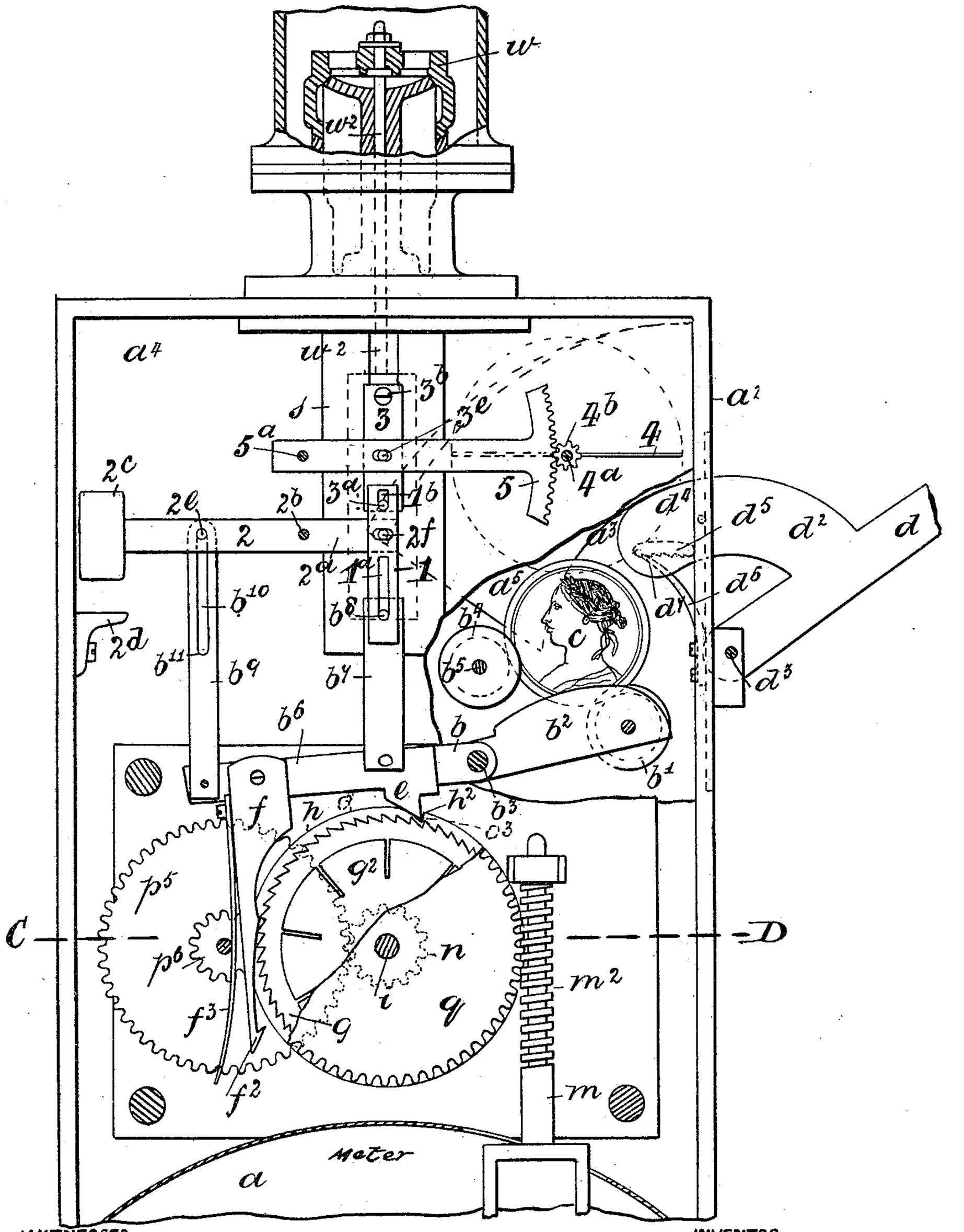
(No Model.) 4 Sheets—Sheet 1.

R. W. BROWNHILL.

APPARATUS FOR VENDING GAS.

No. 405,944. Patented June 25, 1889.

Fig. 1.



