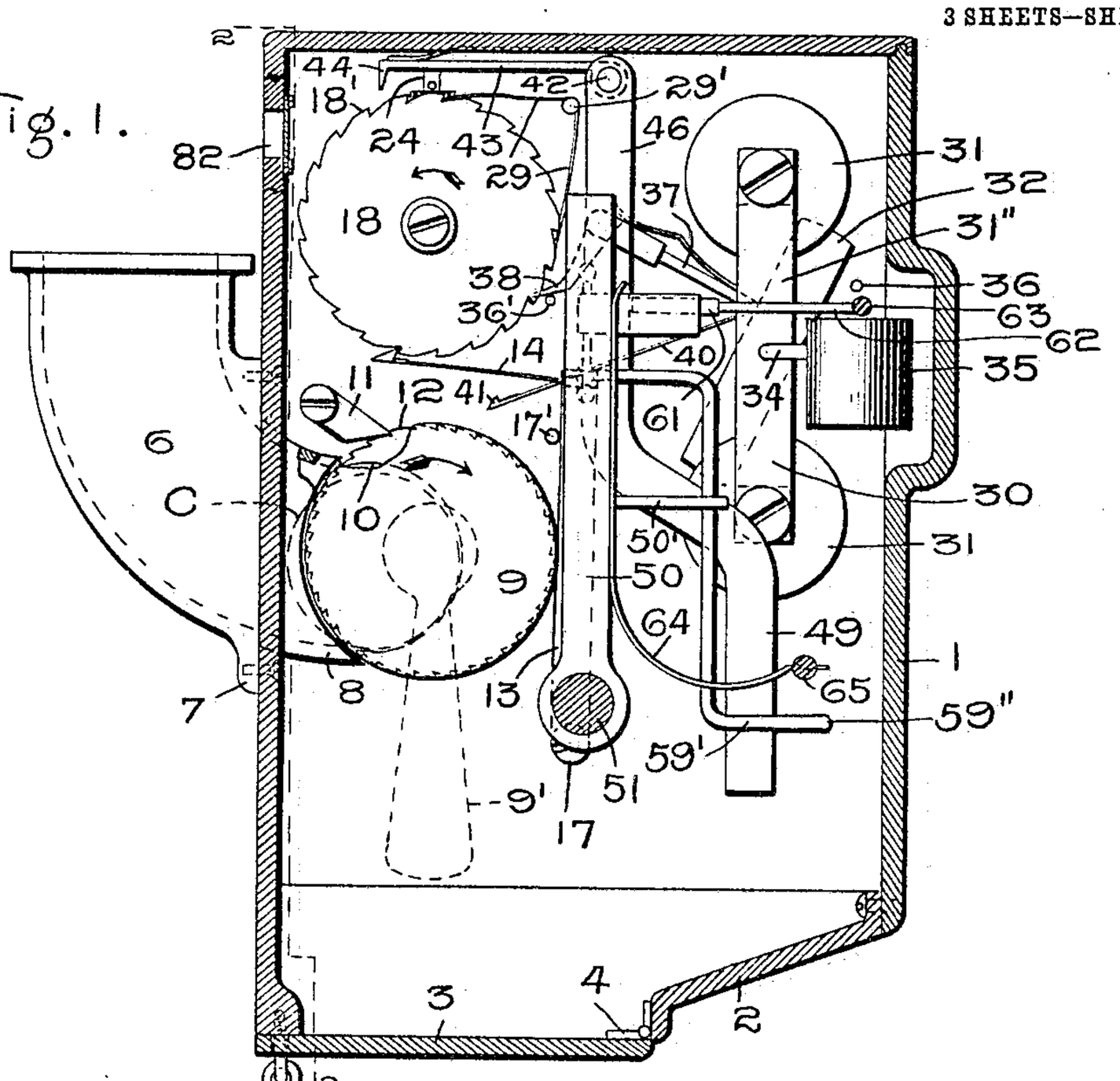
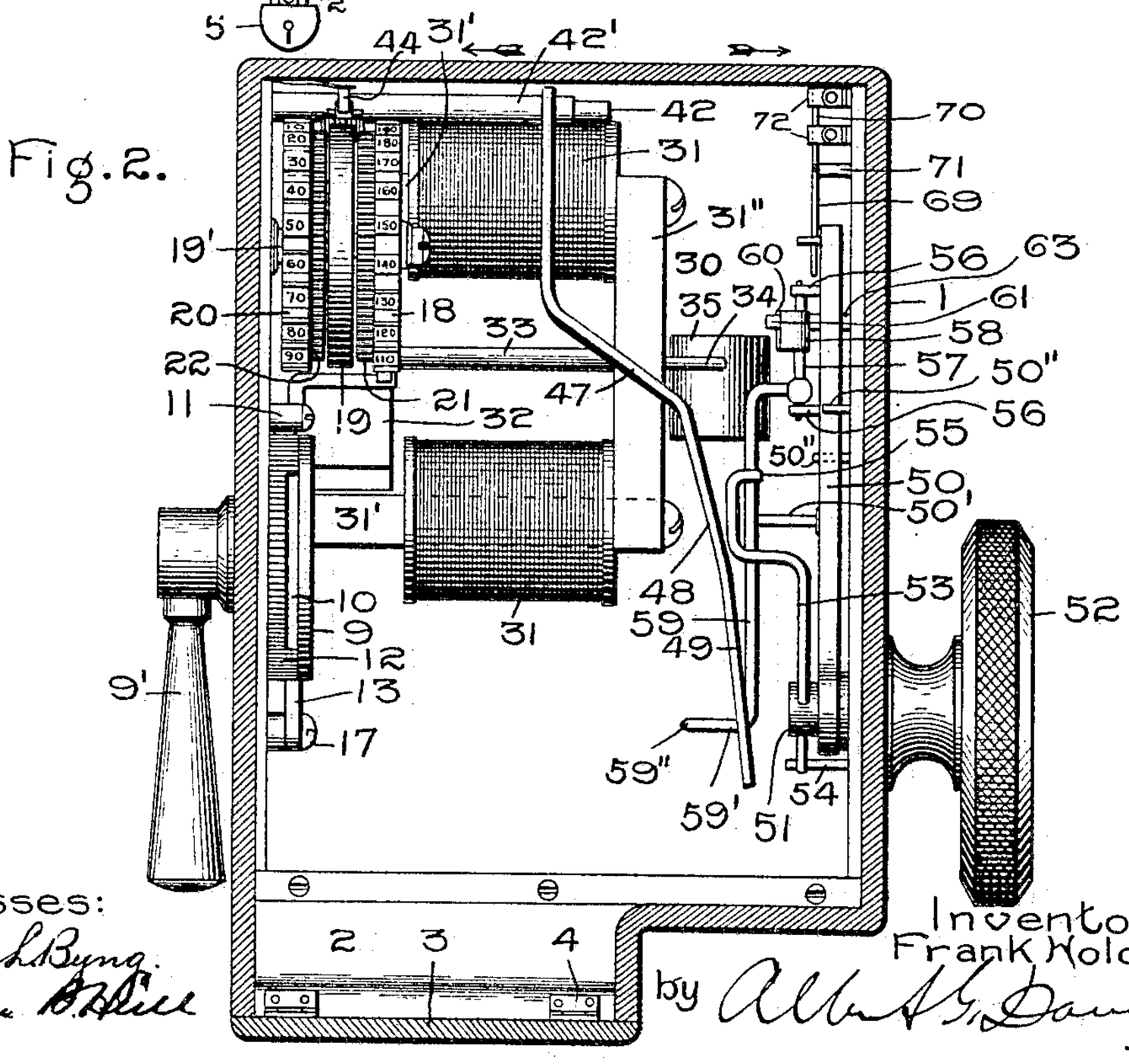


