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PATENTED APR. 7, 1903.

R. E. BATES:
COIN CONTROLLED ELECTRIC METER.

APPLICATION FILED JAN. 14, 1901.

NO MODEL.

4 SHEETS.—SHEET 1.

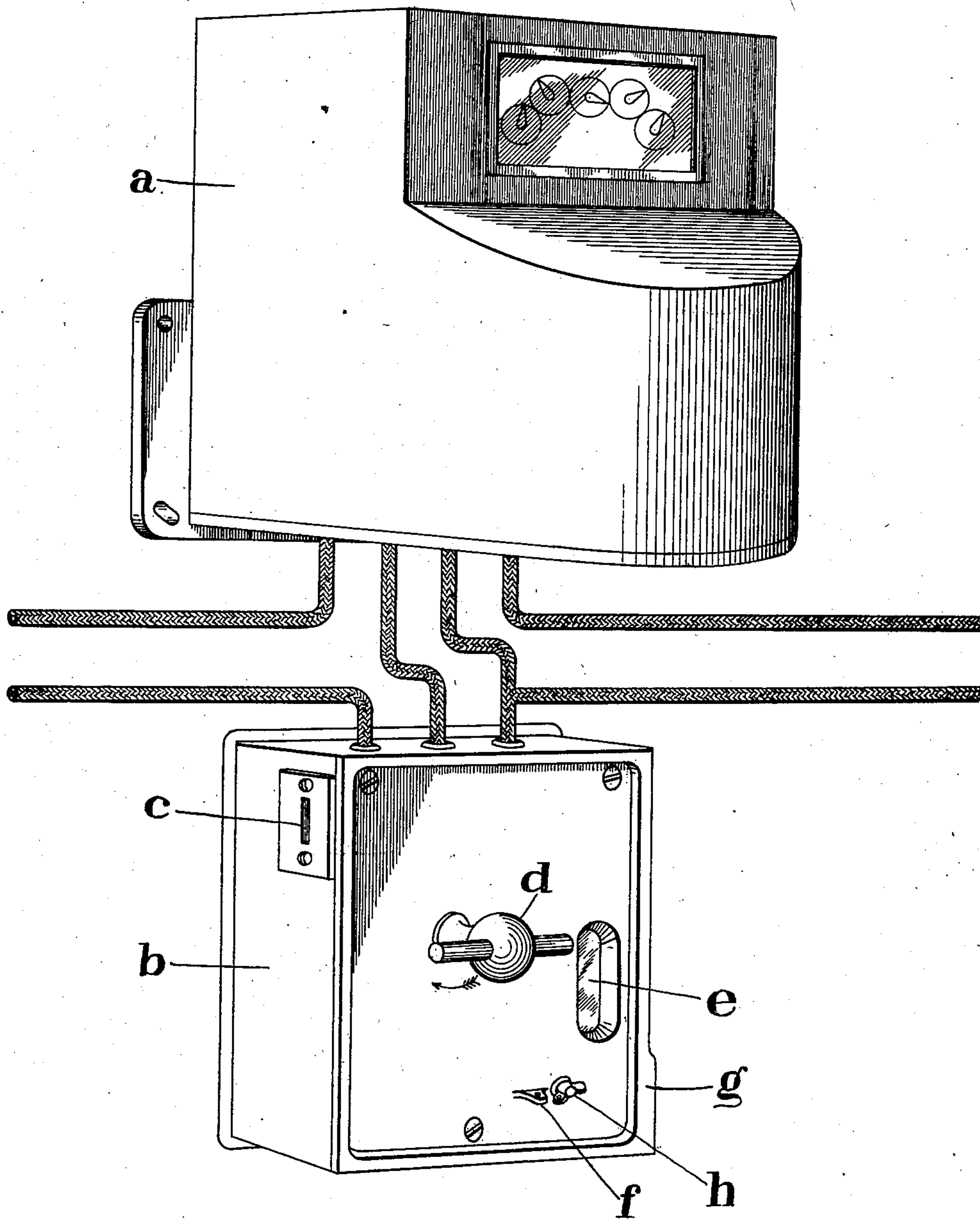


Fig. 1

WITNESSES:

Fred O. Fish
Alfred H. Hildreth

INVENTOR.

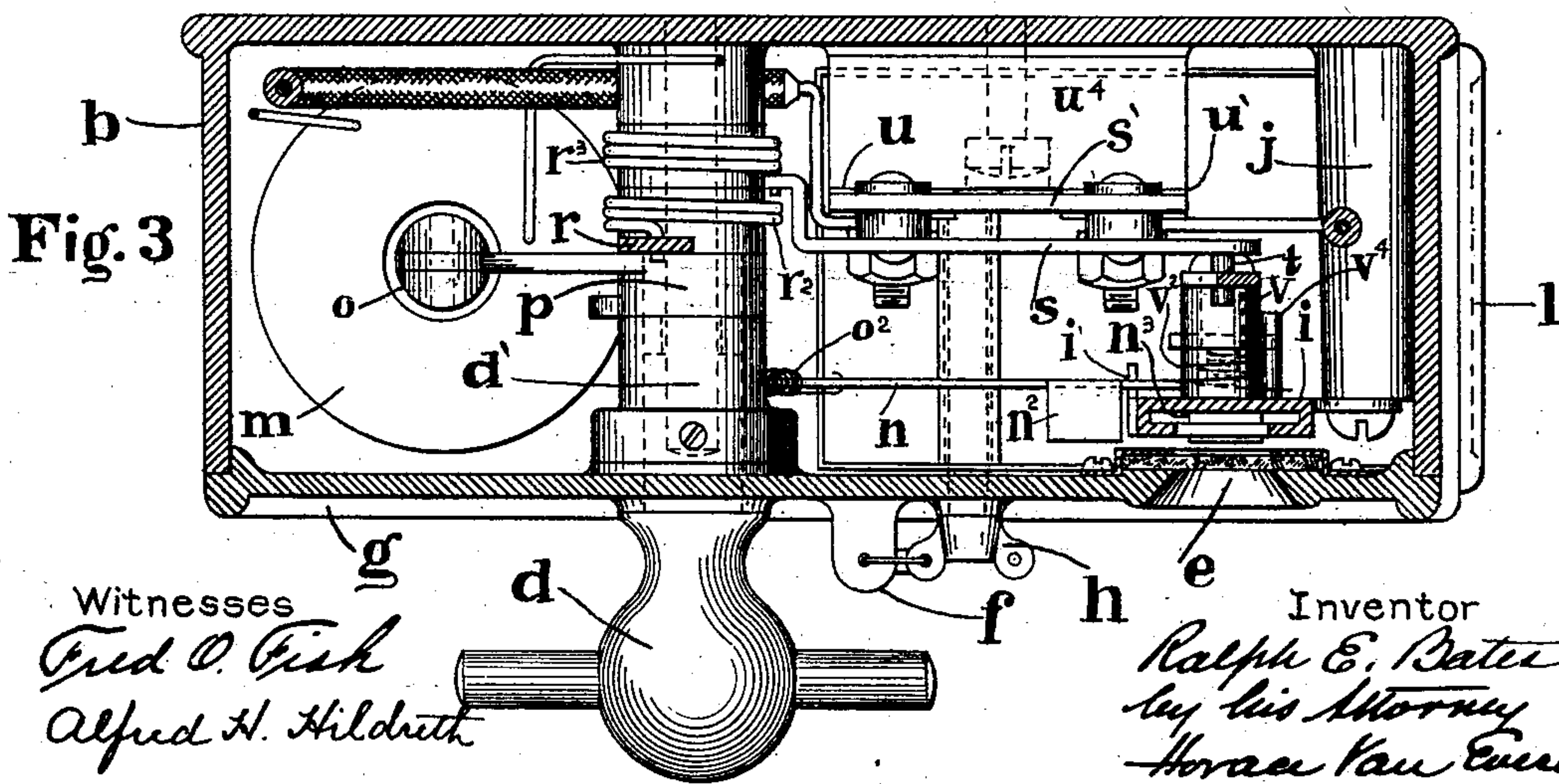
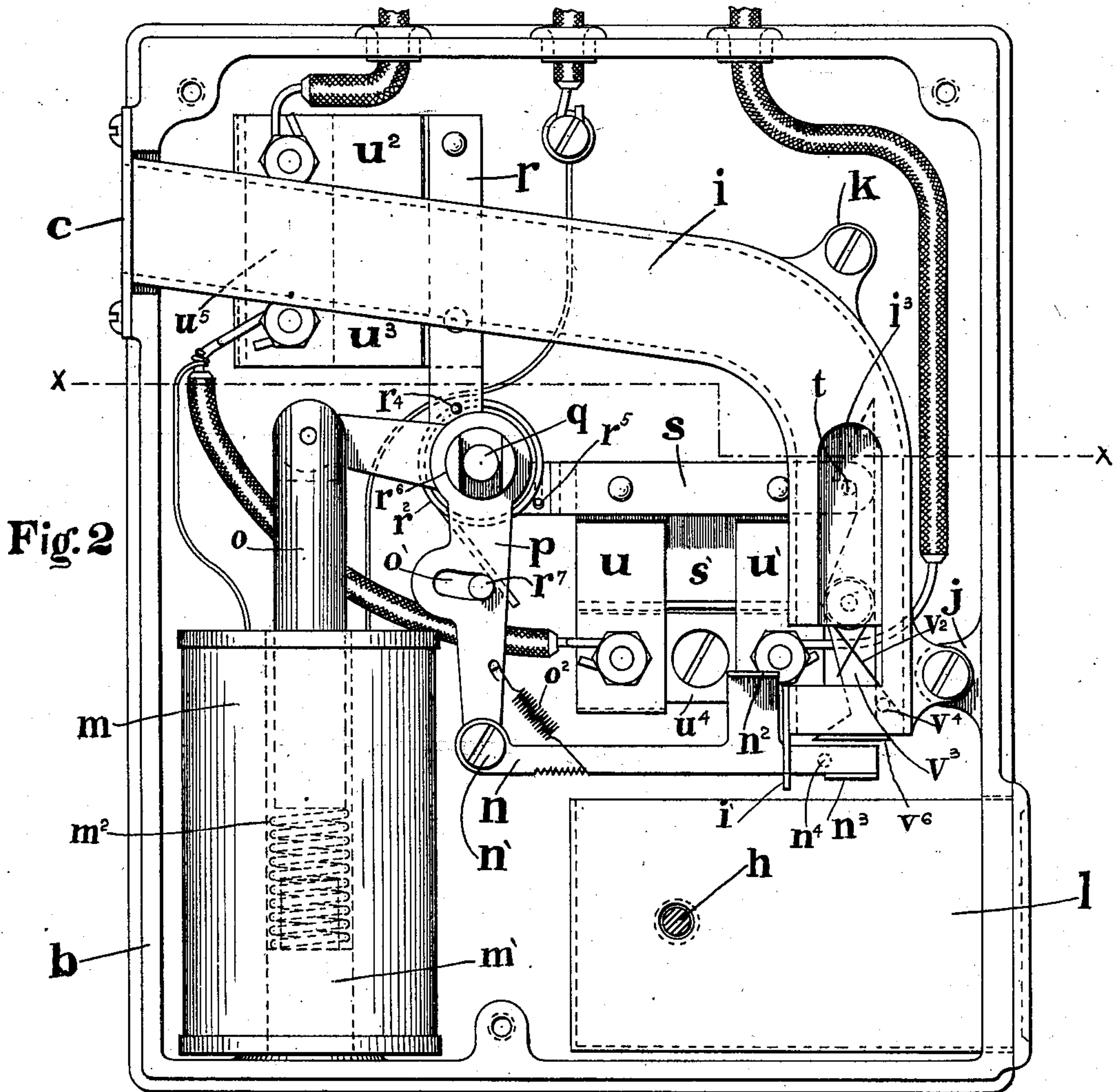
Ralph E. Bates
by his Attorney
Horace Van Everen

