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Patented July 12, 1898.

H. GREEN.  
X-RAY APPARATUS.

(Application filed Sept. 30, 1896.)

(No Model.)

2 Sheets—Sheet 1.

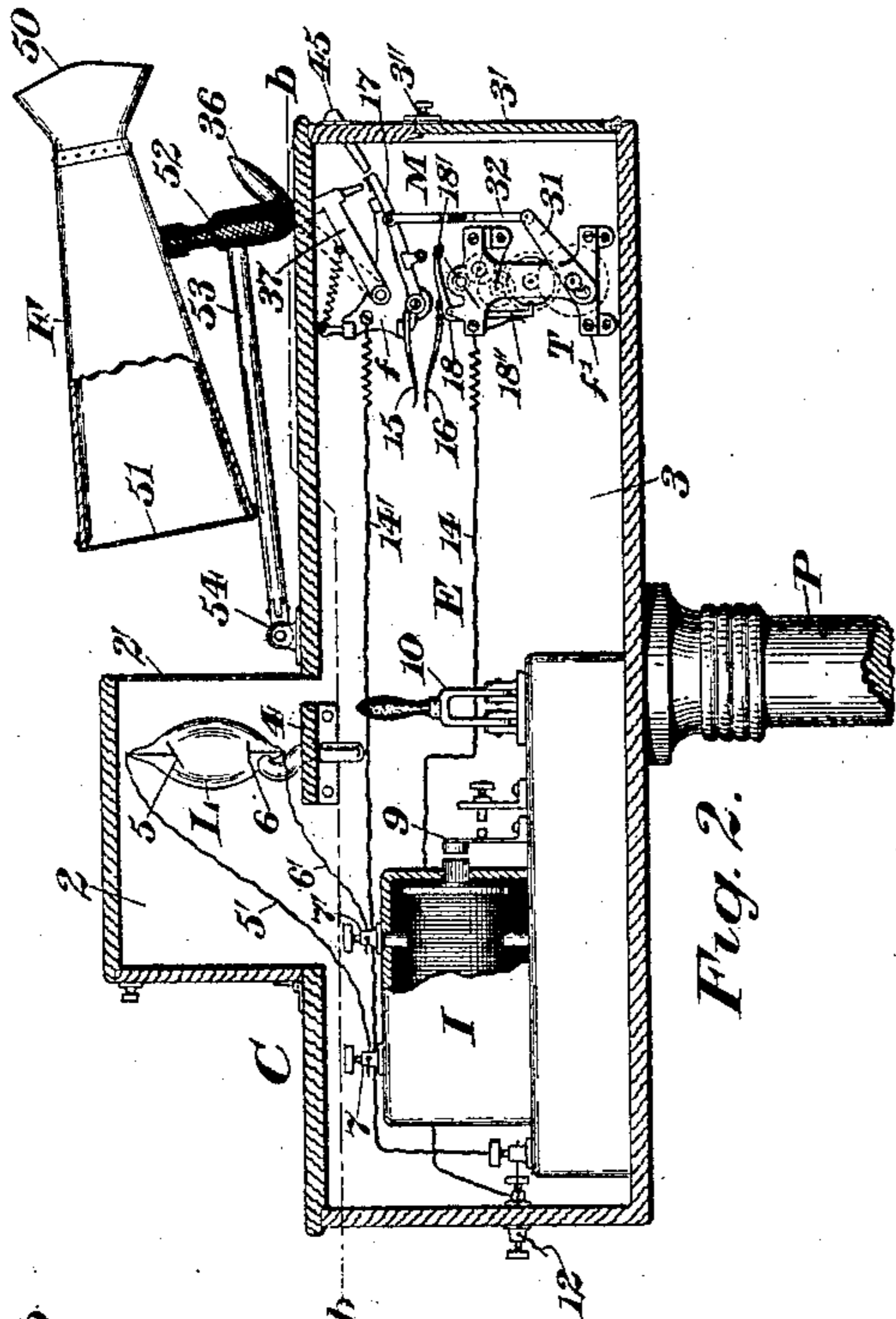


Fig. 2.