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

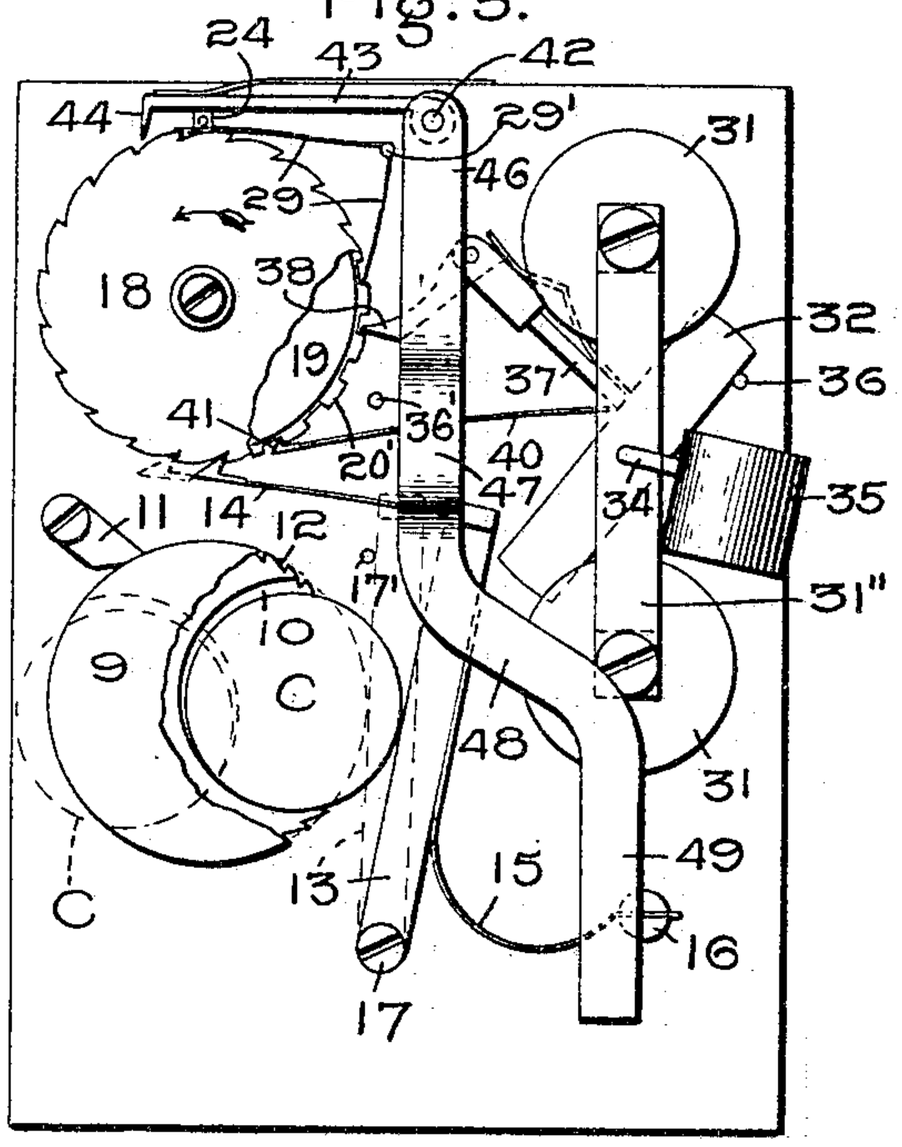


Fig. 5.