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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig. 6

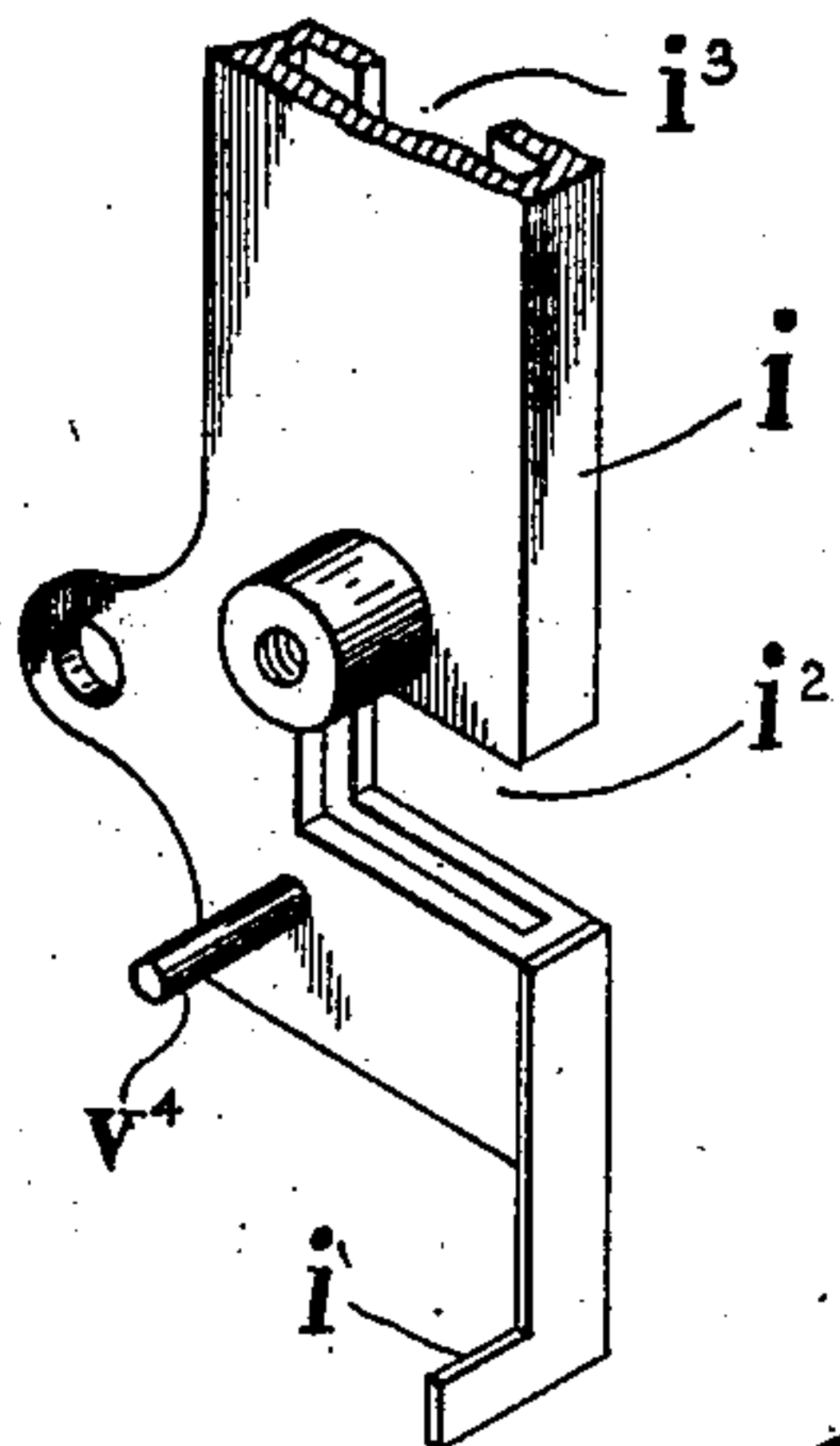