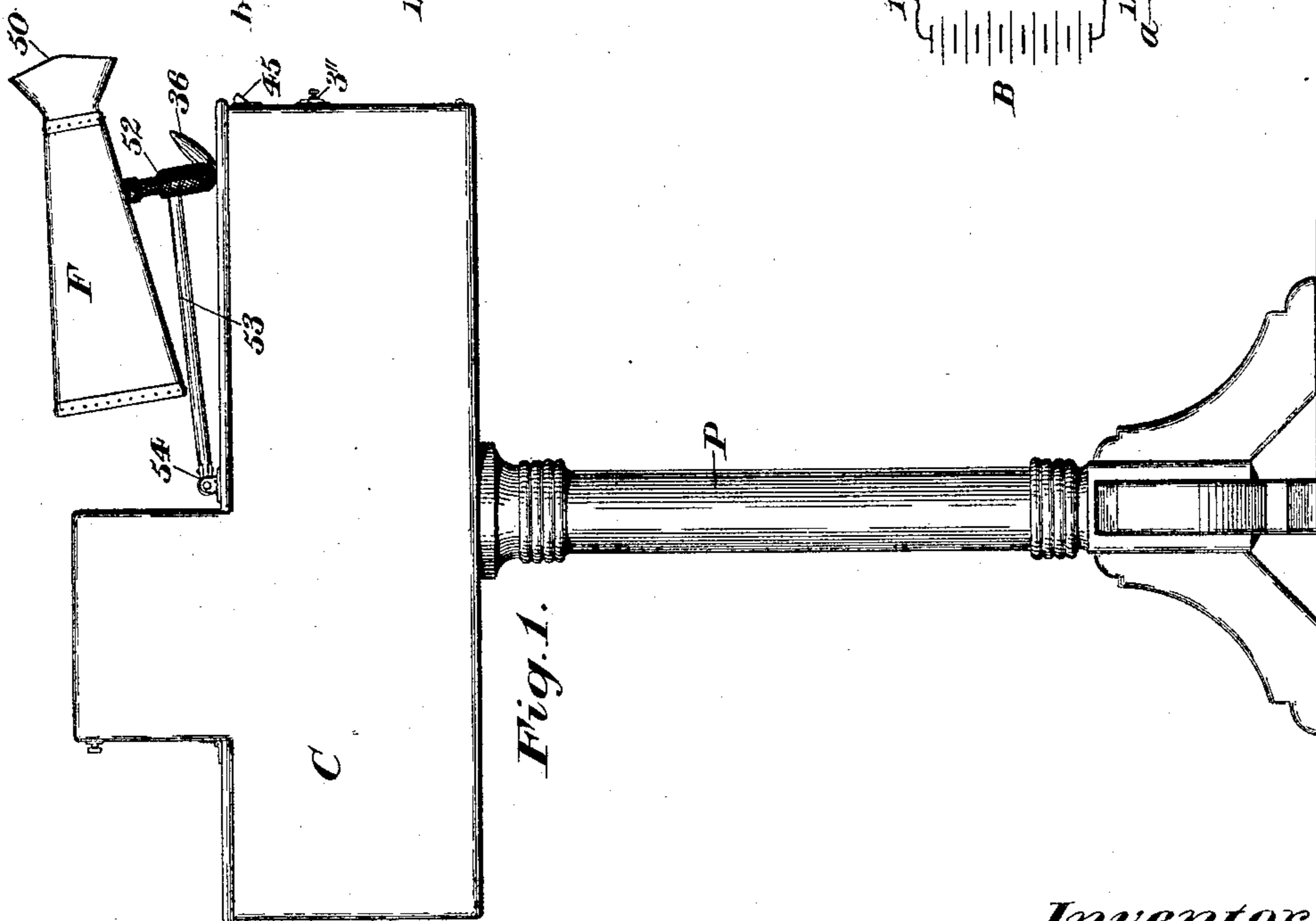


Fig. 1.

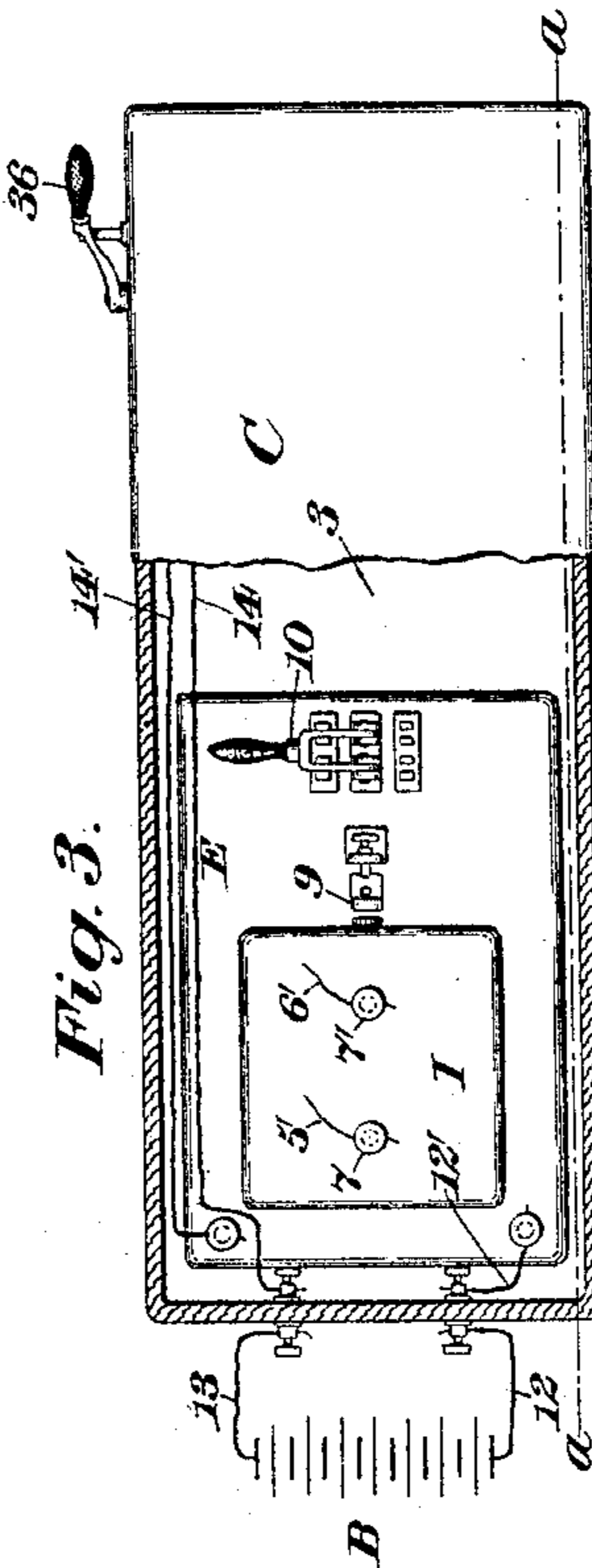


Fig. 3.

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2 Sheets—Sheet 2.

Fig. 5.