WITNESSES

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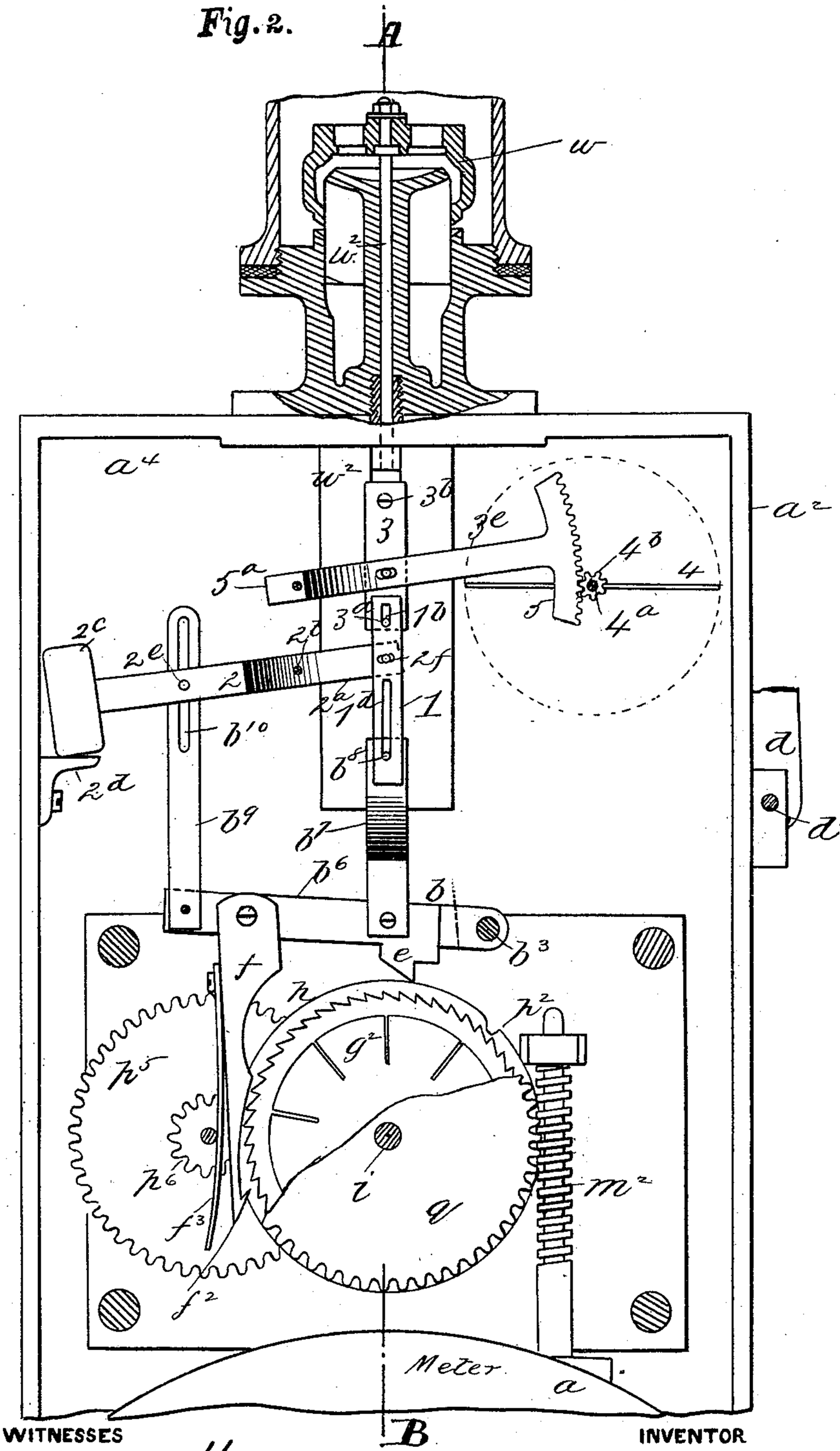
(No Model.) 4 Sheets—Sheet 2.

R. W. BROWNHILL.

APPARATUS FOR VENDING GAS.

No. 405,944. Patented June 25, 1889.

Fig. 2.



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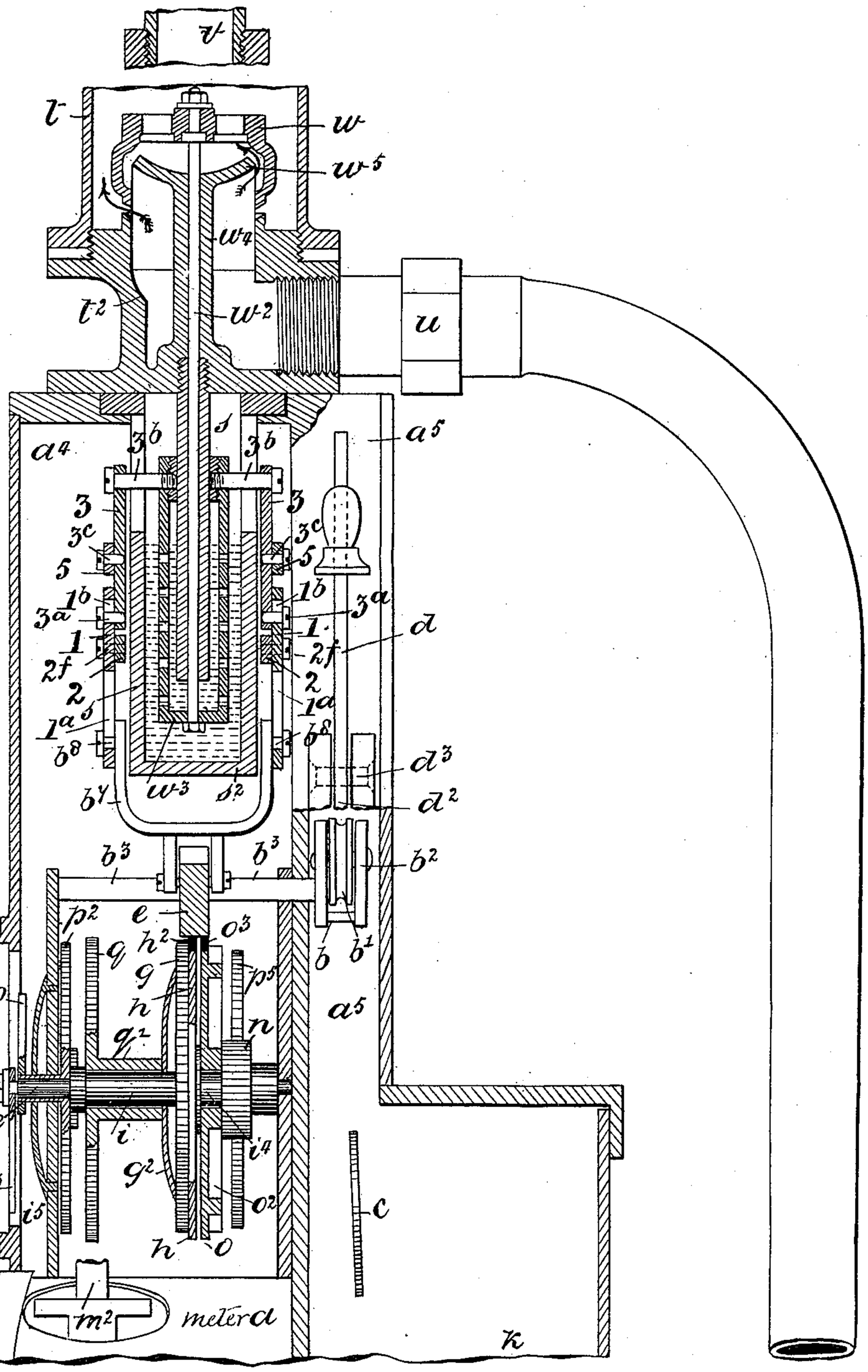
(No Model.) 4 Sheets—Sheet 3.