Fig. 4

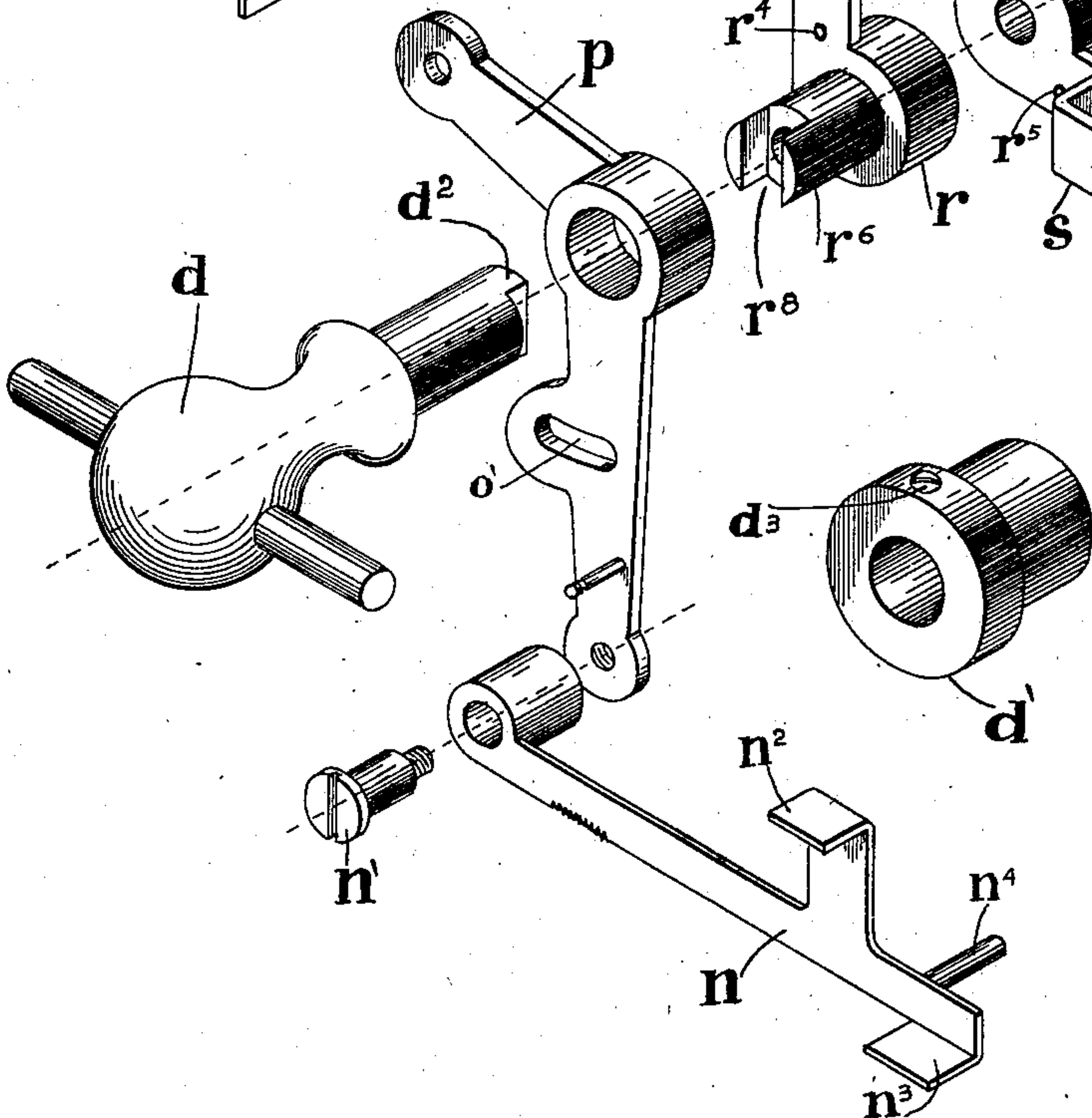
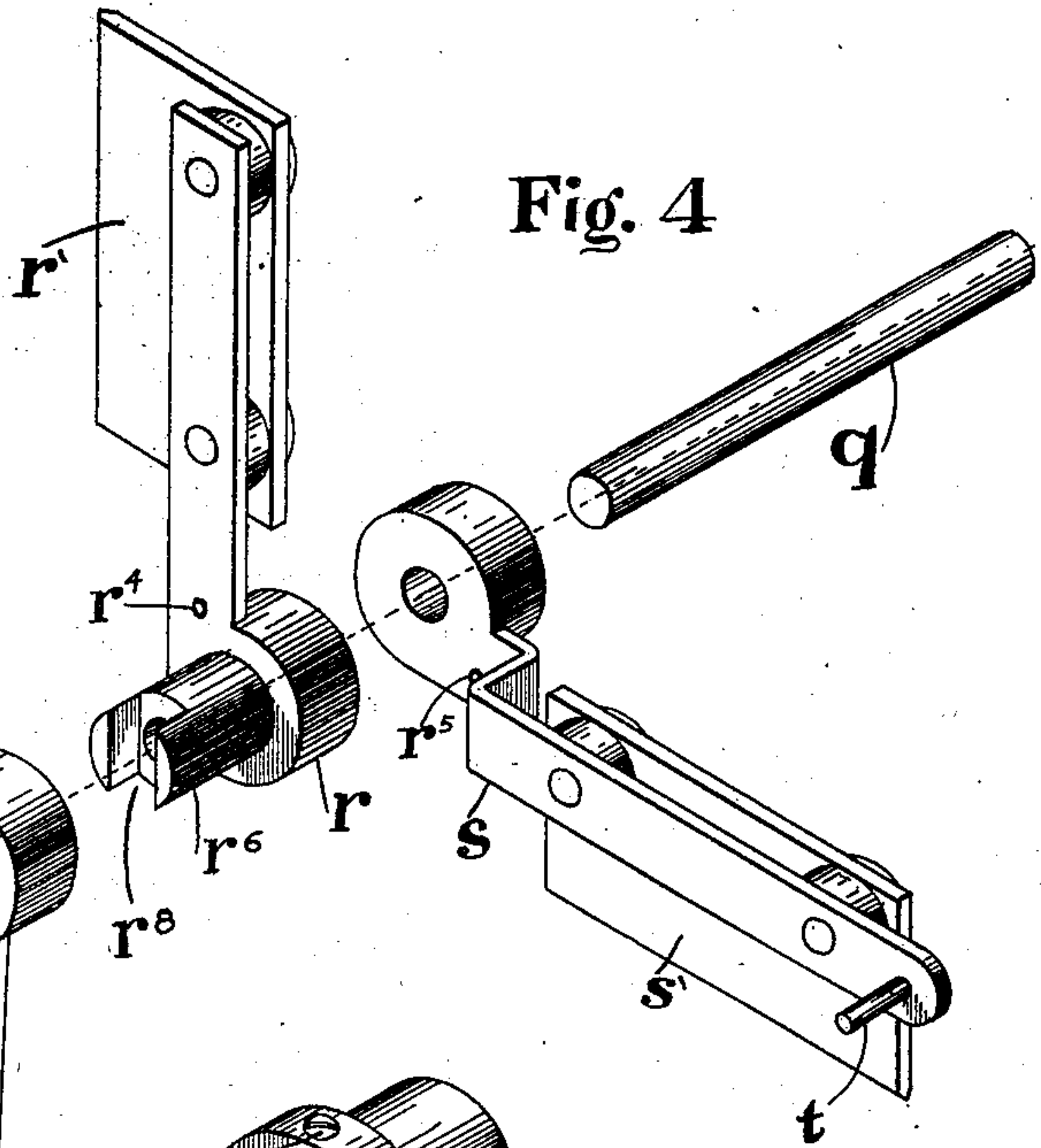
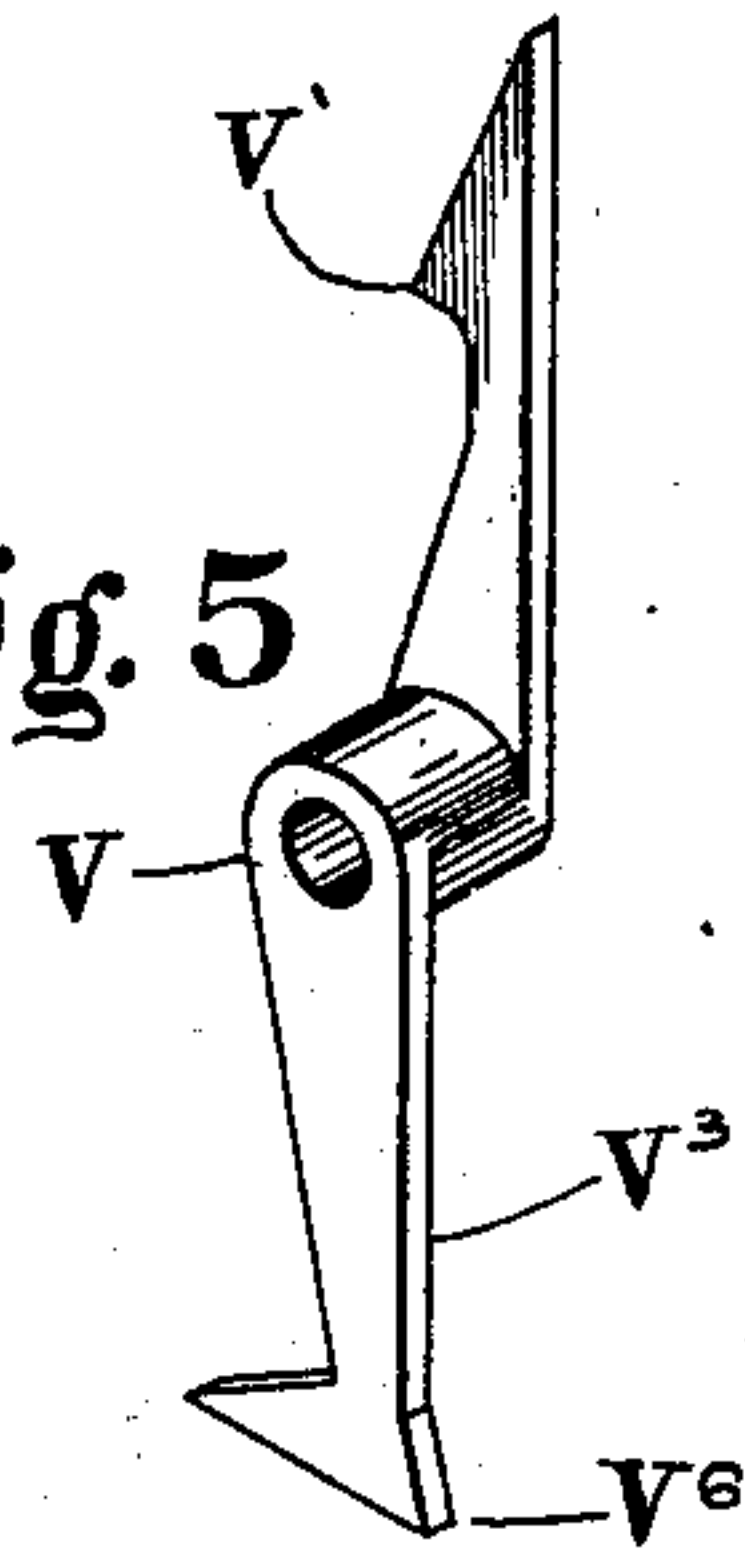