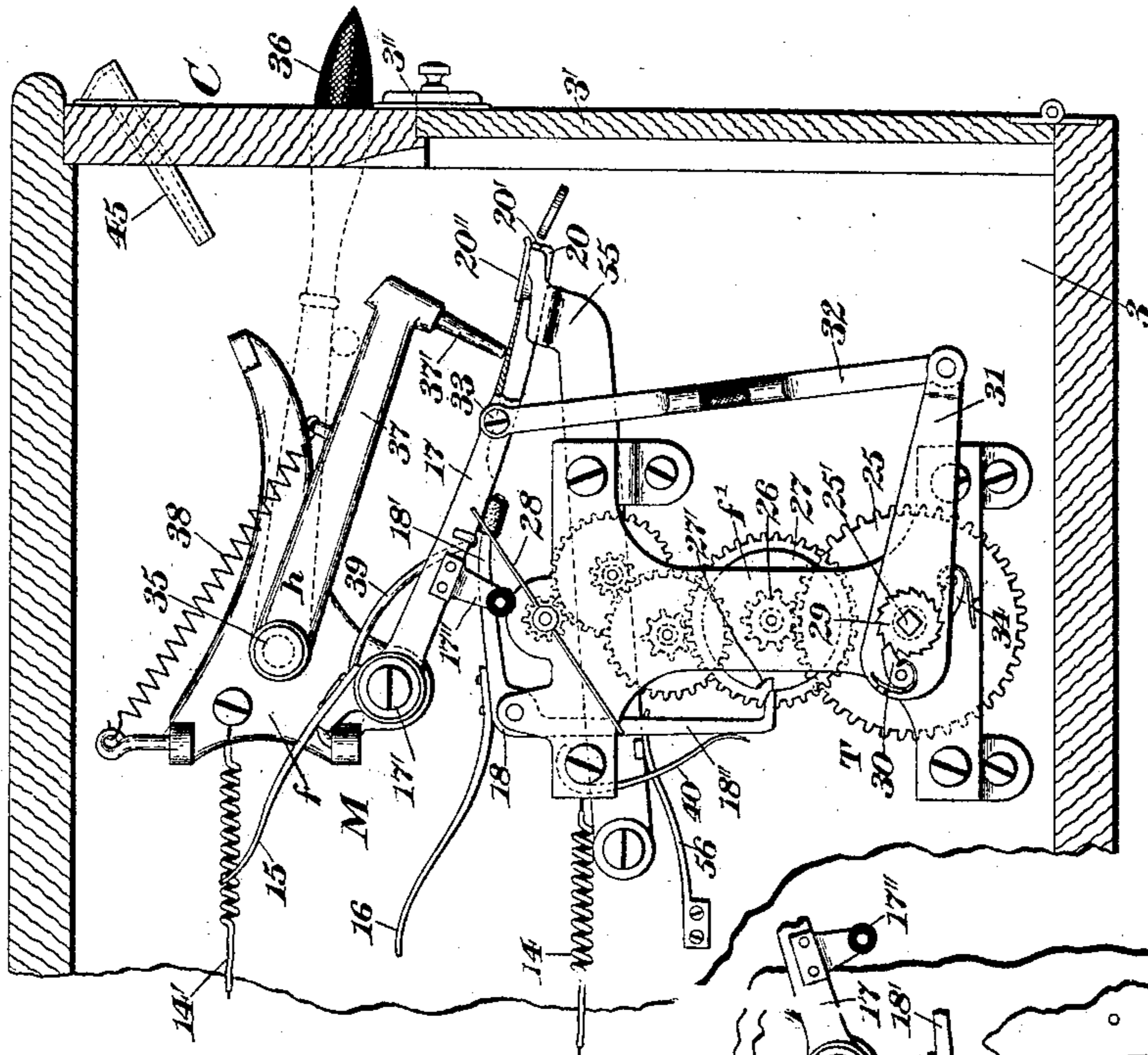


Fig. 6.