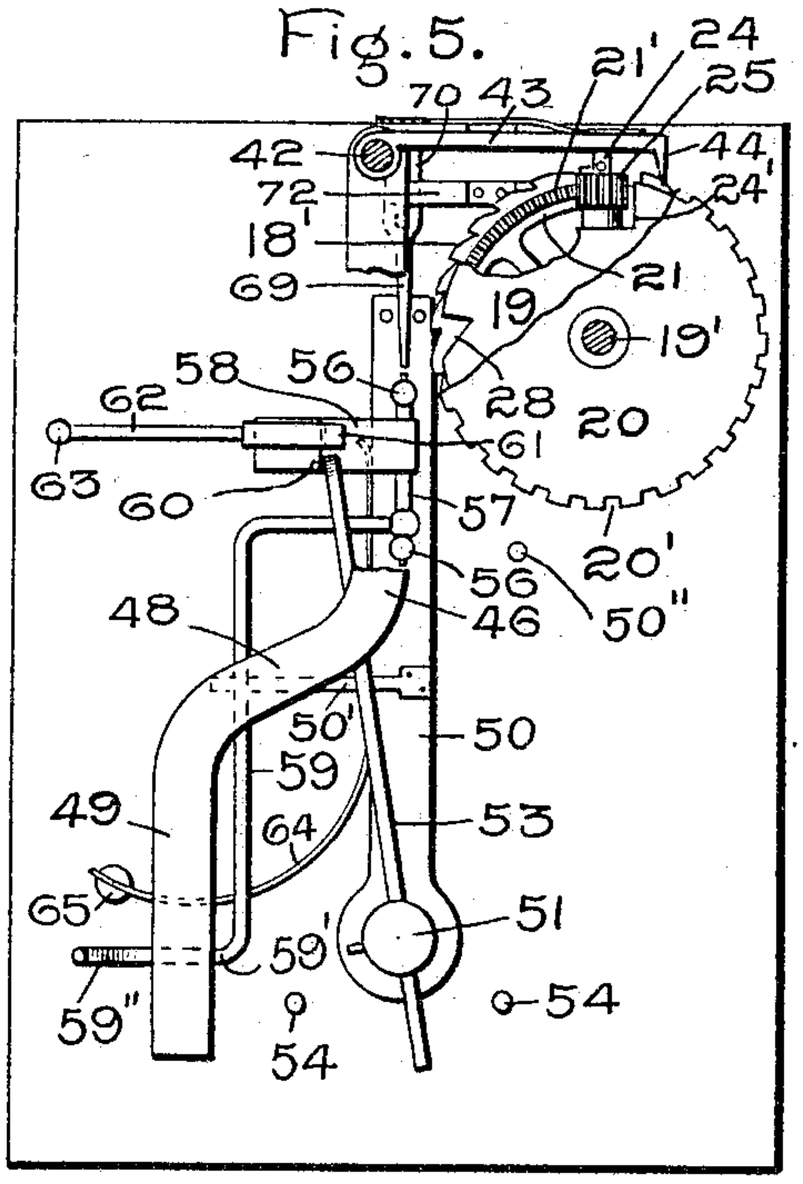


Fig. 4.

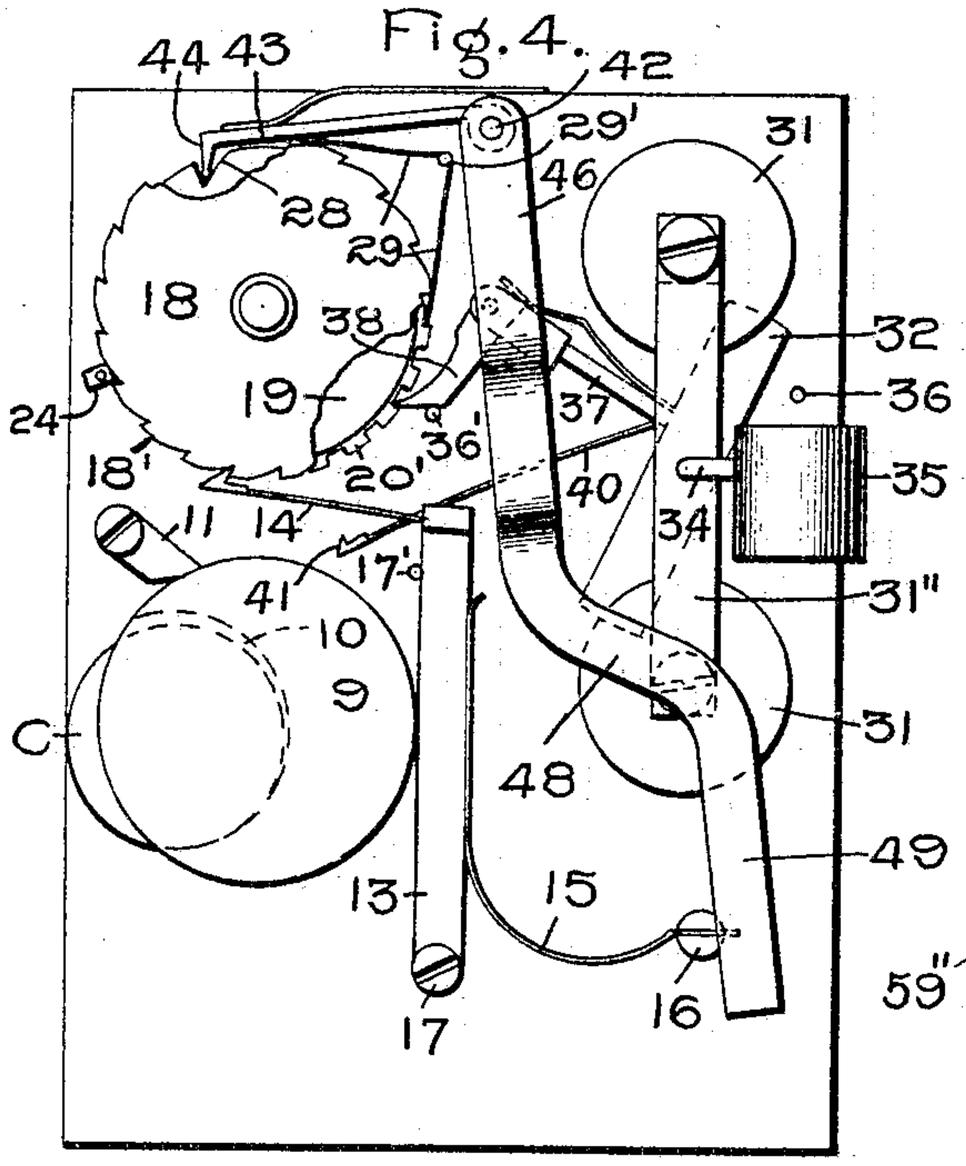
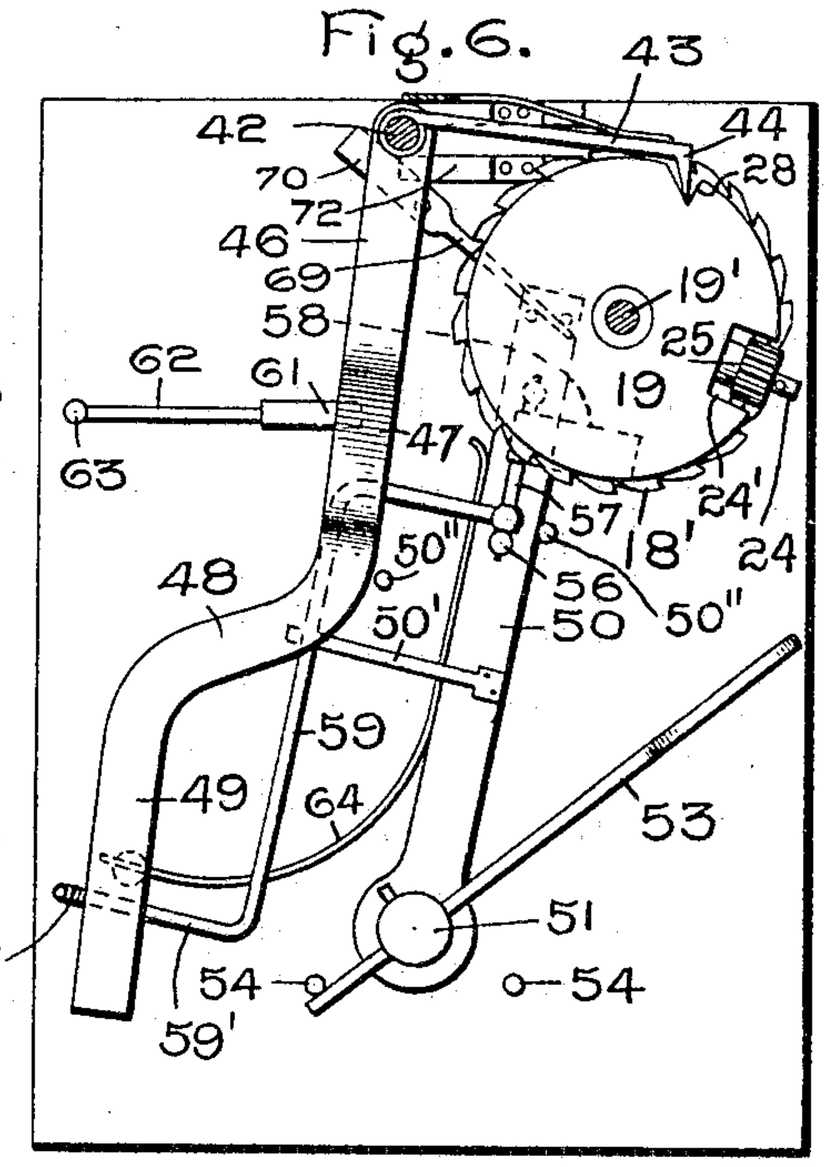