Fig. 5



WITNESSES:

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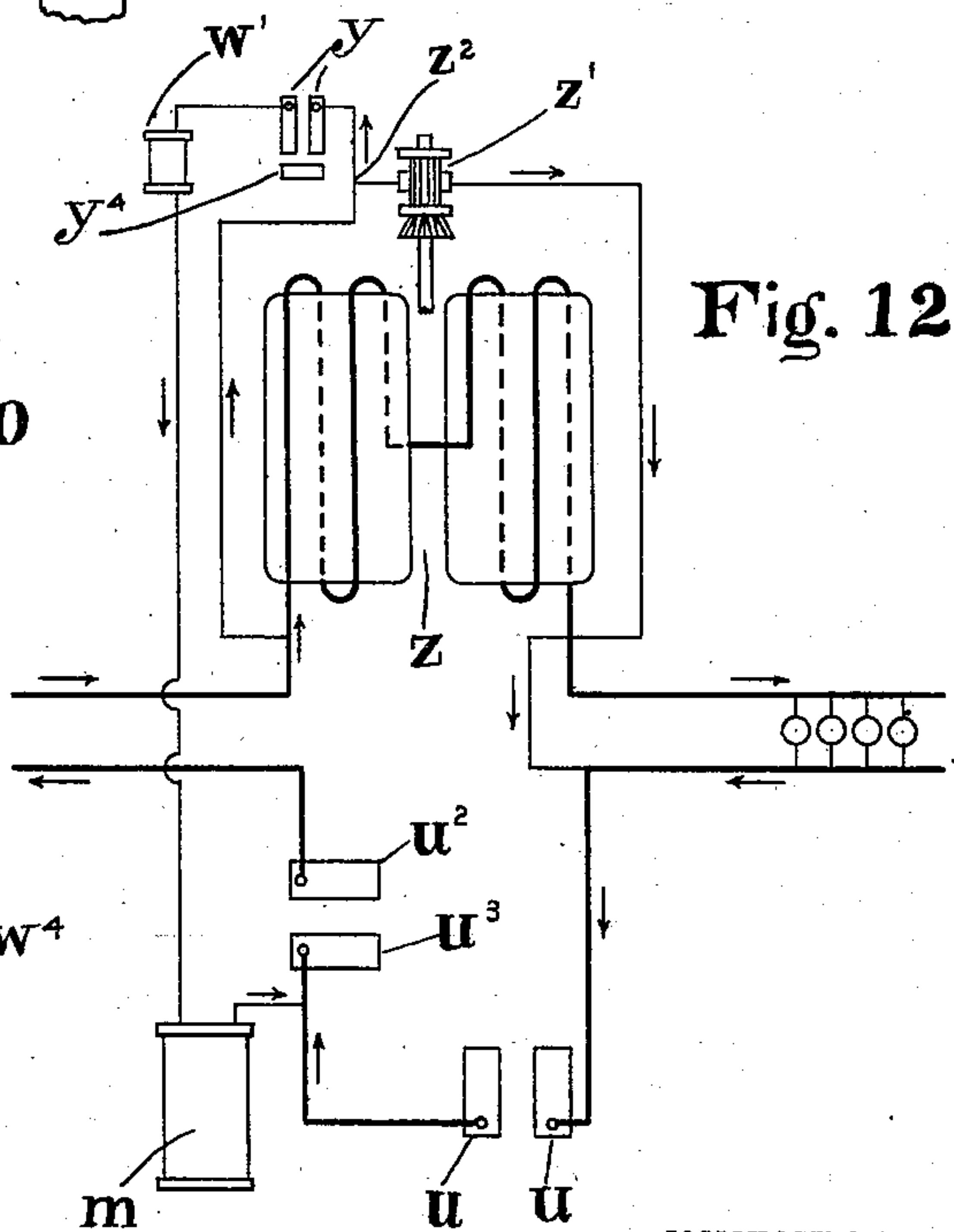
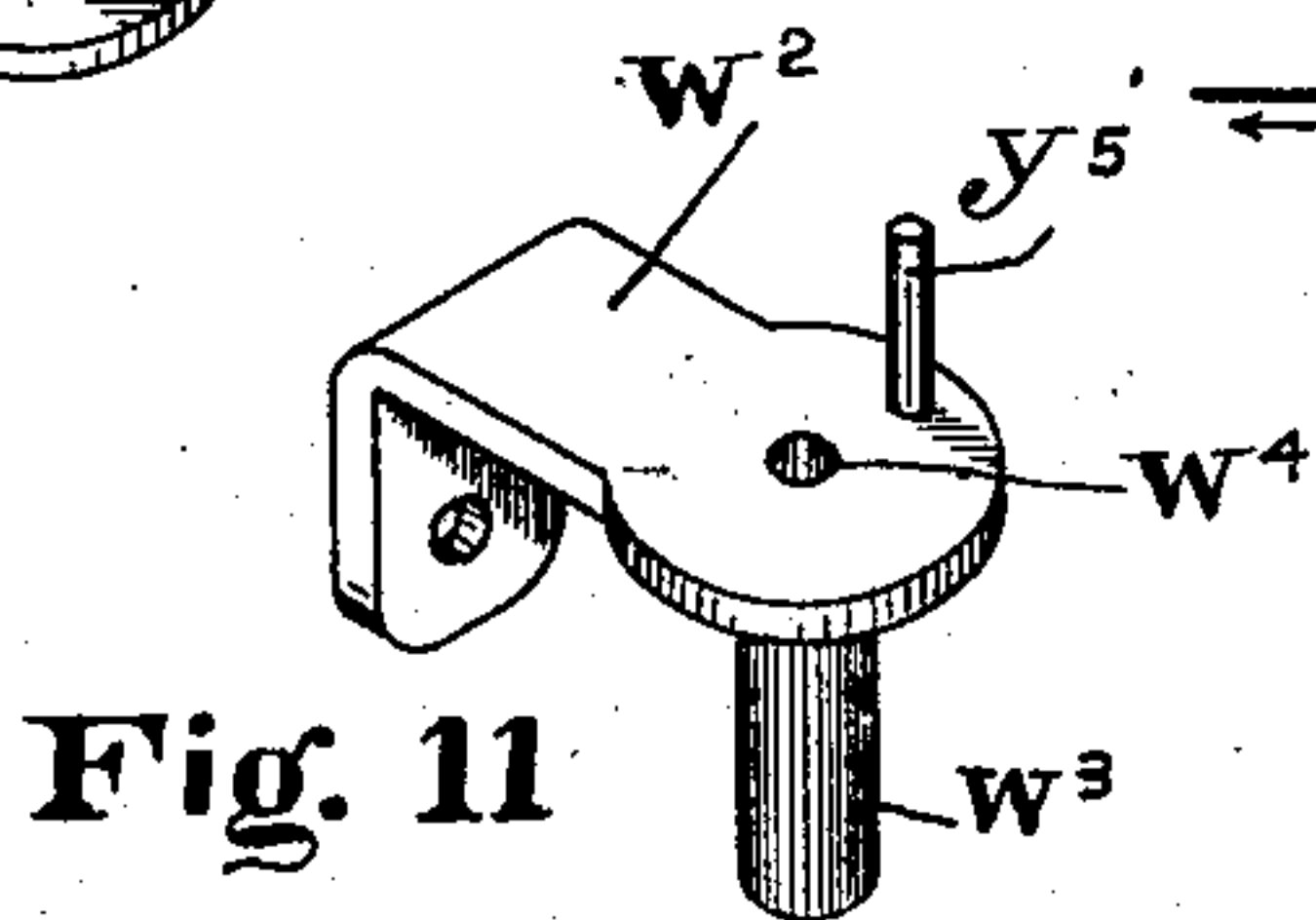
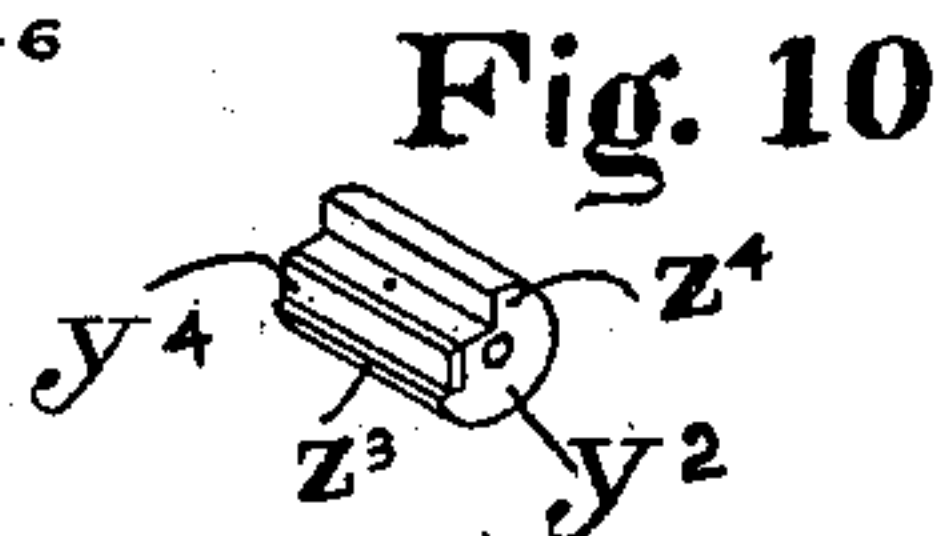