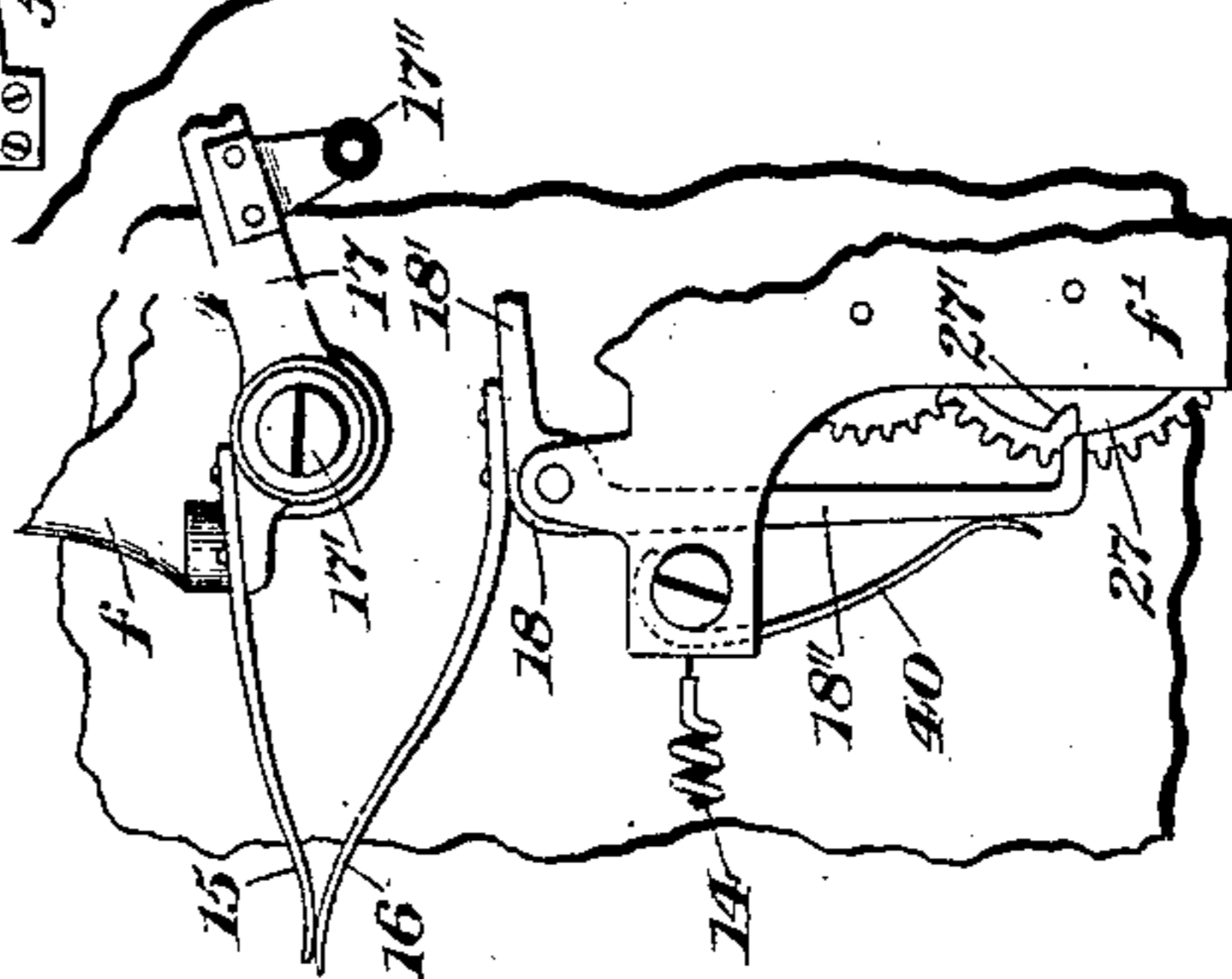
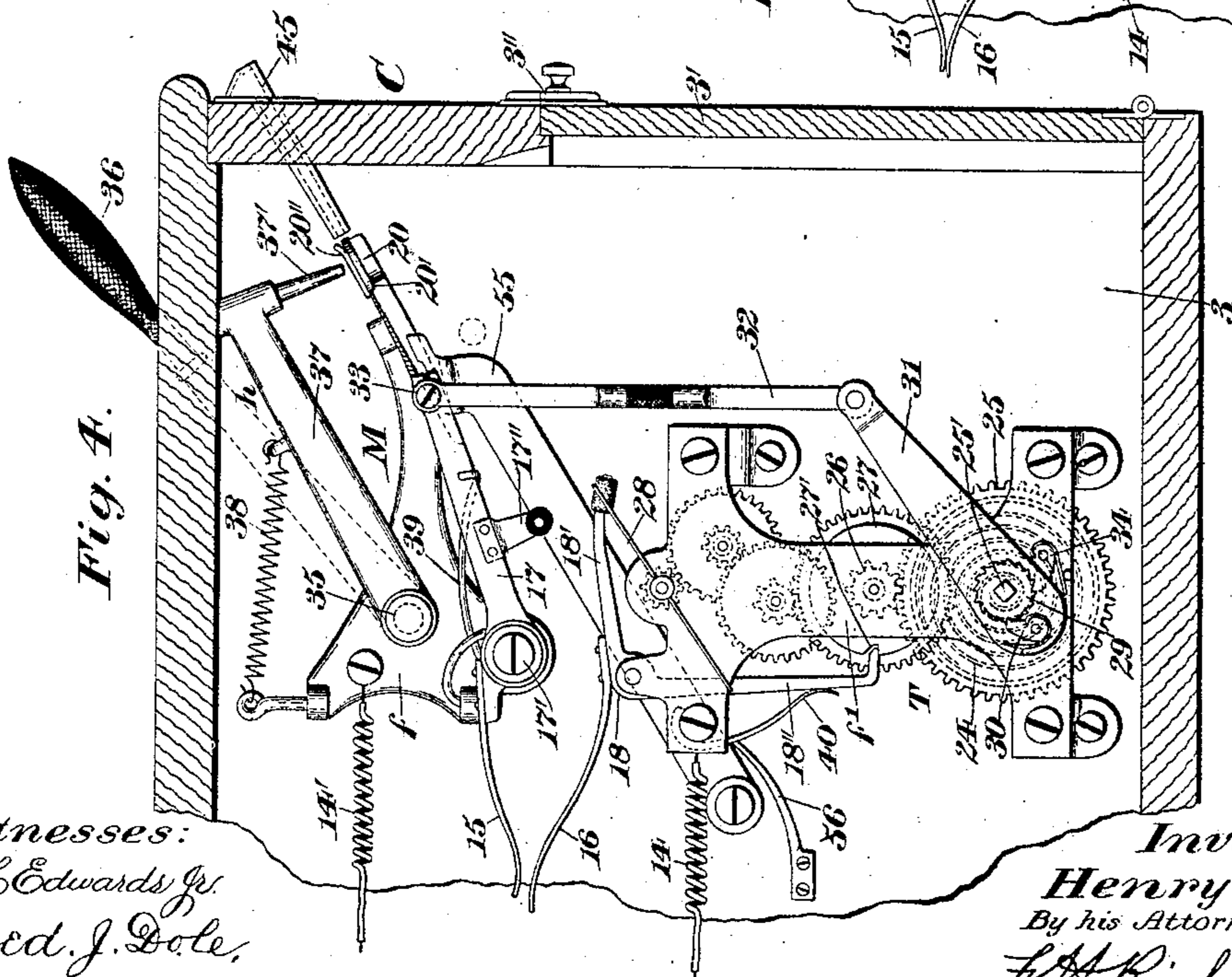


Fig. 4.