R. W. BROWNHILL.

APPARATUS FOR VENDING GAS.

No. 405,944 *Fig. 3.* Patented June 25, 1889.



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(No Model.) 4 Sheets—Sheet 4.

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APPARATUS FOR VENDING GAS.

No. 405,944. Patented June 25, 1889.

Fig. 4.

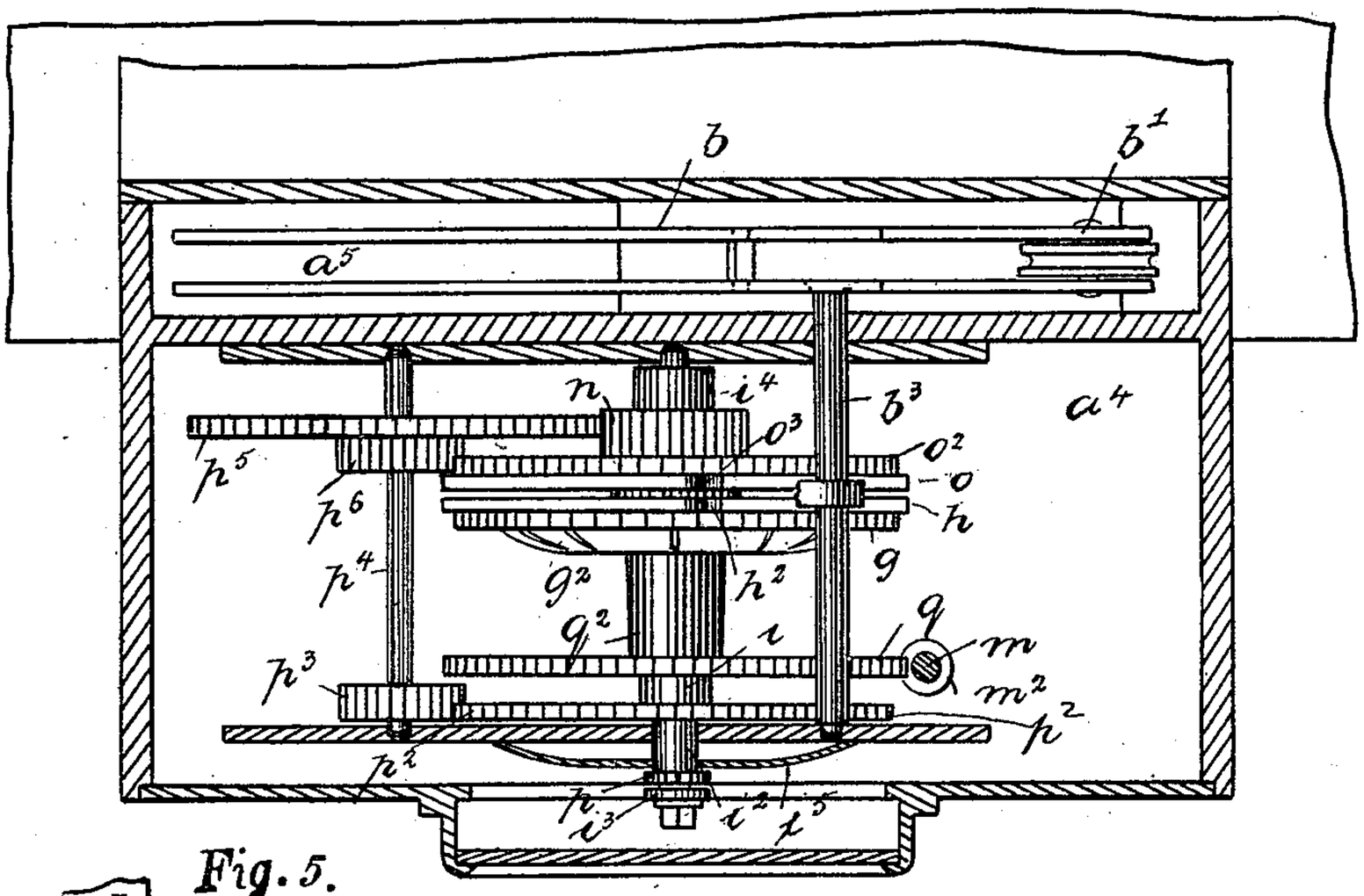


Fig. 5.