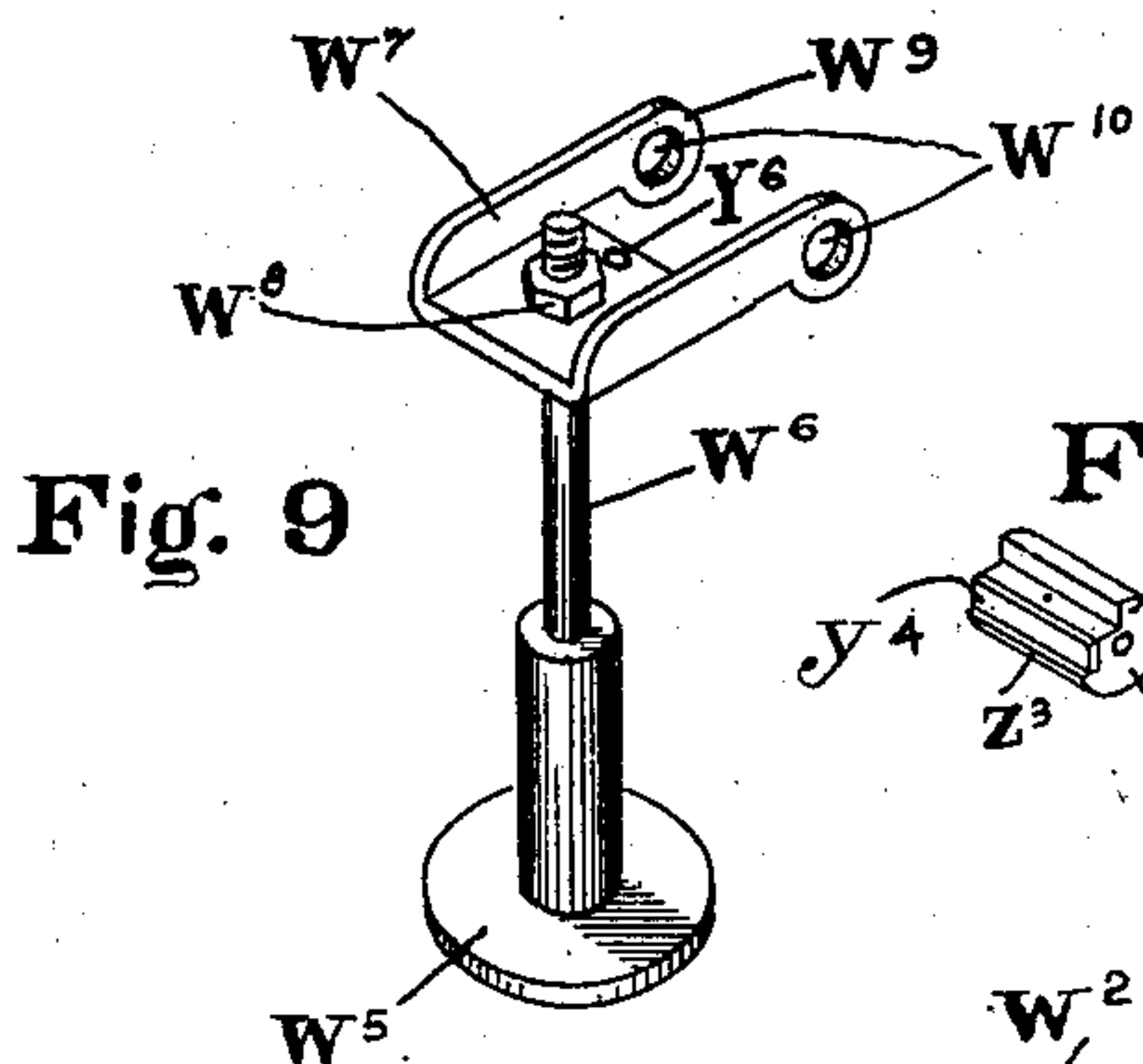
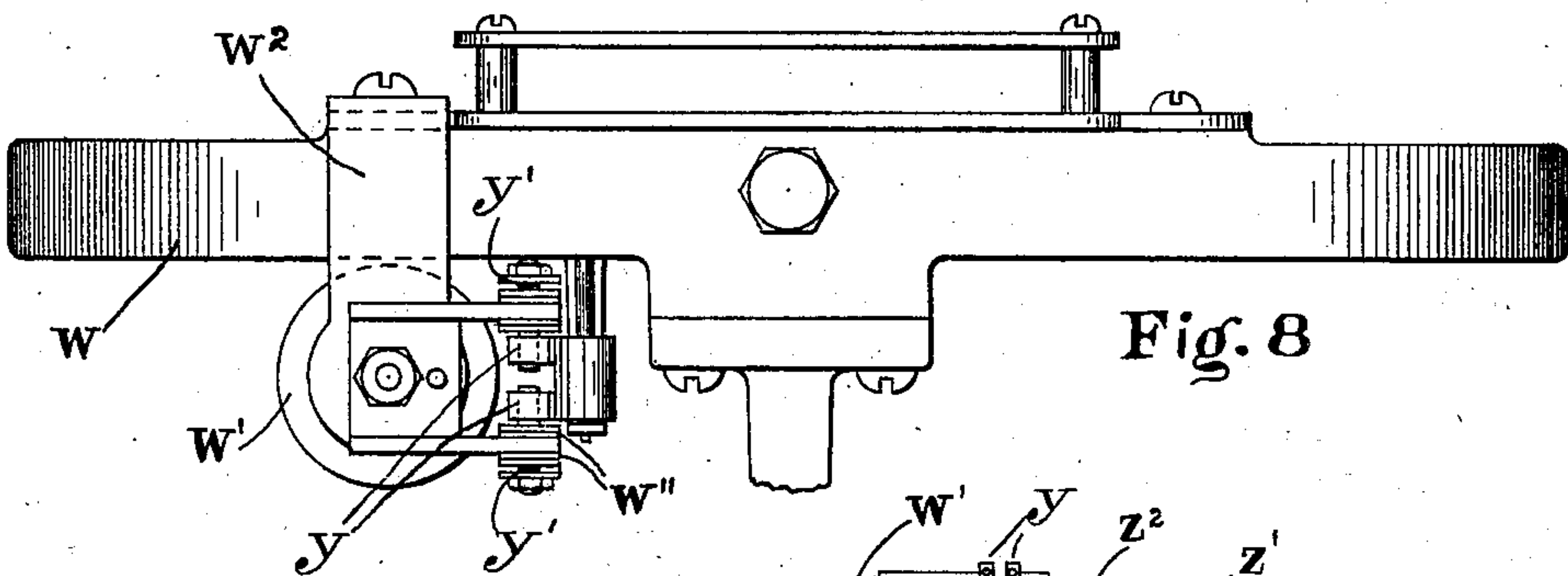
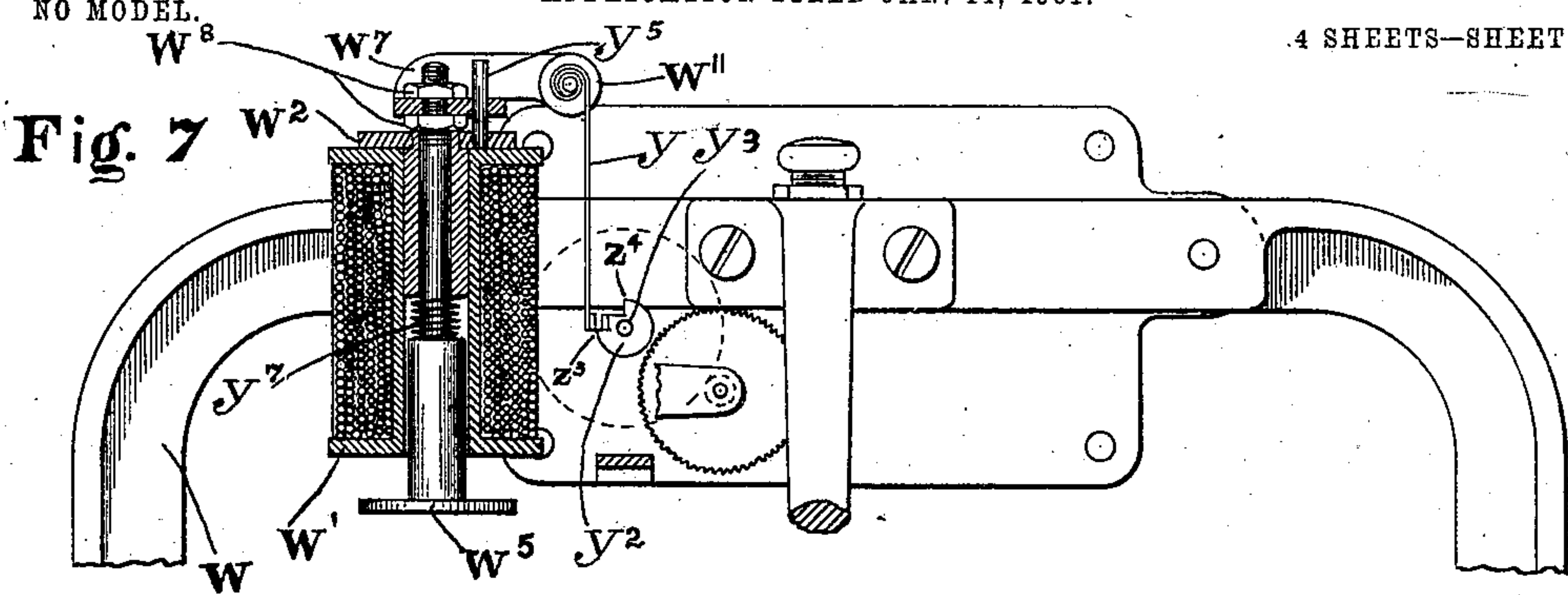
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APPLICATION FILED JAN. 14, 1901.