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# UNITED STATES PATENT OFFICE.

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## X-RAY APPARATUS.

SPECIFICATION forming part of Letters Patent No. 607,233, dated July 12, 1898.

Application filed September 30, 1896. Serial No. 607,494. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY GREEN, a citizen of the United States, residing in Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in X-Ray Apparatuses, of which the following is a specification.

This invention relates to X-ray apparatuses, one object of the invention being to furnish a portable and efficient X-ray apparatus of compact and simplified construction and organization especially adapted to be used by the public without requiring the services of an attendant to operate the same, and which apparatus embodies, in connection with the fluorescing lamp and the electrical circuit in which said lamp is located, coin-operable mechanism for automatically controlling the circuit, whereby the apparatus is rendered operative for a predetermined length of time.

A further object of the invention is to provide, in connection with the fluorescing lamp and the electrical circuit of an X-ray apparatus, improved coin-controlled mechanism for automatically closing the electrical circuit and embodying means whereby the working parts of the apparatus will be automatically locked against movement if a coin of improper size is deposited in the machine and also embodying means for maintaining the circuit in an open condition for a predetermined length of time and for automatically closing said circuit at the expiration of this time.

In the drawings accompanying and forming part of this specification, Figure 1 is a side elevation of a portable X-ray apparatus embodying my invention, said figure showing the cabinet which contains the lamp and circuit-controlling mechanism, the shiftable fluoroscope, and the pedestal upon which the cabinet is mounted, the battery or other source of electrical energy not being shown in this figure. Fig. 2 is a vertical longitudinal section taken on a line corresponding with the dotted line *a a*, Fig. 3, and showing the parts within the cabinet, a portion of the pedestal being shown. Fig. 3 is a plan view of the X-ray apparatus, partially in section, the fluoroscope being removed, this section being taken on the line corresponding with the dotted line *b b*, Fig. 2, and a battery being rep-

resented in connection with the wires which are connected with the lamp. Fig. 4 is a vertical section similar to Fig. 2, on a relatively large scale, of a portion of the cabinet and circuit-controlling mechanism therein, said figure showing the parts in their normal open-circuit position. Fig. 5 is a sectional view similar to Fig. 4, showing the parts of the coin-operable circuit-controlling mechanism in the positions they occupy after a proper coin has been inserted and the hand-lever has been depressed to unlock the timing-train and inaugurate the circuit-closing movement of the circuit-closer actuator and in the position they occupy just preparatory to the complete closing of the electrical circuit, the fan of the time-train being shown in the position it occupies just before it engages the stop member which holds the same against rotation until the circuit is closed. Fig. 6 is a side view of a portion of the timing-train, the circuit-closer, and circuit-closer actuator, and shows these parts in the position they occupy when the circuit is closed.

Similar characters designate like parts in all the figures of the drawings.

The X-ray apparatus in the preferred embodiment thereof shown in the drawings comprises a suitable cabinet or framework, (designated in a general way by C,) a pedestal P, supporting said cabinet or framework, a fluoroscope (designated by F) movably supported on said cabinet, an electrical circuit, (designated in a general way by E,) a fluorescing lamp L, located in said circuit, and coin-operable mechanism (designated in a general way by M) located in said circuit and embodying a contact-maker or circuit-controller and also embodying means for normally locking the mechanism against a circuit-closing movement.

The cabinet or framework C, which may be of any suitable general construction and will preferably be of wood, is shown in the nature of an oblong box having a dome-like extension on the upper side thereof intermediate its ends and comprising two communicating chambers 2 and 3, in the upper chamber 2 of which is supported the fluorescing lamp and in the lower chamber 3 of which is supported the induction mechanism I and the coin-operable circuit-controlling

mechanism. The lower compartment is furnished with a door 3', which will be provided with a lock 3'', and the upper chamber 2 is shown having a relatively thin ray-penetrating plate 2', which is preferably formed of rubber and is located between the lamp L, supported in said chamber, and the inner end of the fluoroscope, which is supported on the upper wall of the lower chamber in advance of the ray-penetrating plate 2', as will be seen by reference to Figs. 1 and 2 of the drawings.

The fluorescing lamp L, which may be of any desired or suitable type, is shown supported by a bracket 4 within the chamber 2 in close proximity to the ray-penetrating plate 2', the anode 5 and cathode 6 at opposite ends, respectively, of the lamp being connected with electric conductors 5' and 6', respectively, which are shown connected at their opposite ends with binding-posts 7 and 7', respectively, of the induction apparatus I, which induction apparatus will in practice embody an ordinary Ruhmkorff induction-coil, an automatic interrupter 9, and a suitable switch 10, the construction and operation of which parts are so well known that it is deemed unnecessary for the purposes of this invention to enter into a detailed description thereof. One terminal, as 12, of the battery or other suitable source of electrical energy (represented by B) is shown connected with the induction apparatus at one side thereof by a short conductor 12', and the other terminal, as 13, is connected with the said apparatus at the opposite side thereof through the medium of two conductors 14 and 14', one of which conductors, as 14, is connected at one end to the terminal of the battery and at the opposite end thereof to one contact member, as 16, of a circuit-controller which will be hereinafter described, and the other of which conductors, as 14', is connected at one end with the induction apparatus and at the opposite end with another contact member, as 15, of said circuit-controller. These members 15 and 16 are located in operative relation, but normally out of contact with each other, as will be hereinafter fully described.