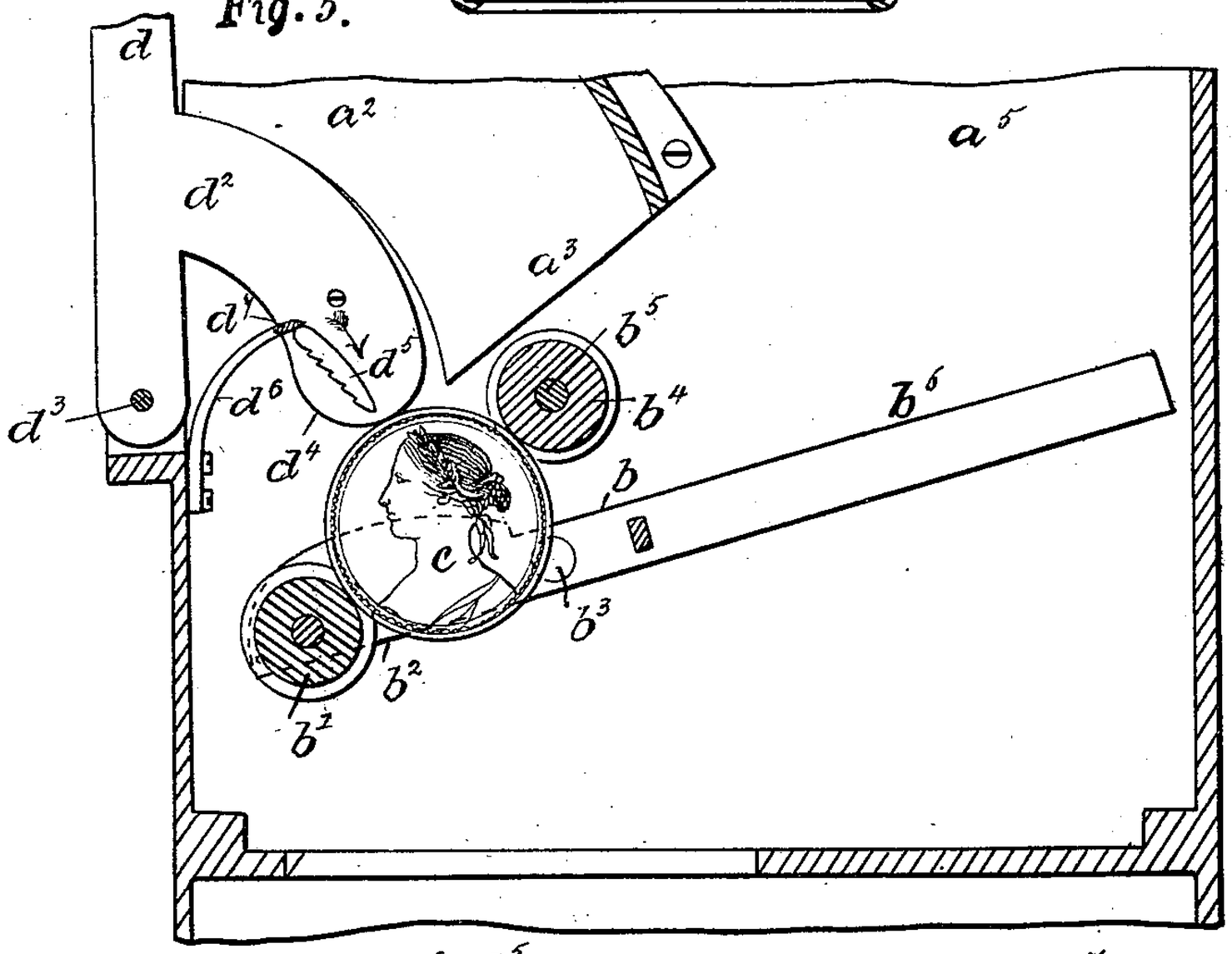


Fig. 7.

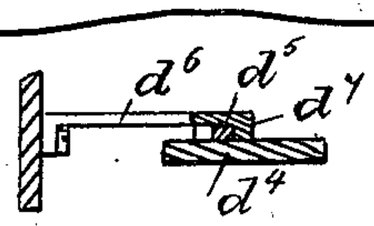
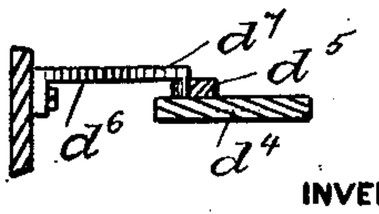


Fig. 8.



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UNITED STATES PATENT OFFICE.

ROWLAND WILLIAM BROWNHILL, OF ASTON NEW TOWN, BIRMINGHAM, COUNTY OF WARWICK, ENGLAND.

APPARATUS FOR VENDING GAS.

SPECIFICATION forming part of Letters Patent No. 405,944, dated June 25, 1889.