4 SHEETS—SHEET 4.

NO MODEL.



WITNESSES:

Fred O. Fish
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UNITED STATES PATENT OFFICE.

RALPH E. BATES, OF WINCHESTER, MASSACHUSETTS, ASSIGNOR OF TWO-FIFTHS TO HORACE VAN EVEREN, OF CAMBRIDGE, MASSACHUSETTS.

COIN-CONTROLLED ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 724,654, dated April 7, 1903.

Application filed January 14, 1901. Serial No. 43,174. (No model.)

To all whom it may concern:

Be it known that I, RALPH E. BATES, a citizen of the United States, residing at Winchester, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Coin-Controlled Electric Meters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to an improvement in coin-controlled electric meters.

Heretofore, so far as I am aware, coin-controlled electric meters have been open to various objections. Some depended upon the mere weight of the coin to close an auxiliary circuit in which a magnet was included to actuate the main switch, some depended on clockwork which was tripped by the coin, some depended on the coin as the conductor to close the auxiliary circuit, some required the insertion of a new coin at the time when the amount of current paid for by the previous coin was consumed, and others required a separate manual actuation for each coin inserted, all of which constructions are objectionable, for reasons apparent to those skilled in this art.

The object of my invention is to reorganize and improve coin-controlled electric meters to obviate the objections which obtain against prior meters of this class. I have produced a meter in which the main switch, so long as a coin is present to pay for current, will be maintained closed, or, in other words, in which all that is necessary to be done by the consumer in order to keep the current turned on is to keep a coin or any desired number of coins in the slot without any other manual operations whatever.

Other objects of my invention are to produce a coin-controlled mechanism capable of being used in connection with any ordinary recording-wattmeter, to use a knife-switch for the main circuit, to produce an efficient escapement for the coins adapted to be operated by the wattmeter, to dispense with an auxiliary circuit for operating the main switch, and to improve the construction of coin-controlled

electric meters in various other details hereinafter specifically described.

To the above ends the present invention consists in the coin-controlled electric meter hereinafter described and claimed.

In the accompanying drawings, illustrating the preferred form of my invention, Figure 1 is a perspective view of my improvement in coin-controlled electric meters. Fig. 2 is a front elevation of the coin-controlled mechanism with the cover-plate removed. Fig. 3 is a sectional plan on the line *x x*, Fig. 2. Fig. 4 is a perspective view of the principal parts of the coin-controlled mechanism and main switch. Fig. 5 is a perspective view of the main-switch detent. Fig. 6 is a perspective view of the lower part of the coin-chute. Fig. 7 is a rear elevation, partially in section, of part of the wattmeter. Fig. 8 is a plan of the same. Figs. 9, 10, and 11 illustrate in perspective details hereinafter referred to, and Fig. 12 is a diagram illustrating the electric circuits.

My invention contemplates a coin-receiver adapted to receive and hold a number of coins pending the consumption of a corresponding amount of current, metering mechanism, a main switch, means for holding the main switch closed, and releasing mechanism connected with the metering mechanism and disconnected from the holding means by the coins in the coin-receiver for releasing the holding means when an amount of current corresponding to the number of coins in the coin-receiver has been consumed. It will be noted that as long as a coin remains or coins remain in the coin-receiver the releasing means will remain inoperative to release the holding means for the main switch.

My invention contemplates a coin-controlled electric meter adapted to hold a number of coins ready to pay for current to be consumed and to subtract them as the current is consumed, operating automatically when the coins are exhausted to open the main switch. I have provided an escapement for the coins operated from the meter for subtracting coins from the coin-receiver whenever an amount of current corresponding to the coin has been consumed. Thus

the metering mechanism attempts whenever an amount of current corresponding to the coin has been consumed to open the main switch; but so long as there remains an additional coin or remain additional coins in the coin-receiver the attempt is prevented of successful accomplishment by such additional coin or coins.

So far as I am aware I am the first to produce a coin-controlled electric meter operating automatically on the consumption of each coin-value amount of current to attempt to release the main switch having means to prevent such release by the presence of additional coin or coins.