I wish it distinctly to be understood that any suitable apparatus for producing the requisite electrical energy to illuminate a fluorescing lamp may be employed in connection with said lamp without departure from this invention, and therefore I do not desire to limit myself to the particular apparatus described in the next preceding paragraph.

The circuit maker and breaker, or "circuit-controller," as it may be sometimes hereinafter referred to, comprises, in the preferred form thereof, (shown most clearly in Figs. 4 and 5 of the drawings,) two normally-separated contact members 15 and 16 and two relatively-separated contact-member carriers 17 and 18, pivotally supported for oscillatory movement in the same vertical plane and

adapted one to be operated by the other to effect a contact between the contact members 15 and 16, and one of said carriers, as 17, being in electrical connection with the conductor 14' and the other of said carriers being in electrical connection with the conductor 14.

The oscillatory contact-member carrier 17 is shown in the nature of an elongated arm pivotally supported at 17' upon a frame or bracket *f*, which frame will be of metal and constitutes an electric connector between the conductor 14', connected thereto, and the contact member 15, carried on the carrier 17. This contact-member carrier has a coin-receiving pocket 20 formed in the outer end thereof, which pocket is shown as a slot, which in practice will be of a width equal to the diameter of the coin to be used and is rabbeted to form a shallow supporting-ledge 20' for said coin, a protecting-plate 20'' being secured to the upper face of the carrier and slightly overlapping each edge of the pocket to prevent the admission of a coin to the pocket which is of a thickness greater than that of the proper coin.

The lower contact-member carrier 18 is shown in the nature of a right-angled lever pivotally supported near the middle portion thereof upon a train-carrying frame *f'*, to which the electric conductor 14 of the primary circuit is connected, said carrier comprising an actuating-arm 18' and a stop-arm 18'', said stop-arm having a lateral projection at the end thereof for engaging a stop-notch of the stop-wheel of the timing-train, as will be hereinafter described.

As a convenient means for normally maintaining the contact members 15 and 16 in a relatively-separated condition, as shown in Fig. 4, and for bringing said contact members together to close the circuit and maintain said contact members in a circuit-closing position for a prelimited time and to automatically separate said contact members at the expiration of this prelimited time, I have provided coin-controlled mechanism which, in the preferred form thereof shown in the drawings, comprises a hand-operable actuator (designated in a general way by *h*) for operating one of the contact-member carriers and a timing-train (designated in a general way by *T*) for controlling the circuit-closing movement of the other contact member.

The timing-train is shown in the drawings in the nature of a clock-train embodying a series of intermeshing gears and pinions, which are preferably driven by a spring 24 (shown in dotted lines in Fig. 4) in connection with the arbor 25' of the master-wheel 25, which master-wheel, through the medium of a pinion 26, controls the stop-wheel 27, which wheel in this instance constitutes the prime factor for limiting the duration of contact between the contact members 15 and 16, said wheel 27 being connected by intermediate wheels to a pinion on the shaft of a fan 28, which constitutes the regulator for the entire train of gears.

It will be obvious that any suitable train of gears or clock-train may be employed in lieu of that illustrated in the drawings without departure from this invention and that other 5 time-motors may be employed.

The stop-wheel 27 is furnished with a stop-notch 27' in the periphery thereof, in which is normally seated the stop pin or projection in the stop-arm 18'', this wheel making one 10 complete rotation between each circuit-opening movement of the contact members 15 and 16, as will be readily understood by reference to Figs. 4 and 5 of the drawings, the velocity of said wheel being such as to allow a rea- 15 sonable length of time between the closing and opening of the circuit.

As a convenient means for winding the timing-train the arbor 25' of the winding drum or wheel 25 is furnished with a ratchet-wheel 20 29, which is engaged by a spring-held pawl 30, carried at the inner end of a lever 31, which is operated by a connecting-rod 32, comprising two connected and relatively-insulated members, one of which is pivotally 25 secured at its lower end to the outer end of said lever 31 and the other of which is pivoted at 33 to the contact-member carrier 17.

For the purpose of preventing an accidental retracting movement of the winding device a stop-pawl 34 is also provided in connection with the ratchet-wheel 29, said pawl being preferably pivoted to the frame *f'* and being held in contact with the ratchet-wheel by a suitable spring. The winding mechanism—to wit, the lever 31 and the connecting-rod 32 between the winding-arbor 25' and the contact-member carrier 17—is controlled 35 in its operation by the movements of the carrier, and it will be seen that at each downward movement of said carrier a winding movement of the winding device will be effected. 40

The hand-operable actuator for the contact-member carrier 17 comprises, in the preferred form thereof shown in the drawings, a 45 rock-shaft 35, journaled in the frame *f* and extending through to the outside of the cabinet C, a hand-lever 36, fixed to the outer end of said rock-shaft, and a carrier-actuating member 37, fixed to the inner end of said rock-shaft and having a coin-engaging pin 37' located at the extreme outer end thereof in position to bear upon a coin located in the opening of the pocket 20 of the carrier 17, said 55 pin being of sufficiently small diameter to pass through the opening or coin-pocket 20 and lock the carrier against movement in case a coin of improper size is deposited in the machine. This carrier-actuating member is 60 held in its normal position by a spring 38.

The contact-member carrier 17, together with the winding mechanism, is held in its normal elevated position by a spring 39, connected at one end with the carrier, near the 65 middle portion thereof, and at the opposite end thereof to the frame *f*, and the contact-member carrier 18 is held in its normal lock-

notch-engaging position by a spring 40, which is fixed to one end of the frame *f'* and bears at the lower end thereof against the stop-arm 70 18'', as will be readily understood by reference to Fig. 4 of the drawings.