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

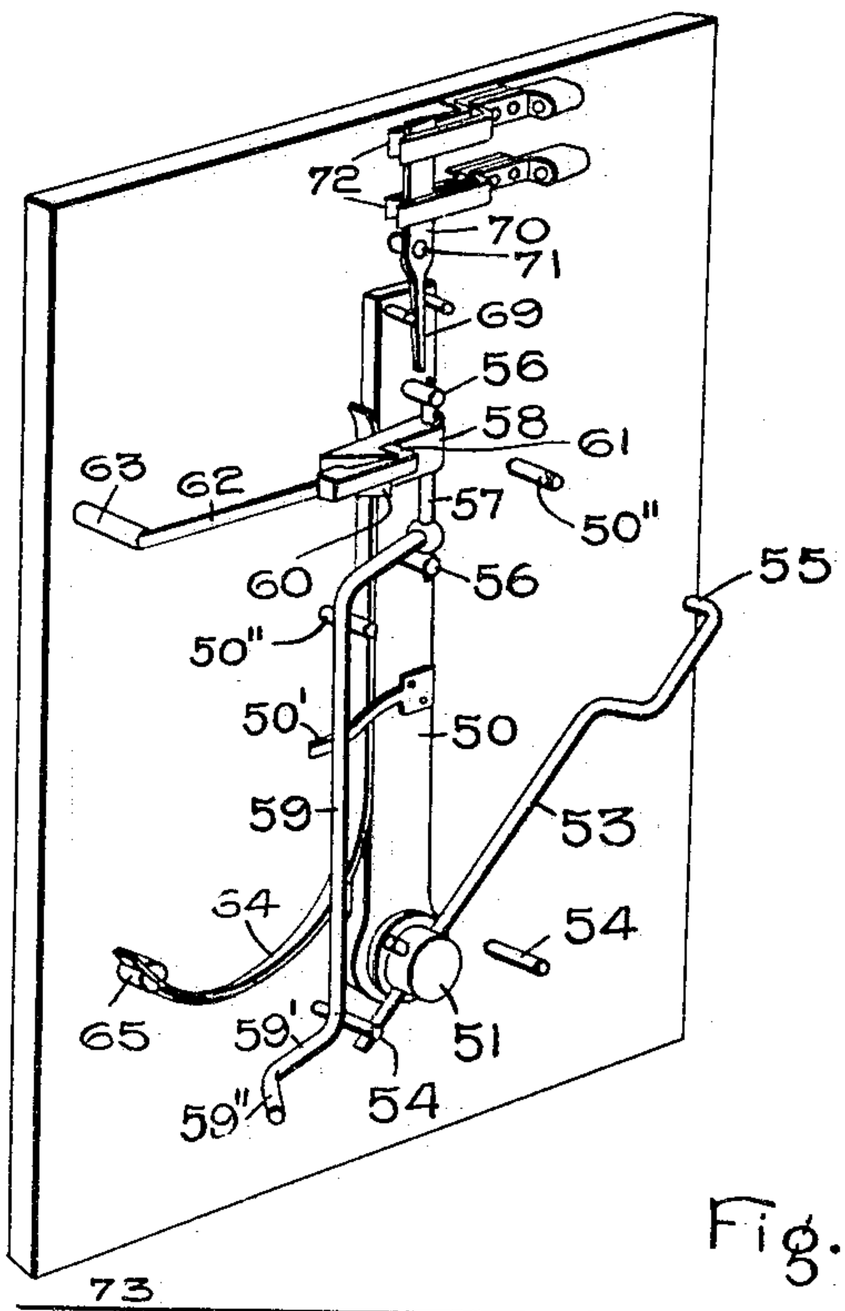


Fig. 8.