Application filed June 29, 1888. Serial No. 278,565. (No model.) Patented in England May 13, 1887, No. 7,012; in France March 5, 1888, No. 176,142, and March 8, 1888, No. 176,220, and in Germany March 12, 1888, Nos. 22,737 and 22,738, and March 20, 1888, No. 23,292.

To all whom it may concern:

Be it known that I, ROWLAND WILLIAM BROWNHILL, engineer, a subject of the Queen of Great Britain, residing at 44½ High Street, Aston New Town, Birmingham, in the county of Warwick, England, have invented certain new and useful Apparatus for Vending Gas, (for which applications for Letters Patent have been made as follows: Great Britain May 13, 1887, No. 7,012; France March 5, 1888, initial No. 176,142, and March 8, 1888, initial No. 176,220; Germany March 12, 1888, initial No. R. P. 22,737, March 12, 1888, initial No. R. P. 22,738, and March 20, 1888, initial No. R. P. 23,292;) and I do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification

This invention relates to a gas-vending apparatus for giving out a determinate quantity of gas on the same having been previously paid for by depositing a coin or coins within a receptacle or through a slit made in the inclosing-framing of the said means. Thus the gas-vending apparatus, in connection with a gas-meter, consists, essentially, of a coin-lever which is operated by a coin or coins pushed or introduced into the apparatus in prepayment for gas to be supplied, and which lever, through links or the like, gives a proportionate or partial backward movement to a disk or disks having inclined notches cut within their peripheries, wherein a catch or cross-bar lies when the meter is stopped or at rest. The other parts consist, essentially, of trains of wheel-work, which are driven directly from the drum of the meter, and through some of them communicate the necessary forward movements to the disks, which are the gas-measuring-out disks.

Figure 1 represents in front elevation, with some of the parts broken away, gas-vending mechanism constructed and arranged according to my invention. It will be seen that the valve for the shutting off of gas from the meter is shown closed, and with the catch or tooth within the notches of both penny and shilling measuring-out disks, and, further, it will also be seen that in this arrangement the coin which is tendered in prepayment for the gas to be delivered has to be pushed home by an arm worked by a lever, which is unable to return until it has completely fulfilled its duty. In this said Fig. 1 the coin is shown dropped between the pulley-jaws and the pusher-arm just in the act of approaching its periphery, so as to pass it home into the receptacle made to receive it, and also to rotate the measuring-out disks to an extent equal to one pennyworth of gas, as hereinafter fully described. Fig. 2 represents a like view as Fig. 1, but with the valve open and the parts in the positions which they respectively assume on the gas-vending mechanism being in action or impelled by the action of the gas passing through the meter, whose motion is transmitted through the drum-shaft. Fig. 3 represents, partly in elevation and partly in vertical section, the said gas-vending mechanism, taken upon the dotted lines A B, Fig. 2. Fig. 4 is a horizontal section and top side plan of the said mechanism, taken upon the dotted lines C D, Fig. 1. Fig. 5 is a back sectional view of the back inclosing-casing of the mechanism, exhibiting the guide-slit, the back of the pusher-arm and lever, with a raised rack upon the face of the former, around the back and front of which the returned end of a spring travels on the pushing in and pulling out of the lever. The coin which is tendered in prepayment for certain cubic metric-gas delivery is shown pushed fully through the jaw-like pulleys and in a position which it assumes on falling. Fig. 6 represents the raised rack and spring for preventing the lever from being partially pushed home and then withdrawn. Fig. 7 represents a like view, with the hooked end of the spring at the back of the rack, while in Fig. 6 the said hooked end is shown engaging with the teeth of the rack.

The same letters of reference indicate corresponding parts in Figs. 1 to 7, both inclusive, of the accompanying drawings.

a is a gas-meter provided with the usual de-

livery or service pipe, and the gas passing therethrough is controlled by the drum of the meter, which, as previously described, is impelled by the flow of gas, whose volume it measures. The chambers of the drum are of known capacity, and its revolution is controlled and indicated by trains of wheel-work, which register the quantity of gas upon dials placed for that purpose. In this form of my invention the drum is stopped only by the shutting off of gas, which would otherwise flow into the service-pipe.

b is a lever fulcrumed at b^3, with a box or divided-like end b^2, consisting of two plates separated from each other to the full distance of the breadth of a penny, and with the end thereof inclosed by a grooved pulley b', so that as the coin is pushed home, as hereinafter described, it drops between the inside periphery of the said grooved pulley and the center pin, upon which the lever turns. Thus, the lever consists of a long and a short arm, the one for working the prepayment and gas-delivery mechanism and the other for receiving the coin.

