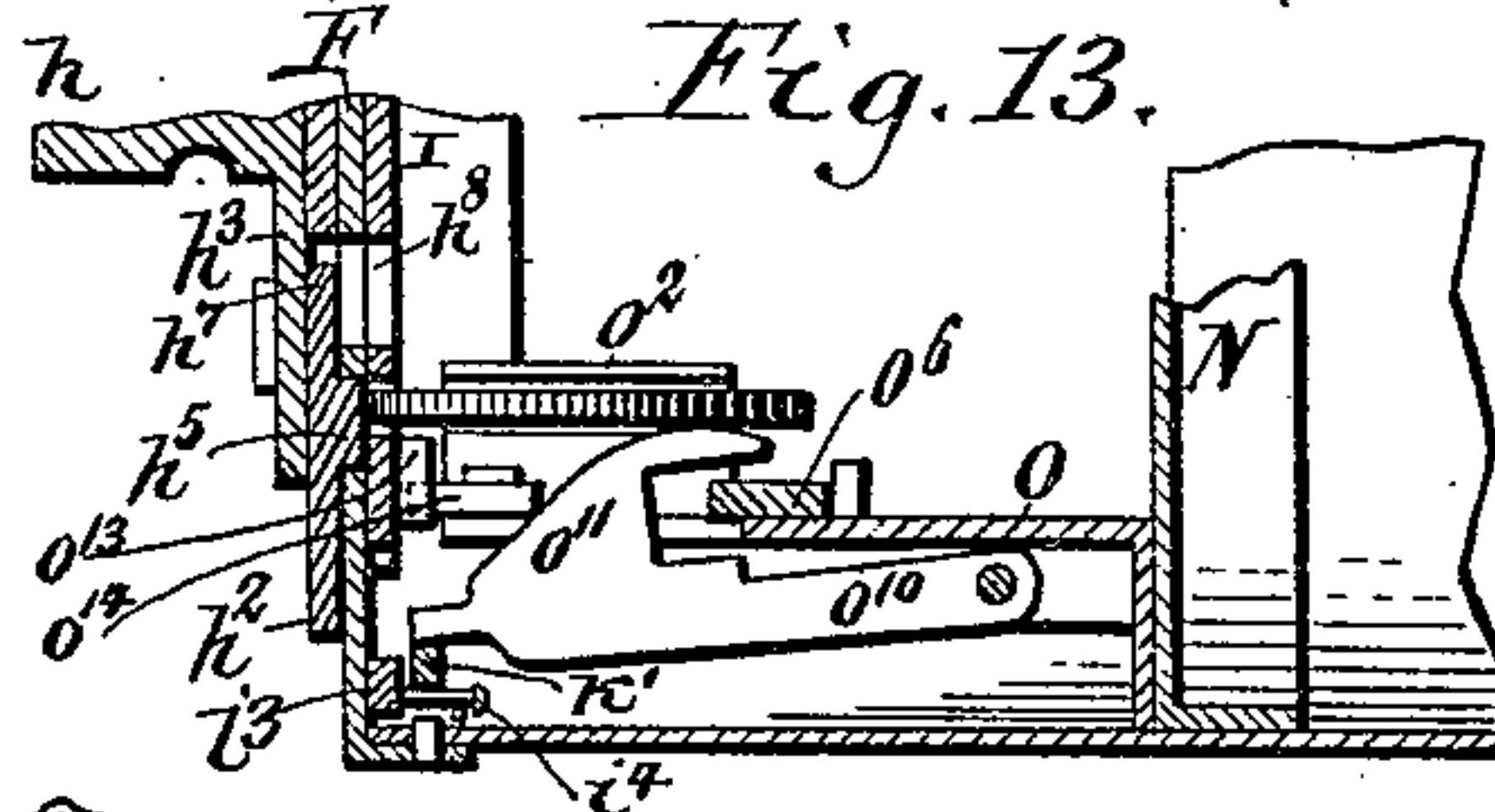