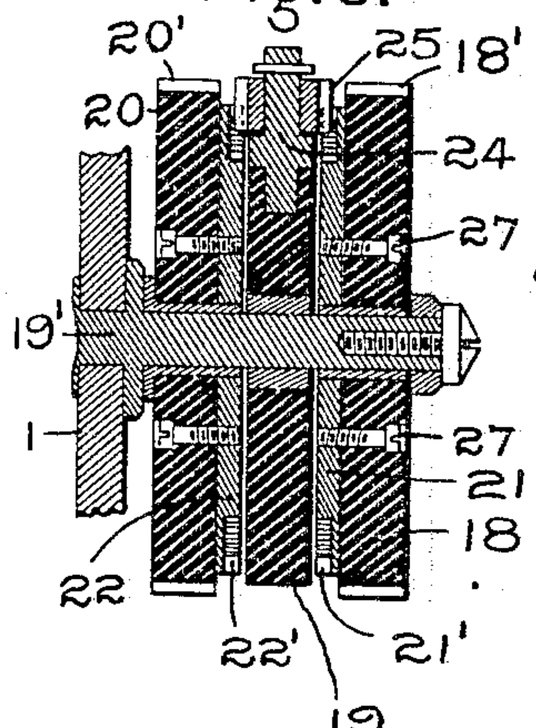


Fig. 9.

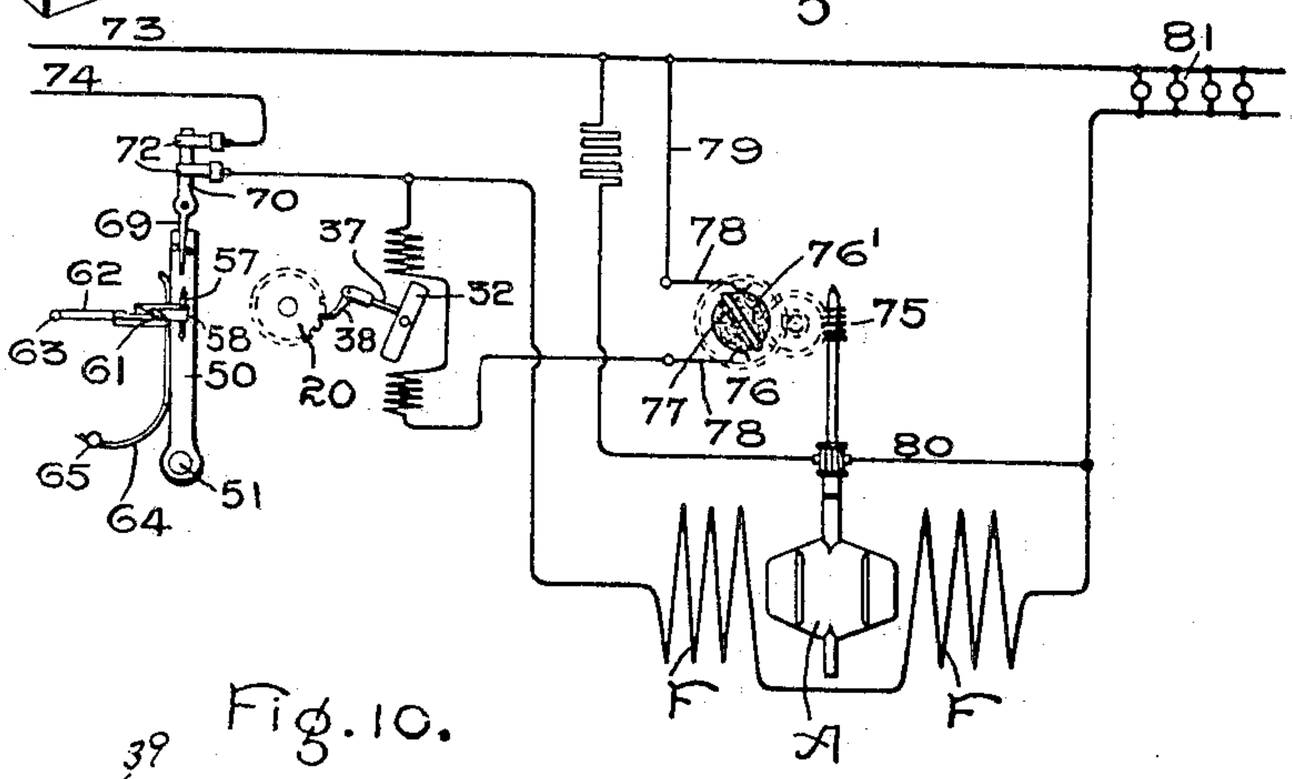
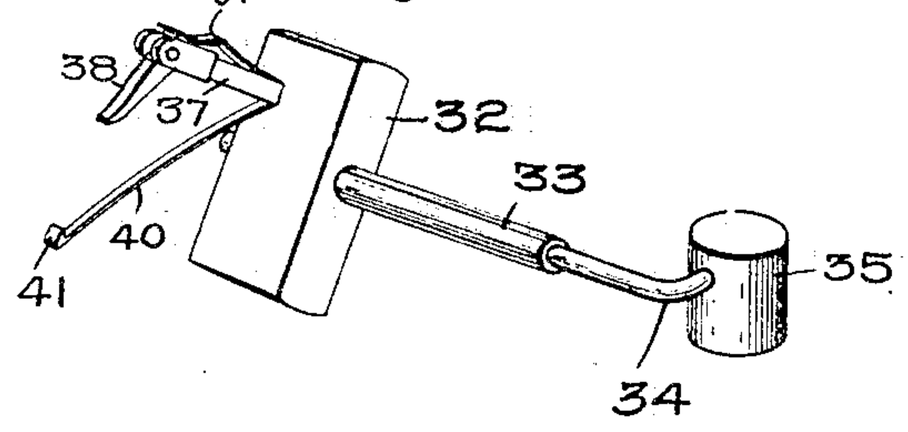


Fig. 10.



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No. 782,029. Patented February 7, 1905.

UNITED STATES PATENT OFFICE.

FRANK HOLDEN, OF LONDON, ENGLAND, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

PREPAYMENT ATTACHMENT FOR ELECTRIC METERS.

SPECIFICATION forming part of Letters Patent No. 782,029, dated February 7, 1905.

Application filed September 4, 1902. Serial No. 122,034.

To all whom it may concern:

Be it known that I, FRANK HOLDEN, a citizen of the United States, residing at London, England, have invented certain new and useful Improvements in Prepayment Attachment for Electric Meters, of which the following is a specification.