The view Fig. 1 shows the partition between the coin-receptacle and the mechanism-inclosing casing broken away, as it will be seen from the transverse sectional plan, Fig. 4, that the fulcrum at b^3 works through the divisional wall, which separates the said mechanism-inclosing casing from the coin-receiving compartment.

b^4 is a loose pulley turning upon a fixed axis b^5, secured within the coin-receptacle casing a^5 of the front casing a^4, and upon the pulleys b' and b^4, the coin *c* is dropped through the coin-slit a^2 when the pusher-arm and lever have been pulled back. The coin-slit a^2 has a guide-spout a^3 for conducting the said coin above the space between the rollers. The coin is pressed home between the pulleys by the pusher-arm d^2 of the lever *d*, which is fulcrumed upon a pin center d^3 at its lower end. The forward end d^4 of the pusher-arm d^2 has a raised rack d^5 upon one side, standing out from the face of the said end, as best seen in the back elevation, Fig. 5, and in the sectional views, Figs. 6 and 7. This rack is plain upon its top edge and toothed upon its under edge with the teeth raking outwardly.

d^6 is a flat spring with a hooked or returned end d^7, and which said end moves alternately upon the plain top side and the racked underside. Thus on the pushing in of the pusher-arm d^2 and the carrying with it of the rack d^5, the teeth of the rack are made to wipe over the returned outer end d^7 of the spring d^6, and should the lever *d* be only partially pressed home it is prevented from being again pulled out by the said end of the spring confronting the reverse way of the teeth, which thereby prevents the same being moved until the rack-teeth have completely wiped or traveled over the end d^7 of the spring as aforesaid. By this means any attempt to fraudulently obtain gas other than in a prescribed manner is prevented. Further, the pulling out of the lever straightens out the spring and makes the hooked end d^7 travel up the plain top edge and return to its normal position in front of the lower end of the rack. Thus, after the coin *c* has been fully pressed home by the edge of the part d^4 of the pusher-arm d^2 impressing itself upon the rim of the coin, the whole of the teeth of the rack have been made to travel and wipe over the end d^7 of the spring, when the spring reaching the top end of the rack, slightly straightens out, and brings the said end d^7 upon the curved part, so that on the lever *d* being pulled out the spring then further straightens out and travels back on the plain top edge in the direction as indicated by the arrow, and on arriving at the bottom lower end the spring shortens again, so as to bring its end that it shall be able to act upon the rack-teeth for the next forward movement of the lever.

It will be seen that the pulling out of the lever for the uncovering of the coin-slit and the pushing in of the lever for the pressing home of the coin makes the end of the spring travel around both the plain and serrated parts of the standing-up rack. It will also be observed that the pulling out of the lever is necessary for the uncovering of the coin-slit a^2.

The long arm b^6 of the lever *b* has a catch or tooth *e* upon its under side, which is made to engage with notches h^2 o^3 of a penny measuring-out disk *h* and a shilling measuring-out disk *o*, as best seen in the sectional plan, Fig. 4, and in the vertical section, Fig. 3, and fast upon the outside face of the penny measuring-out disk *h* is a ratchet-wheel *g*, and with the teeth of this ratchet-wheel the hooked end f^2 of the swinging pawl *f*, connected to the arm b^6 of the lever *b* engages. The hanging pawl *f* has a flat spring f^3 at its back, which on being moved upwardly takes the hooked end into position with the teeth, but on its descent, pressure being relieved, it falls away from the teeth by being hung out of the center of motion.

The lever *b*, which is counterpoised by the weight of the valve and other auxiliary moving parts disposed above it, as hereinafter described, carries a forked upright b^7 with fixed studs or pins b^8 near its upper ends, which work within upright longitudinal slots 1^a of opposite slides 1, which are worked in an upward direction by the short end 2^a of a weighted arm 2, fulcrumed at 2^b, having upon its extreme outer end a weight 2^c, which is limited in its motion by a bracket-stop 2^d. The slides 1, which are situated on the two opposite sides of the chamber or casing s^2 of the mercurial slide *s*, have short slots 1^b in their upper ends, wherein opposite pins 3^a, carried upon the lower ends of upper slides 3, rest. These upper slides 3 are connected by pins 3^b to the movable valve *w* by a valve stem or stalk w^2, the cognate parts of which said valve-stem

and valve will be fully described later on in this specification.

The extreme outer end of the arm b^6 of the lever b carries an upwardly-directed and jointed arm b^9, with a long slot b^{10} at its upper end, wherein a pin 2^e, carried by the weighted arm 2, works. The bottom b^{11} of this slot is for the purpose of reclosing the valve on the pulley-jaws being opened to their fullest extent—that is, when the coin has got half-way through—so that should a coin or any other object be designedly placed between the jaws for the purpose of holding them open or the lever down, then the object is frustrated, as the gas is thereby cut off by the closing of the valve. Thus on the introduction of a penny through the coin-slit a^2, and on the same being directed to the top of the short end of the lever between the grooved pulleys, the pressing inward of the coin depresses the short end b^2 of the lever b and raises the long arm b^6 and the tooth or catch e from out of the notches h^2 o^3 of the gas-measuring-out disks $h\,o$, and raises the forked upright b^7 and its pin b^8 above the lower end of the slots 1^a of the slides 1, thereby freeing the said slides from any downward pressure, thus allowing the said slides to rise and press upward the valve w through the intervention of its stalk w^2 and the upper slide 3. The rising or upward movement is effected by the pin 2^f on the end of the short arm 2^a of the weighted arm 2 rising by the falling of the weighted end 2^c on the same being free to move. Thus the bottoms of the grooves 1^a follow the upward movements of the pins b^8, thus allowing the lower slides 1 to rise by the falling of the weighted end of the arm 2, consequent upon the same being weighted and fulcrumed, as represented, and which said upward movement of the slide raises the valve by the rising of the upper slides 3, which are connected with the valve-stalk.