I believe I am the first to produce a coin-controlled electric meter having means to release the main switch connected with the metering mechanism and controlled by the coins in the coin-receiver.

My invention is broad and generic in character and is not limited to any specific form of mechanism and arrangement of circuits, as any equivalent construction and arrangement of circuits is within the purview of my invention.

The illustrated embodiment of my invention shown in the accompanying drawings is described as follows:

The wattmeter *a*, which may be of any desired form of motor-wattmeter, is illustrated as the well-known Thomson recording-wattmeter. The coin-controlled mechanism or, as it may be termed, the "prepayment" device is contained in the box *b*, having the coin-receiving slot *c*, the switch-handle *d*, the coin-sight window *e*, the seal-lug *f*, and seal-nut *h*.

Fig. 1 illustrates the preferred arrangement of meter and prepayment device; but, if desired, the two parts of my apparatus may be located apart from each other.

The coin-receiver is the chute *i*, supported by the bosses *j* and *k*, leading from the slot *c* across the box and discharging its contents into a drawer *l*, provided for that purpose.

The main switch *s* is adapted to be closed by hand and held closed by a detent *v* so long as coins are present in the coin-receiver *i*. This main switch *s* carries the insulated conductor-blade *s'*, which is adapted to connect the contact-clips *u* and *u'*, supported on the back of the box by insulating-block *u⁴*. The main switch *s* is carried by a hub loosely mounted on the shaft *q*, projected forward from the back of the box, and a spring *r³*, engaging the hole *r⁵*, normally tends to open the main switch. The main switch may be operated directly by the person inserting the coin to move it from its open to its closed position, and such a construction is within the scope of my invention viewed in its broader aspects; but as outside means might be employed to hold the switch closed, and thus to obtain current without payment therefor, I prefer to provide a secondary switch, which when the handle *d* is operated to close the

main switch will be opened coincidently with or prior to the closing of the main switch.

The secondary switch *r* consists of an insulated conductor-blade *r'*, mounted on a hub *r⁶*, also loosely mounted on the shaft *q* and which is adapted to connect the contact-clips *u²* and *u³*, similarly supported on the back of the box by the insulating-block *u⁵*, and a spring *r²*, engaging the hole *r⁴*, normally tends to close the secondary switch. The hub *r⁶* is provided with a slot *r⁸*, which is engaged by the correspondingly-shaped projection *d²* of the handle *d*, by which means the secondary switch is capable of being operated. The main switch *s* is offset from its hub, as shown, so that its plane of movement is identical with the plane of movement of the secondary switch *r*. As a result when the secondary switch is opened by the handle *d* the main switch will be closed. The handle *d* is received in a bearing in the cover *g* and held in place by a collar *d'*, secured to the spindle of the handle by a set-screw *d³*.

The means for holding the main switch *s* closed consists of the detent *v*, pivoted on the back of the coin-chute *i* and provided on one end with the hook *v'* and on the other end *v³* with a cam *v⁶*. A spring *v²*, engaging at one end the detent *v* and at the other the pin *v⁴*, normally tends to move the detent in the direction to cause the hook *v'* to engage the pin *t*, projected from the side of the main switch *s*.

The means for releasing the main-switch-holding means comprise devices connected with the metering mechanism and controlled by coins in the coin-receiver. While any means connecting the releasing means with the metering mechanism is in its broader aspects within the scope of my invention, I prefer, because of its convenience and simplicity, to employ a shunt-circuit, a solenoid, and a coin-escapement actuated by the solenoid for releasing the holding means for the main switch controlled by the coins in the coin-chute.

The coin-escapement *n* consists of a lever pivoted by the screw *n'* to the bell-crank lever *p*, provided with the slot *o'*, adapted to be engaged by the stop-pin *r⁷*, loosely mounted on the hub *r⁶* of the secondary switch *r*. The escapement is provided with two tappets *n³* and *n²*, adapted to engage, respectively, the first and second coins in the coin-chute *i*. The coin-escapement is adapted to move transversely under the coin-chute, the tappet *n³* being moved from opposite the mouth of the chute to permit the first coin to drop into the coin-drawer *l* at the same time that the tappet *n²* enters the notch *i²* and supports the second coin, so that there will be at all times when there is more than one coin in the chute a coin resting on either the one or the other of the tappets. The coin-chute is cut away at its lower end on one side, as at *i³*, to permit the consumer to see the unused coins through the coin-sight window *e*. Now the

coin-escapement is provided on its rear with a pin n^4 , which is adapted to engage the cam v^6 of the detent v , and a spring o^2 is provided, which normally tends to lift the coin-escapement so that the pin n^4 may engage the cam v^6 of the detent v , and the strength of the spring o^2 is such that a single coin will depress the coin-escapement to lower the pin n^4 below the cam v^6 . The spring o^2 may be adjusted by moving its lower end to engage the proper notch in the lower side of the escapement. A support i' is provided for the escapement n to rest upon when it is depressed by a coin.

The above-described arrangement is such that each reciprocation of the escapement n allows a single coin to drop from the coin-chute into the coin-drawer, that so long as a coin is or coins are present in the coin-chute the escapement is prevented from releasing the detent for the main switch, and that upon the discharge of the last coin from the coin-chute the escapement will be raised by its spring and its pin n^4 will engage the detent and release the holding means for the main switch. The escapement is operated by a solenoid m , provided with a pole-piece m' and a core o , normally supported by a spring m^2 , the core being pivoted to one arm of the crank-lever p . When the solenoid is energized, it attracts the core and operates the bell-crank lever p to move the escapement to subtract a coin from the coin-chute. This escapement-solenoid is energized by the closing of a shunt-circuit through it by the metering mechanism. For reasons apparent to those skilled in the art it is desirable that the shunt-circuit should be closed for as short a space of time as is sufficient to operate the escapement, and so I prefer to employ the peculiar make-and-break device illustrated in the drawings, which operates to close the shunt-circuit and immediately thereafter to open the same again, and any suitable make-and-break device is within the purview of my invention and is intended to be covered by the claims including such an element, except where I have expressly limited them to include an instantaneously-acting make-and-break device, in which case any equivalent instantaneously-acting make-and-break device would be covered thereby.

The instantaneously-acting make-and-break device illustrated in the drawings consists of the solenoid w' , mounted on the frame w of the metering mechanism by means of the bracket w^2 . This make-and-break solenoid is also included in the shunt-circuit and acts to open the circuit as soon as it has been closed. It is provided with the pole-piece w^3 , perforated by the longitudinal hole w^4 to receive the rod w^6 , of non-magnetic material, such as brass, attached to the armature w^5 . To the upper end of the rod w^6 is attached the brush-holder w^7 , provided with the hole y^6 , which slides on the pin y^5 , thereby holding the brush-holder from displace-

ment. Dependent spring-brushes y are supported from the two ears w^9 and w^{10} of the brush-holder, being insulated from each other and from the brush-holder by the insulating-bushings 11. Binding-posts y' are provided for each brush, which also serve as the supports for the brushes. Mounted on any suitable rotating part of the metering mechanism and preferably on one of the dial-spindles is the drum y^2 , of insulating material, against the surface of which the brushes are pressed by their inherent elasticity. Upon one side of the drum is placed the contact-strip y^4 , just below the surface thereof, so that when the drum rotates to the position shown in Fig. 7 the brushes jump off the step z^3 and fall suddenly upon the contact-strip y^4 , thereby closing the shunt-circuit and energizing both the solenoids m and w' . The solenoid w' attracts its armature w^5 , thereby lifting the brush-holder w^7 , and with it the brushes y , so that they spring off the contact-strip y^4 and fall on the step z^4 of the drum, thereby instantaneously breaking the shunt-circuit immediately after it has been closed. With the closing of the shunt-circuit the solenoid m moved the escapement to the right and one coin was subtracted from the coins in the coin-chute, and with the subsequent breaking of the shunt-circuit the escapement was returned by the spring m^2 to its original position. If the last coin was subtracted from the coin-chute, the escapement on the dropping of the coin was lifted by its spring, and on the return movement of the escapement the pin n^4 would engage the detent and release the main switch, thus permitting its spring to open it and turn off the current.

By reference to Fig. 12, illustrating the field-coil z of the metering mechanism, its armature-commutator z' , the armature-shunt tapped at z^2 for the prepayment device shunt extending through the brushes y , contact-strip y^4 , solenoids w' and m , and the main-switch clips u u' , and secondary-switch clips u^2 u^3 , the connections are made plain.