My invention relates to improvements in prepayment attachments for electric meters, in which upon the insertion of one or more coins a switch can be closed and current obtained to the value of the coin or coins deposited, the switch being automatically opened when current of the value of the coin or coins inserted has passed through the meter.

My invention consists in certain features and details of construction which will be more fully pointed out in the claims.

In the drawings, Fig. 1 is a sectional elevation of my device. Fig. 2 is a sectional view taken on the line 2 2 of Fig. 1, the end of the coin-chute not being shown. Fig. 3 shows one position of part of the mechanism seen when looking in the direction indicated by the arrow at the right of Fig. 2. Fig. 4 shows a different position of the same mechanism. Fig. 5 shows one position of some of the mechanism seen when looking in the direction of the arrow located at the left of Fig. 2. Fig. 6 shows a different position of the same mechanism. Fig. 7 is a perspective view of the switch and switch-actuating mechanism. Fig. 8 is a sectional view showing certain details of construction. Fig. 9 is a diagrammatic view showing the arrangement of the meter, its circuits, coin-controlled switch, &c.; and Fig. 10 is a perspective view showing the armature of the electromagnet and the parts carried by it.

The prepayment mechanism is inclosed in a suitable casing 1, which is shown as made with an integral upper portion and a separate bottom portion 2. A door 3, hinged at 4 to the bottom 2, is provided by which access is obtained to the interior of the casing and through which the inserted coins can be removed. A suitable lock 5 is provided to render the interior of the casing inaccessible to unauthorized persons. The coin-chute 6 passes through the front wall of the casing and is secured thereto by suitable means. Lugs 7, formed on the chute, abut against the casing and help to position the chute. The inner end 8 of the coin-chute is curved to embrace part of the periphery of the coin-carrier 9, to which a coin inserted in the mouth of the chute is delivered. The coin-carrier 9 is a cylindrical disk, having a pocket 10 formed in its periphery. The edge of this pocket is formed on the arc of a circle, the diameter of which is somewhat greater than that of the coin to be received, but with its center so placed that the edge of an inserted coin, if of proper size, will project somewhat beyond the periphery of the disk 9, as clearly shown in Figs. 1, 3, and 4, in which a coin C is shown in position in the coin-carrier. The carrier is provided with an axle or journal, which passes through the wall of the casing. A handle 9′ is secured to the axle on the outside of the casing, by means of which the carrier may be rotated. It has not been thought necessary to illustrate the exact construction of the axle which supports the carrier. When the carrier is rotated in the direction of the arrow (shown in Fig. 1) after the insertion of the coin, the pivoted lever 13, (clearly shown in Figs. 3 and 4,) which normally stands in contact with the periphery of the carrier, is engaged by the coin, which projects beyond the peripheral surface of the carrier somewhat, and acts as a cam to force the lever 13 to the right, as clearly shown in Fig. 3.

A portion of the periphery of the carrier 9 is toothed, as indicated at 12, and a pawl 11, pivoted to the casing, engages the teeth 12 and prevents backward rotation of the carrier. The lever 13 is pivoted at 17 and is normally held against the periphery of the coin-carrier by means of the bent spring 15, secured to the post 16. A spring-pawl 14 is mounted on the upper end of the lever 13 and turns the disk 18 one notch in the direction indicated by the arrow in Fig. 3 on the insertion of each coin. A stop-pin 17′ is provided for preventing the lever 13 from bearing too heavily against the coin-carrier 9.

The disk 18 is rotatably mounted on a stud

19′, carried by the wall of the casing. Disks 19 and 20 are also mounted on the stud 19′, the disk 19 being located between the disks 18 and 20, which are similar in construction. These disks may be made of any suitable material, such as hard rubber, and have teeth 18′ and 20′ formed on their peripheries. Circular disks or wheels 21 and 22 are secured to the inner faces of the disks 18 and 20. The disks or wheels 21 and 22 are preferably made of metal and are provided at their outer edges with a series of teeth 21′ and 22′, respectively, which project vertically from the faces of the disk. The disks 21 and 22 are secured to the disks 18 and 20, respectively, in any suitable manner, as by means of the screws 27.

The disk 19, which is pivotally mounted on the shaft 19′ between the disks 18 and 20, may be made out of the same material as the disks 18 and 20 and is provided with a radial pin or stud 24, which projects somewhat above the periphery of the disk. This stud supports a spur-gear 25, which engages with the gear-teeth carried by the inner faces of the disks 18 and 20. A notch 24′ is provided in the disk 19, in which the gear 25 is located. Disk 19 is also provided with a peripheral notch 28, (clearly shown in Figs. 4 and 6,) the purpose of which will be explained hereinafter. The construction of the disks is such that when one of the outer disks is held still and the other one is turned the inner disk 19 is turned in the the same direction as and at half the angular velocity of the turning-disk by means of the spur-wheel and intermeshing gear-teeth.

The disk 18 always turns in the same direction, the direction being that indicated by the arrow in Fig. 3, while the disk 20 always rotates in the opposite direction. Retrograde movement of these disks is prevented by a pair of suitable springs or stop-pawls 29. These are both mounted on a post 29′, carried by the casing, and are so set that one lies in the plane of the disk 18 and prevents backward rotation of it, as is clearly shown in Fig. 1, while the other one is mounted on the plane of the disk 20 and prevents its retrograde movement, as clearly shown in Figs. 3 and 4.

An electromagnet 30 is placed to the rear of the disks 18 and 20. The coils 31 of the electromagnet are mounted on cores 31′, which are secured at their front ends to the wall of the casing. A yoke or cross-bar 31″ connects their rear ends. The armature 32 of the electromagnet is carried by a rock-shaft 33, (best seen in Fig. 10,) one end of which is mounted in the wall of the casing and the other end of which passes through and is pivoted in the yoke of the electromagnet and is provided beyond the yoke with an offset portion 34, at the end of which a counterweight 35 is mounted. The counterweight 35 is so located that the armature 32 is normally held in the position shown in Fig. 3, resting against stop-pin 36, there shown. When the electromagnet is energized, however, the armature tends to turn into a vertical position between the cores 31′. The armature 32 is somewhat shorter than the distance between the cores and is located between the ends of the coils 31 and the wall of the casing. Rigidly mounted upon the side of the armature 32 is the post 37, to which a pawl 38 for engaging the toothed disk 20 is pivoted. A spring 39 is provided for holding the pawl 38 in contact with the disk 20. An arm 40 is also rigidly secured to the side of the armature 32 and is set at an angle with and somewhat below the post 37. A tooth 41 at the outer end of the arm 40 engages the toothed periphery of the disk 20, when the armature 32 is in the normal position, as shown in Fig. 3. Hence, by means of the pawls 29 and 40, the disk 20 is rigidly held against rotation in either direction when the armature is in the position shown in Fig. 3. When the armature 32 assumes the more upright position shown in Fig. 4, however, pawl 41 is disengaged from the wheel 20, which is then advanced by the pawl 38 (see Fig. 4) until the pawl engages the stop-pin 36′.