The partial rising of the arm b^6 raises the upwardly-directed arm b^9, and the falling of the weighted arm 2 brings its pin 2^c to the bottom b^{11} of the slot b^{10} of the said arm b^9, so that the further pressing inward of the coin, and the consequent changing of the distance between the grooved pulleys, further depresses the short arm b^2 of the lever b, and raises the long arm b^6 of the said lever, and thereby still further pressing upward the upright arm b^9 and raising the weighted arm 2 into a neutral position, which thus allows the valve and valve-stem and upper slide 3 to fall, and shutting off gas, as represented in Fig. 1.

The raising of the long arm b^6 of the lever b raises the swinging pawl f and makes its hooked end f^2 engage with the teeth of the ratchet-wheel g, moving the said ratchet-wheel round to an extent of six teeth, which is an equivalent to one-twelfth revolution of the penny measuring-out disk and one hundred and forty-fourth of the shilling measuring-out disk.

The ratchet-wheel g and penny measuring-out disk h are tight upon an arbor i, whose outer end i^2 is reduced and carries the penny indicating-finger i^3, whose rotation is made in front of the dial i^5, so that the said wheels and arbor with finger at its end move together, and so does, also, a rear part i^4 of the said arbor with a pinion n fixed upon it, which engages with a toothed wheel p^5, (best seen in the plan Fig. 4,) for communicating motion to the shilling-finger p, mounted upon the sleeve end of a toothed wheel p^2.

The shilling measuring-out disk o runs free upon the rear part i^4 of the said spindle i, and a reduced motion thereto is communicated through the same train of wheels that communicate a like motion to the shilling-finger axis. Thus motion to the said disk o and its finger p is transmitted from the pinion n through the wheel p^5 to the spindle p^4, which has fast upon it pinions p^3 p^6 of like diameters. The pinion p^3 communicates motion to the shilling-finger wheel p^2, while the pinion p^6 communicates a like motion to the shilling measuring-out disk o, and which motion is reduced, in manner as aforesaid, so as to make the said finger and disk rotate only at a speed of one hundred and forty-fourth that of the penny measuring-out disk and finger h i^3. Working loosely upon the arbor i is a tangential meter-wheel q, driven from a worm m^2 of a meter-axis m, and which said axis receives its motion direct from the meter-drum.

Disposed between the inner end of the sleeve q^2 of the meter-wheel q and the ratchet-wheel g is a friction-clutch g^2, by means of which motion from the meter is transmitted to the penny and shilling measuring-out disks, for taking them back through the measured distances which they have been moved forward. The clutch consists of a dished disk of metal with inwardly-directed slit edges. The function of the clutch is to create sufficient binding-power between the face of the ratchet-wheel g and the meter-wheel q, so that after the measuring-out disks have been advanced measured distances equivalent to the amount of gas paid for, the measuring-out disks and driven wheels of the meter part move together at a rate proportional to the drum's motion. Thus the rising of the swinging pawl f pulls round the ratchet-wheel and measuring-out disk, leaving the meter-wheel q, which is in gear with the worm m^2, stationary, consequent upon it being unable to rotate other than in the direction of the meter-drum, and after the said ratchet-wheel has been moved to a measured distance it re-rotates or moves backward by the clutch creating sufficient friction between the wheels, as aforesaid, to make the whole move together as if they were rigid upon one shaft. The mercurial slide s, for making a sound joint for preventing the escape of gas on the working of the valve, is as follows:

s^2 is an outer cylindrical casing, open at top and closed at bottom, with slots through its opposite sides, wherethrough pins 3^b pass in

connecting the slides 3 to the valve-stalk carrier w^3, to the lower end of which the valve-stalk w^2 is fixedly connected. The valve-stalk passes through an inner tube or sleeve w^4, whose upper end carries a dished seat w^5, coming within the inside of the valve w, which surmounts its stalk w^2.

t is the valve-casing; t^2, the base thereof, wherethrough gas from the outlet-pipe u, connected with the meter, passes, so that the gas, when the valve is open, as in Fig. 3, passes in the directions indicated by the arrow to the service-pipe v.