In the organization of mechanism herein described it is desirable to provide means for locking the time-train against movement and 75 consequently prevent engagement of the two contact members 15 and 16 until the contact-member carrier 17 has been depressed and has again returned to the normal position thereof shown in Fig. 4, and for this purpose the 80 carrier 17 is furnished with a stop-arm 17'', located in position to intercept the movement of the fan 28 on the depression of said carrier. This stop-arm has an insulated pin, against which the wing of the fan strikes 85 when the carrier 17 has been depressed sufficiently to disengage the stop-arm of the contact-member carrier 18 from the stop-wheel 27, and the end of the actuating-arm 18' of said carrier 18 has an insulated projection, 90 against which the carrier 17 abuts when said carrier 17 operates the carrier 18. Thus it will be seen that all of the parts are insulated, so as to maintain an open circuit until the two contact members 15 and 16 have en- 95 tered the circuit-closing positions shown in Fig. 6.

As a means for directing the coin to the pocket 20 of the carrier 17 the cabinet C is furnished with a coin-chute 45, the entrant 100 end of which is located on the outside of the cabinet, and the discharge end of which is located in juxtaposition to the pocket 20 of the carrier when such carrier is in the normal elevated position shown in Fig. 4. 105

In the operation of the coin mechanism, a proper coin being inserted in the coin-chute 45, it is conveyed thereby to the pocket 20 of the contact-member carrier 17, after which the hand-lever 36 is depressed from the position shown in Fig. 4 to that shown in Fig. 5, 110 which causes the pin 37' of the carrier-actuating member to strike the coin contained in the pocket 20, depressing the carrier 17 from the position shown in Fig. 4 to that shown in 115 Fig. 5. This causes the winding mechanism to impart a winding movement to the arbor 25' and brings the carrier into engagement with the insulated end of the actuating-arm of the contact-member carrier 18, thus shifting the stop-arm 18'' out of engagement with the stop-notch of the stop-wheel 27 and also elevating the contact member 16 to the position shown in Fig. 5 to engage the contact member 15 when the time-train T is released 125 and the carrier 17 is returned to its normal position, it being observed that when the carrier 17 is in its depressed position the stop member 17'' will be in position to intercept the fan 28 and prevent the operation of the 130 train until the stop member is carried by the carrier 17 upward and out of the path of movement of said fan, and it will also be seen that in this depressed position of the carrier

17 the contact member 15, carried thereby, is moved from the position shown in Fig. 4 to that shown in Fig. 5. Upon the release of the hand-lever, after the depression thereof just described, the elevating-spring 39, in connection with the carrier 17, returns said carrier to its elevated position with the stop-arm out of contact with the fan, thus releasing the time-train and at the same time bringing the contact member 15 into engagement with the contact member 16, as shown in Fig. 6, and closing the circuit, which circuit remains closed until the stop-wheel 27 makes one complete rotation and the stop-notch is brought into juxtaposition to the stop-pin on the stop-arm of the carrier 18, when said carrier will be automatically thrown into engagement with the stop-wheel and the contact member 16 will be thrown out of engagement with the opposing contact member 15, thus opening the circuit.

From the foregoing description it will be seen that the possibility of "beating" the machine by the insertion of an improper coin is very small, for the following reason: If a coin of improper diameter is deposited in the machine, it will drop through the pocket 20, and the push-pin 37' on the carrier-actuated member will, upon the depression of the hand-lever 36, pass through the pocket in the carrier 17, and owing to the difference in the arc described by the respective ends of the carrier 17 and actuating member 37 block the movement of the carrier 17 after the same has moved a very short distance. Furthermore, engagement of the two contact members 15 and 16 cannot possibly be made until the hand-lever is returned to the normal position thereof shown in Fig. 4 and in position for the next operation thereof. Thus it will be impossible to maintain a closed circuit except for the limited time determined by the movements of the time-train T.

The fluoroscope F is shown in the nature of a conical tube having at the smaller end thereof an eye shape 50 and at the larger inner end thereof a fluorescing screen 51, which will usually be made of translucent or ray-penetrating material, such as paper or celluloid, coated or otherwise treated with fluorescent material.

As a means for supporting the fluoroscope in relation to the lamp L, so that observations may be had at different angles, the same is mounted near the middle portion thereof upon a handle 52, having a supporting-arm 53, which has a universal connection 54 at the inner end thereof with the upper wall of the cabinet. This construction and organization may, however, be variously modified without departure from this invention.

As a convenient means for ejecting the coin from the pocket of the contact-member carrier 17 after the same has been operated to shift the contact-member carrier 18 to the position shown in Fig. 5 I have provided an ejecting device, which in the preferred form

thereof shown in Figs. 4 and 5 comprises an ejector-arm 55, which is pivotally supported at one end and is held at the opposite end thereof in sliding engagement with the under face of the contact-member carrier 17 and in position to engage the rear edge of the coin and push the same out of the pocket, as shown in Fig. 5. The outer coin-engaging end of the ejecting-arm will be preferably constructed of insulated materials for obvious reasons. This arm is held with its coin-engaging end in operative engagement with the carrier 17 by means of a suitable spring 56, which bears against the under face thereof, as shown in the drawings.

It will be noticed that as the carrier 17 is shifted from the position shown in Fig. 4 the coin-engaging end of the ejecting-arm 55 will, by reason of the position of said arm relatively to the carrier 17, slide along the under face of said carrier toward the outer end thereof and will in the course of the last stages of its movement engage the rear edge of the coin and eject the same, as shown.

In using the fluoroscope the object to be inspected is placed between the inner and largest end of the fluoroscope and the window or plate 2' in advance of the lamp, the fluoroscope being moved as desired.