The operation of the illustrated embodiment of my invention is as follows: Upon the insertion of a coin in the coin-receiver i the lever n is depressed by the weight of the coin and the pin n^4 is withdrawn from contact with the cam-surface v^6 of the detent v , and the latter is permitted to be moved by its spring v^2 into the position shown in Fig. 2. The handle d is now turned to the right, thereby first opening the secondary switch r and then closing the main switch s , which will be held closed by the detent v engaging the pin t on the side of the main switch s . Upon letting go of the handle d the secondary switch r will be closed by its spring and the current will be turned on. The parts will then occupy the positions shown in Fig. 2. When the metering mechanism has run until the brushes y fall upon the contact-strip y^4 of the step-drum y^2 , the shunt-circuit through the solenoids m and w' will be closed and the coin-escapement will

subtract the coin from the coin-receiver. The weight of the coin being removed from the lever n , it will be raised by the spring o^2 , and its pin n^4 upon the return stroke of the lever will engage the detent v and swing it to unlock the main switch s , which will be immediately opened by its spring, and the current will be turned off. If there is more than one coin in the coin-receiver, the second coin will engage the tappet n^2 of the lever n before the tappet n^3 was relieved of the weight of the first coin, and so the lever n being held down the only action of the coin-escapement will be to subtract a coin from the coin-receiver. Upon the return of the escapement the second coin will fall on the tappet n^3 . So long, therefore, as one coin remains in the coin-receiver the current will remain turned on, and upon the consumption of each coin-value amount of current a coin will be subtracted from the coin-receiver, and at each subtraction of a coin the attempt will be made to release the main-switch-holding means, and when the last coin is subtracted the current will be turned off.

It is to be noted that, if desired, two or more coins may be subtracted from the coin-receiver at each operation of the escapement. It is also to be noted that a construction in which the release of the holding means for the main switch is controlled rather than actuated by the coin-escapement is within the purview of my invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A coin-controlled electric meter, having, in combination, metering mechanism, a main switch, a coin-receiver, means to hold the main switch closed, means to release the holding means connected with the metering mechanism and disconnected from the holding means by the coins in the coin-receiver, substantially as described.

2. A coin-controlled electric meter, having, in combination, metering mechanism, a main switch, a coin-receiver, means to hold the main switch closed, means to release the holding means controlled by the metering mechanism and disconnected from the holding means by a coin or coins in the coin-receiver and thereby prevented from accomplishing such release, substantially as described.

3. A coin-controlled electric meter, having, in combination, metering mechanism, a main switch, means to hold the main switch closed, a coin-receiver, and means controlled by the metering mechanism for subtracting coins from the coin-receiver having provision to release the holding means when the last coin is delivered from the coin-receiver, substantially as described.

4. A coin-controlled electric meter, having, in combination, metering mechanism, a main switch, a coin-receiver, means to hold the main switch closed, and means controlled by the metering mechanism and by the coins in

the coin-receiver acting to release the holding means upon the delivery of the last coin from the coin-receiver, substantially as described.

5. A coin-controlled electric meter, having, in combination, metering mechanism, a manually-operated main switch, a coin-receiver, means to hold the main switch closed, means controlled by the metering mechanism to subtract one coin at a time from those contained in the coin-receiver when current of value equivalent thereto has been consumed, substantially as described.

6. A coin-controlled electric meter, having, in combination, metering mechanism, a main switch, a coin-receiver, means to hold the main switch closed, and means controlled by the metering mechanism to subtract one coin at a time from those contained in the coin-receiver and having provision to release the holding means upon the subtraction of the last coin from the coin-receiver, substantially as described.

7. A coin-controlled electric meter, having, in combination, a main switch and a secondary switch in series, means for successively opening the secondary switch and closing the main switch, and coin-controlled means for holding the main switch closed, substantially as described.

8. A coin-controlled electric meter, having, in combination, a coin-receiver, a main switch and a secondary switch in series, and coin-controlled means for holding the main switch closed inoperative in the absence of a coin or coins from the coin-receiver, substantially as described.

9. A coin-controlled electric meter, having, in combination, metering mechanism, a main switch, a coin-receiver, means to hold the main switch closed, a coin-escapement having provision to release the main-switch-holding means, a magnet for actuating the escapement, an escapement-circuit and a make-and-break device in said circuit, controlled by the metering mechanism, substantially as described.

10. A coin-controlled electric meter, having, in combination, metering mechanism, a main switch, a coin-receiver, means to hold the main switch closed, a coin-escapement having provision to release the main switch-holding means, a magnet for actuating the escapement, an escapement-circuit, and an instantaneously-acting make-and-break device in said circuit controlled by the metering mechanism, substantially as described.

11. A coin-controlled electric meter, having, in combination, a main switch and a secondary switch in series, means for successively opening the secondary switch and closing the main switch, means for closing the secondary switch after the main switch is closed, and coin-controlled means for holding the main switch closed, substantially as described.

12. A coin-controlled electric meter, hav-

ing, in combination, a coin-receiver, a main switch and a secondary switch in series, manually-controlled means for closing the main switch, means for holding the main switch closed having provision rendering it inoperative in the absence of a coin or coins in the coin-receiver, substantially as described.

13. A coin-controlled electric meter, having, in combination, a main switch and a secondary switch in series, means for successively opening the secondary switch and closing the main switch, and coin-controlled means for holding the main switch closed, substantially as described.

14. A coin-controlled electric meter, having, in combination, metering mechanism, a main switch and a secondary switch in series, means for successively opening the secondary switch and closing the main switch, means to hold the main switch closed, and means connected with the metering mechanism and controlled by said metering mechanism in connection with the coins in the coin-receiver to release the holding means, substantially as described.

15. A coin-controlled electric meter, having, in combination, metering mechanism, a coin-receiver, a main switch normally free to be turned by the operator, means to hold the main switch closed, and means connected with the metering mechanism and the coins in the coin-receiver to release the holding means, substantially as described.

16. A coin-controlled electric meter, having, in combination, metering mechanism, a coin-receiver, a main switch, a latch to hold the main switch closed, and a device caused to be operated by the metering mechanism to subtract a coin from the coin-receiver when current of value equivalent thereto has been consumed and to open the latch, said device being provided with a portion adapted to engage and arrest a subsequent coin and to be acted upon thereby so as to prevent the opening of the latch, substantially as described.

17. A coin-controlled electric meter, having, in combination, metering mechanism, a coin-receiver, a manually-operative main switch, a device to hold the main switch closed, a coin-escapement, means normally holding the coin-escapement in operative relation to the holding device to prevent said device from engaging the main switch, the escapement being constructed to be engaged and moved by a coin in the coin-receiver to permit the holding device to engage and hold the main switch, means actuated by the metering mechanism for operating the escape-

ment to subtract one coin at a time from the coin-receiver, substantially as described.

18. A coin-controlled electric meter, having, in combination, a main switch and a secondary switch in series, coin-controlled means to hold the main switch closed, means normally acting to hold the main switch open, and means to close the main switch connected with the secondary switch and operating to open the secondary switch upon the closing of the main switch, substantially as described.

19. A coin-controlled electric meter, having, in combination, a coin-receiver, a main switch and a secondary switch in series, coin-controlled means for holding the main switch closed, and means for opening the main switch, unless held closed by the holding means, when the secondary switch is closed, substantially as described.

20. A coin-controlled electric meter, having, in combination, a coin-receiver, a main switch and a secondary switch in series, manually-controlled means for operating them, and coin-controlled means for preventing the closing of both switches in the absence of a coin or coins from the coin-receiver, substantially as described.

21. A coin-controlled electric meter, having, in combination, a manually-operated main switch, means for opening the main switch, a coin-receiver, metering mechanism, a magnetically-operated coin-escapement connected with the metering mechanism provided with a spring-supported lever interposed in the path of the coins in the coin-receiver, said spring acting to lift said lever when the last coin has been subtracted and upon its return movement to release the opening means for the main switch, substantially as described.

22. A coin-controlled electric meter, having, in combination, a main switch, a coin-receiver, a coin-escapement, metering mechanism for causing the coin-escapement to be actuated upon the consumption of current equivalent to each coin value, of means normally tending to open the main switch, said escapement acting after subtracting the last coin from the coin-receiver to release the opening means, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

RALPH E. BATES.

Witnesses:

HORACE VAN EVEREN,
ALFRED H. HILDRETH.