The action of the machine is as follows: The coin tendered in prepayment for gas required to be consumed is dropped into the coin-slit a^2 when the lever d is fully pulled back, and in dropping through it falls upon and between the rollers, and also between the sides of the divided short end b^2 of the lever b. When in this position, as in Fig. 1, the lever d is moved inwardly, as indicated in the said Fig. 1, with the presented edge d^4 of the pusher-arm d^2 pressing forcibly upon the upper edge of the coin, the lever being further pressed forward, forces down the short arm b^2, turns the lever b upon its fulcrum b^3, raises the long arm b^6, and takes the catch or tooth e from out of the notches h^2 o^3 of the measuring-out disks, raises the forked upright b^7 and its fixed studs or pins b^8, freeing the slides 1 from downward pressure, which are now made to rise by the weighted arm 2, whose inner end 2^a is connected to the said slides 1 by studs 2^f, and which upward movement of the said slides raises the upper slides 3 through the pins 3^a, working in the short slots 1^b, and slightly raises the valve-stalk, and with it the valve. This is the first movement, and it may be here observed that the falling of the weighted arm 2 has caused the pin 2^e to fall down the slot b^{10} to nearly the end b^{11}. The continued and further movement of the lever brings the penny half-way through or midway between the rollers b' b^4, which position creates the closing of the valve by the continued upward movement of the long arm b^6 of the arm b, causing the bottom b^{11} of the slot b^{10} of the upwardly-directed arm b^9 to raise the long arm of the weighted lever 2, thereby lowering the valve by depressing the slides 1, whose opposite slots 1^a work over the pins b^8 and draw down the upper slides 3, and with them the valve-stalk and valve, so as to close the valve, as in Fig. 1, and cut off gas. During the partial opening of the valve and its closing, as aforesaid, the raising of the arm b^6 of the lever b has raised the swinging pawl f and made its hooked lower end engage with the teeth of the ratchet-wheel g and pull the ratchet-wheel round to the extent of six teeth and the measuring-out disk h through a distance of one-twelfth of a revolution, and the the shilling measuring-out disk through a distance of one hundred and forty-fourth of a revolution, bringing the respective notches h^2 o^3 into the positions indicated at Figs. 1 and 4. The motion of both penny and shilling measuring-out disks is communicated and indicated by the fingers $i^3 p$, and during the time that the said disks are moved forward to a measured distance the resistance offered by the clutch g^2 is less the force applied, so that the clutch remains quiescent with the meter-wheel q; but on the coin c being fully pushed home through the rollers it drops by its own weight into the coin-receptacle k, made to receive it. The lever b now being free of the coin, the weight-pressure of the valve and the parts connected with it causes the long arm b^6 of the lever to be lowered or pressed downward (with the short end b^2 raised) until the point of the catch or tooth e rests upon the peripheries of both penny and shilling measuring-out disks, as indicated in Fig. 2, and in consequence of the slides 1 being free of downward pressure of the studs b^8 they rise by the falling of the weighted arm 2, thereby raising the valve through the intervention of the upper slides 3, connected with the lower slides 1, and so allow gas to flow from the meter to the delivery-pipe v until the notches h^2 and o^3 of the penny and shilling measuring-out disks h and o, respectively, become coincident and under the point of the tooth or catch e, when it falls into both notches, allows the long arm b^6 to be lowered, which pulls down the forked upright b^7 and its pins b^8 pulls down the slides 1 by coming at the bottom of the slots 1^a, raises the weighted lever into a horizontal position, lowers and closes the valve through the intervention of the upper slide 3, connected with the lower slide, and puts the parts into their normal positions, as represented in Fig. 1.

The parts are prevented from falling too rapidly by the fly 4, consisting of radiating vanes turning upon a fulcrum center 4^a, with a pinion 4^b upon it, which gears with a toothed sector 5, fulcrumed at 5^a, and connected by pins 3^c to the upper slides 3, by which means the falling or lowering of the parts are only slowly allowed to move into their predetermined positions.

In applications filed by me June 12, 1888, Serial Nos. 276,846 and 276,847, I have shown, described, and claimed certain improvements in gas-vending apparatus, and hence in the present application do not lay claim to the features or combinations claimed in said applications.

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

1. The combination, with a gas-meter and a service-pipe containing a valve, of vending mechanism connected with said meter and valve and comprising releasing devices operated by the forcing inward and releasing of a coin, substantially as described and set forth.

2. The combination, with a gas-supply pipe, of vending mechanism provided with a detent normally holding the said mechanism from operation, and adapted to be released by the

insertion of a coin within the apparatus, as described and set forth.

3. The combination, with a coin-lever b b' b^2 b^6, pivoted at b^3, and having a tooth or catch e, of disks h o, having notches h^2 o^3, as set forth.

4. The combination, with mechanism for controlling the gas delivery and registration, of the coin-operated lever b, provided with the roller b', and having the tooth e engaging with the wheels h o, substantially as set forth.

5. In a gas-vending apparatus, the combination, with the gearing-train receiving motion from the meter-drum and the valve w, of the forked upright b^7, slides 1 and 3, weighted lever 2, lever b b^2 b^6, and arm b^9, substantially as described.

6. In a gas-vending apparatus comprising mechanism for insuring the delivery of a measured quantity of gas and a coin-operated lever by which said mechanism is restrained and released, the combination, with said lever, of the lever d, provided with a coin-pusher d^2, substantially as described.

7. In a gas-vending apparatus, the combination of the coin-pushing-home arm or lever d d^2, carrying a rack d^5, the spring-pawl d^6 d^7, and the pawl located upon the fixed framing and adapted for preventing the lever from being withdrawn until the coin has been fully pushed home, thus preventing fraud, as set forth.

8. The combination, with the valve w w^2 and its casing and coin-lever b, with tooth e, and pawl f, of slides, arms, and levers b^7, 1, 2, 3, and b^9, and their cognate parts, as set forth.

9. The combination, with the meter-wheel q and clutch g^2, of the penny and shilling disks h o, provided, respectively, with the notches h^2 o^3, as set forth.

10. The combination, with the penny and shilling disks h o, provided, respectively, with notches h^2 o^3, of transmitting and reduction gear n and the attendant transmitting and reduction gear and cognate parts i i^2 i^3 i^4 i^5 p' p^2 p^3 p^4 p^5 p^6 n o^2, as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 26th day of April, 1888.

ROWLAND WILLIAM BROWNHILL.

Witnesses:
HENRY SKERRETT,
MILES E. HUGHES,
Both of Birmingham.