A stud 42, carried by the wall of the casing, projects out somewhat in the rear of and above the stud 19′ and parallel thereto and rotatably carries a sleeve 42′. The sleeve 42′ carries an arm 43, provided at its outer end with a tooth 44. The arm 43 is in the plane of the disk 19, and the tooth 44 is adapted to drop in the notch 28 and engage the walls thereof. A long arm 46 extends perpendicularly from the outer end of the sleeve 42′. This arm is provided at its lower end with a portion 49, which is substantially vertical and which is located adjacent the lower portion of the wall of the casing, which is opposite the wall on which the stud 42 is mounted. The arm 46 is bent at 47 and 48, as shown, in order to obtain the necessary clearance. The purpose of this arm will be hereinafter explained.

A pivot or journal 51 passes through the opposite wall of the casing from that carrying studs 19′ and 42, and is provided at its outer end with an operating handle or wheel 52. A switch-lever 50 is loosely mounted on the pivot 51. A bent arm 53 is rigidly carried by the pivot 51. The arm 53 passes through this pivot 51, and suitable stops 54, carried by the wall of the casing, project into the path of the low portion of the arm and limit its movement, as clearly shown in Fig. 7. The arm 53 is provided at its end with a tooth or projection 55, which extends in a direction substantially at right angles to the main portion of the arm 53. The switch-lever 50 is provided with a pair of posts 56, in which the rock-shaft 57 is rotatably mounted. The rock-shaft 57 carries an arm 58, provided with a tooth 60, which is adapted to engage with the projection 55 of arm 53, and with

a holding-tooth 61. The tooth 61 is mounted at the end of a spring-arm 62, carried by a post 63. The tooth 61 is located above the end 55 of the arm 53, so that the arm 53 clears the tooth. The tooth 60 is broad enough to engage both the tooth 61 and the arm 53. An arm 59 is also carried by the rock-shaft 57. This arm extends from the rock-shaft 57 in substantially a horizontal direction for a short distance and then extends downward in a vertical direction for a considerable distance, where it is provided with horizontal portions 59′ and 59″. The main portion of the arm 59 and the bent portion 59′ lie in a plane which is substantially parallel with that of the side of the casing to which the lever 50 is pivoted. The portion 59″ of this arm 59, however, is bent so as to form an acute angle with the wall of the casing, as seen in Fig. 7. The arm 59 and the lower end of the arm 46 are adjacent to one another, and the arm 46 when oscillated slides along the angular portion 59″, and thus rocks the shaft 57. A spring 50′ is secured to the switch-lever 50 and holds the arm 59 in contact with the arm 46. Suitable stops 50″ are provided for limiting the movement of the switch-lever 50. A spring 64 normally holds the switch-lever to the right. The spring 64 is carried by a post 65, which is mounted on the face of the wall of the casing.

At the upper end of the switch-lever 50 are projecting pins between which the end 69 of the switch-blade 70, pivoted at 71, extends. The switch-blade 70 connects the contacts 72 when the switch-lever 50 is to the left, as seen in Fig. 7, and the teeth 60 and 61 are in engagement.

An ordinary Thomson meter A is provided for measuring the current supplied by the lines 73 and 74 to the translating devices 81. The meter may be located in the same casing with the prepayment mechanism or it may be separated therefrom. The field-coils F of the meter and the switch 70 are located in the line 74. The line 80 supplies the armature-current of the meter. The armature-shaft of the meter carries a worm-gear 75, which through suitable connections drives the circuit making and breaking device 76. This device comprises a circular disk of insulating material 76′, in which a bar 77, of conducting material, is diametrically arranged.

A pair of contact-springs 78 bear against the periphery of the circuit making and breaking device 76. At equal intervals of current consumption the circuit making and breaking device 76 is turned, so that the conducting member 77 connects the contacts 78 and current flows through the line 79. The line 79 includes the windings of the coils 31.

A window 82 is provided in the front of the casing, through which suitable figures placed on the periphery of the dials 18 and 20 can be read. These figures are so arranged as to inform the customer concerning the total amount of current purchased and the amount thus purchased which has not been used up.

The operation of my device is as follows: In the normal position of the apparatus prior to the insertion of any coins (shown in Fig. 6) the tooth 44 is located in the recess 28 and the arm 46 is to the extreme left, as seen in that figure. In this position the lower end of the arm 46 engages the cam or bent portion 59″, holding the arm 59 and the detent 60 against the action of the spring 50′ toward the wall of the casing to such an extent that the projection 55 on the arm 53 cannot engage with the tooth 60. Any rotation of the wheel 52 is thus without effect on the detent 60 and switch-lever 50. On the insertion of a coin in the carrier and its rotation in the direction indicated by the arrow in Fig. 1 the lever 13 is engaged by the periphery of the coin and forced toward the right, as shown in Fig. 3. The disk 18 is thus turned by the pawl-arm 14 one notch in the direction indicated by the arrow in Fig. 3. The rotation of the disk 18 rotates the disk 19 in the same direction. As the disk 19 is advanced, the tooth 44 is raised out of the notch 48 onto the periphery of the disk 19. The elevation of the tooth 44 rocks the sleeve 42′, and thus oscillates the lever 46 into the position shown in Fig. 5. In this position of the lever 46 it no longer engages the cam or angular portion 59″ of the arm 59, which is forced out from the wall of the casing by its spring 50′. The outward movement of the arm 59 is limited by the engagement of the portion 59′ with the lever 46. If the wheel 52 is now turned, the projection 55 on the arm 53 will engage the tooth 60 and advance the switch-lever 50 until it contacts with stop-pin 50″. (Shown to the left of Fig. 7.) In this position of the lever the tooth 60 will be engaged by the tooth 61, and the switch-lever 50 will thus be retained in the advance position. The forward movement of the switch-lever 50 rocks the switch-blade 70 about the pivot-pin 71, closing the circuit between the contacts 72, so that current can flow from the lines 74 through the translating devices 81 to the line 73. When the proper amount of current has passed through the circuit, the circuit making and breaking device 76 is turned by the action of the meter into the position in which the contact 77 establishes electrical connection between the contact 78, allowing current to flow through the line 79. The passage of current through the line 79 energizes the coils 31 of the electromagnet and attracts the armature 32, turning it toward the vertical. The movement of the armature disengages the pawl 41 from the disk 20 and advances the disk one notch by means of the tooth 38. The advancement of the disk 20 produces a corresponding amount of retrogression of the