Having described my invention, I claim—

1. In an X-ray apparatus, the combination, with a cabinet having a ray-penetrating partition or plate and with an electric circuit, of a fluorescing lamp located in said circuit within said cabinet and in juxtaposition to the ray-penetrating plate; two relatively-shiftable contact members located in said circuit; coin-controlled mechanism for shifting said contact members into and out of contact with each other; and a fluoroscope mounted on said cabinet and having an X-ray-penetrating screen in juxtaposition to the ray-penetrating plate of said cabinet.

2. In an X-ray apparatus, the combination with a cabinet having a ray-penetrating partition or plate; of a lamp located within said cabinet in juxtaposition to the ray-penetrating plate; electrical mechanism in connection with said lamp and effective for illuminating said lamp; and a fluoroscope shiftable mounted upon said cabinet and having a ray-penetrating screen in juxtaposition to the ray-penetrating plate of said cabinet.

3. In an X-ray apparatus, the combination, with a cabinet having a ray-penetrating partition or plate and with an electric circuit, of a fluorescing lamp located within said cabinet and in said circuit in juxtaposition to the ray-penetrating plate; coin-controlled mechanism for controlling the circuit and embodying two normally-separated shiftable contact members located in said circuit; means for shifting said members into contact, to close the circuit; a time-motor in connection with, and effective for limiting the duration of contact between, the contact members; and a fluoroscope mounted on said cabinet and hav-

ing a ray-penetrating screen in juxtaposition to the ray-penetrating plate of said cabinet.

4. In an X-ray apparatus, the combination of an electrical circuit embodying an induction apparatus; a fluorescing lamp located in said circuit; shiftable contact members located in said circuit and normally maintaining the circuit open; a coin-controlled carrier in connection with one of said contact members; an oscillatory carrier in operative connection with the other contact member; and means operable on deposit of a coin for actuating one carrier to effect a circuit-closing movement of the two contact members.

5. In an X-ray apparatus, the combination of an electrical circuit; a fluorescing lamp located in said circuit; two normally-separated contact members located in said circuit; a coin-controlled oscillatory member for effecting engagement of the two contact members; a hand-operable actuator for actuating the oscillatory member; a time-train for maintaining the contact members in their circuit-closing position for a predetermined length of time; and means for automatically separating said contact members at the expiration of this predetermined length of time.

6. The combination of a cabinet having a ray-penetrating partition or plate; a fluorescing lamp supported in said cabinet in juxtaposition to said plate; a coin-controlled electrical circuit in operative connection with said lamp and inclosed by the cabinet; a fluoroscope having a ray-penetrating screen in juxtaposition to the ray-penetrating plate of the cabinet; and means for supporting the said cabinet.

7. The combination of an inclosed cabinet having a ray-penetrating partition or plate; a lamp supported within said cabinet in juxtaposition to said plate; a coin-controlled electrical circuit in operative connection with said lamp and inclosed by the cabinet; a fluoroscope having a ray-penetrating screen in juxtaposition to the ray-penetrating plate of the cabinet; universally-shiftable supporting means for said fluoroscope; and means for supporting said cabinet.

8. In an X-ray apparatus, the combination with a fluorescing lamp and with an electrical circuit for energizing said lamp; of hand-operable, coin-controlled mechanism comprising two normally-separated contact members located in said circuit, two pivotally-supported contact-member carriers in connection with the two contact members, respectively, and one of which carriers has a coin-receiving pocket; an oscillatory hand-operable actuator for depressing one of said carriers and for shifting the other carrier with its contact member into its contact position; means for retracting the first-mentioned carrier and thereby effecting a contact between the two contact members; a train of gears for limiting the duration of contact between the

two contact members and having means for automatically separating the contact members; and a chute for directing a coin to the coin-receiving pocket of the first-mentioned carrier.

9. In an X-ray apparatus, the combination, with a suitable cabinet having a ray-penetrating plate, of a normally open electrical circuit; a fluorescing lamp supported in said cabinet in juxtaposition to said plate; two normally-separated contact members in said circuit; a coin-controlled carrier in connection with one of said contact members; an oscillatory carrier in operative connection with the other of said members and controlled in its movements by the movements of the coin-controlled carrier; a motor embodying a time-train and having a stop-wheel; a detent on one contact-member carrier and controlled in its releasing movement by the return of the other contact-member carrier to its normal position; and means on the coin-controlled carrier, for locking the time-train against movement when the carrier is in its depressed position and the detent is in its unlocked position and for retaining said time-train in such locked position until said coin-controlled carrier is returned to its normal position.

10. In an X-ray apparatus, the combination, with a suitable cabinet, an electric circuit, and with a fluorescent lamp located in said circuit, of two normally-separated contact members located in said circuit; a coin-controlled carrier in operative connection with one of said contact members and effective on the descending movement thereof for shifting the contact member of the other carrier into position to be engaged by the first-mentioned contact member, when the coin-controlled carrier returns to its normally-elevated position; a spring-motor embodying a time-train having a stop-wheel; a detent in normal engagement with the stop-wheel and controlled by the descending movement of the coin-controlled carrier for releasing the detent from the stop-wheel; means on the coin-controlled carrier, for locking the time-train simultaneously with the release of the detent and for holding the time-train against movement until the coin-controlled carrier is returned to its normally-elevated position; a hand-operable actuator for depressing the coin-controlled carrier; a winding device controlled by the descending movement of the coin-controlled actuator, for winding the spring-motor; and means for returning the hand-operable actuator and coin-controlled carrier to their normal elevated positions and to thereby effect a contact of the two contact members and simultaneously release the time-train.

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