disk 19, and if only one coin is inserted the pawl 44 again drops in the notch 48. This oscillates the lever 46, which, engaging the angular portion 59″ of the arm 59, oscillates the rock-shaft 57 and swings the tooth 60 out of engagement with the tooth 61. The switch-lever is then forced to the right under the action of the spring 64, and this movement opens the circuit between the contact 72. In this position of the lever 46, as above explained, the switch-actuating member 55 does not engage the pawl 60. The friction on the periphery of the disk 18, due to the spring 29, is so great that there is no danger of the disk 18 being turned in the forward direction when the disk 20 is turned in its forward direction.

Instead of inserting one coin at a time a plurality of coins may be inserted of a number equal to the number of teeth which it is necessary to advance the disk 18 in order to carry the disk 19 from the initial position around to the position in which the upper end of the stud 24 will engage with the tooth 44, carried by the arm 43. When this takes place, the mechanism is locked against the insertion of more coins. The switch can be closed at any time after the insertion of the first coin.

If desired, suitable arrangements may be made for automatically closing the coin-chute when the full number of coins the machine is designed to operate with are inserted.

In place of the construction shown, I may make the switch-blade 70 an integral part of the switch-lever 50.

Other modifications of the construction and relation of parts may be made without departing from the spirit of my invention, as I do not intend to be limited to the exact construction shown and described.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A meter, a switch member, operating means therefor, coin-controlled means for permitting the engagement of the switch member by the operating means, and mechanism controlled by the meter for preventing such engagement.

2. A meter, a switch member, means for engaging said switch to operate it, and mechanism controlled by the meter for preventing said engagement.

3. The combination of a meter, a shaft provided with an operating-handle, a switch-lever loosely mounted on said shaft, a detent carried by said switch-lever, an arm rigidly mounted on said shaft for engaging said detent, and means operated by the meter for preventing the engagement of the meter and the switch-lever.

4. A casing, an operating-shaft mounted therein, a switch-lever loosely mounted on said shaft and carrying a detent, an arm rigidly carried by said operating-shaft for engaging said detent and advancing said switch, and a holding-detent carried by the casing for engaging said detent and retaining said switch in its advanced position.

5. A casing, an operating-shaft journaled therein carrying an engaging member, a switch-lever loosely mounted on said shaft, a detent carried by said switch-lever having its middle portion located at a distance from the shaft substantially equal to the length of the engaging arm, a holding-detent carried by the casing and located at a distance from the shaft greater than the length of the engaging arm, whereby the engaging arm may engage the detent to advance the switch-lever and the holding-detent may engage the said detent to hold the switch-lever advanced and said arm and switch-lever may clear one another, and means for disengaging said detents.

6. A casing, an operating-shaft journaled therein carrying an arm, a switch-lever loosely mounted on said shaft, a detent carried by said switch-lever, a holding-detent carried by the casing, said holding-detent and engaging arm being arranged to each engage said switch-carried detent and to clear one another, and means for disengaging the detents.

7. A casing, a switch-lever mounted therein, a broad detent carried by said switch-lever, means for engaging one portion of said detent and advancing said switch-lever, a holding-detent carried by the casing for engaging another portion of said detent and maintaining the switch-lever in its advanced position, and means for disengaging the detents.

8. An actuator, a switch member, a detent carried by said switch member normally out of position to be engaged by said actuator, and coin-controlled means for permitting the movement of the detent into the engaging position.

9. An actuator, a member to be actuated, means carried by said actuated member for engaging said actuator, mechanism for positively holding said means in an inoperative position, and coin-controlled means for moving said mechanism to allow said engaging means to move into operative position.

10. A switch, a rotatable disk for controlling the operation of the switch, coin-controlled means for rotating the disk in one direction, and an electromagnet for positively rotating the disk in the other direction.

11. A switch-lever, a locking-detent carried thereby provided with a cam-arm, a shaft bearing an arm for engaging said cam-arm, and coin-controlled means for rocking said shaft.

12. A switch-lever, a pair of posts carried thereby, a locking-detent therefor swiveled in said posts, a spring carried by the switch-lever for normally holding said detent in one position, and means for moving the detent into another position.

13. A movable switch-lever, a locking-detent carried thereby, an operating member for engaging said detent and advancing said switch-lever, a holding member for engaging

the same detent to maintain the switch-lever in its advanced position, and means for disengaging the holding member and detent.

14. A movable switch member, a detent carried thereby, a holding member to engage said detent, an operating member for engaging said detent and moving it into engagement with said holding member, and means for disengaging said holding member and said detent.

15. In combination, a rotatable disk, a movable bar, means carried by said bar for normally engaging said disk to hold it against rotation, but disengaged therefrom by the movement of said bar, means carried by said bar for rotating said disk when said bar is moved, and means for moving said bar.

16. A circuit, a meter included therein, a switch in said circuit, movable means for operating said switch, and mechanism controlled by the meter for rendering the movement of said means inoperative.

17. In combination, a meter, a disk, means for normally holding the disk against rotation, means operated by the meter for releasing said holding means and for advancing said disk.

18. A meter, a switch member, a locking member carried by the switch member, and means controlled by the meter for rendering said locking member inoperative.

19. A switch member, movable engaging means carried thereby, manually-actuated means for coöperating with said engaging means, and mechanism for throwing said engaging means into an inoperative position.

In witness whereof I have hereunto set my hand this 23d day of August, 1902.

FRANK HOLDEN.

Witnesses:
FREDK. L. RAND,
A. NUTTING.