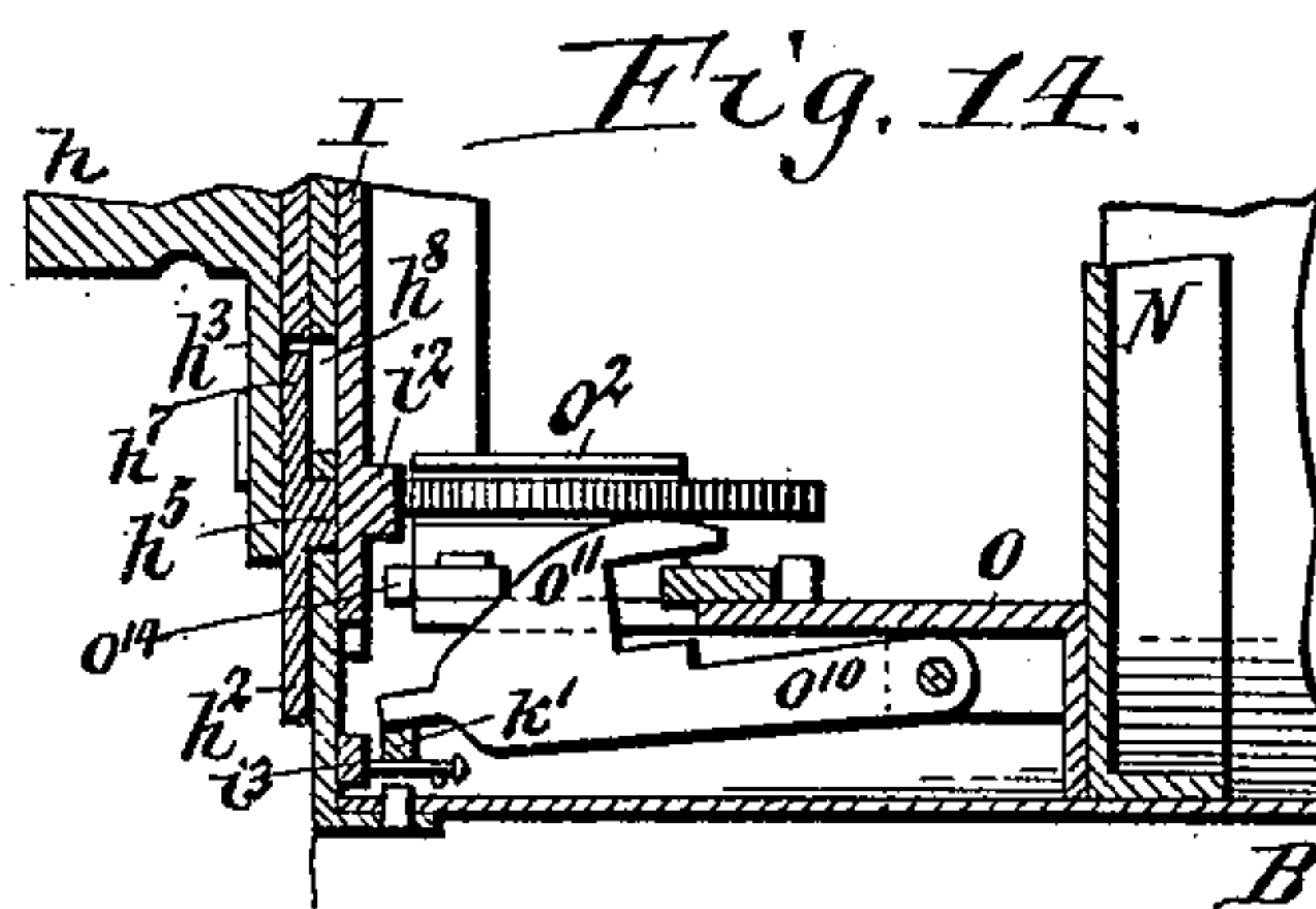
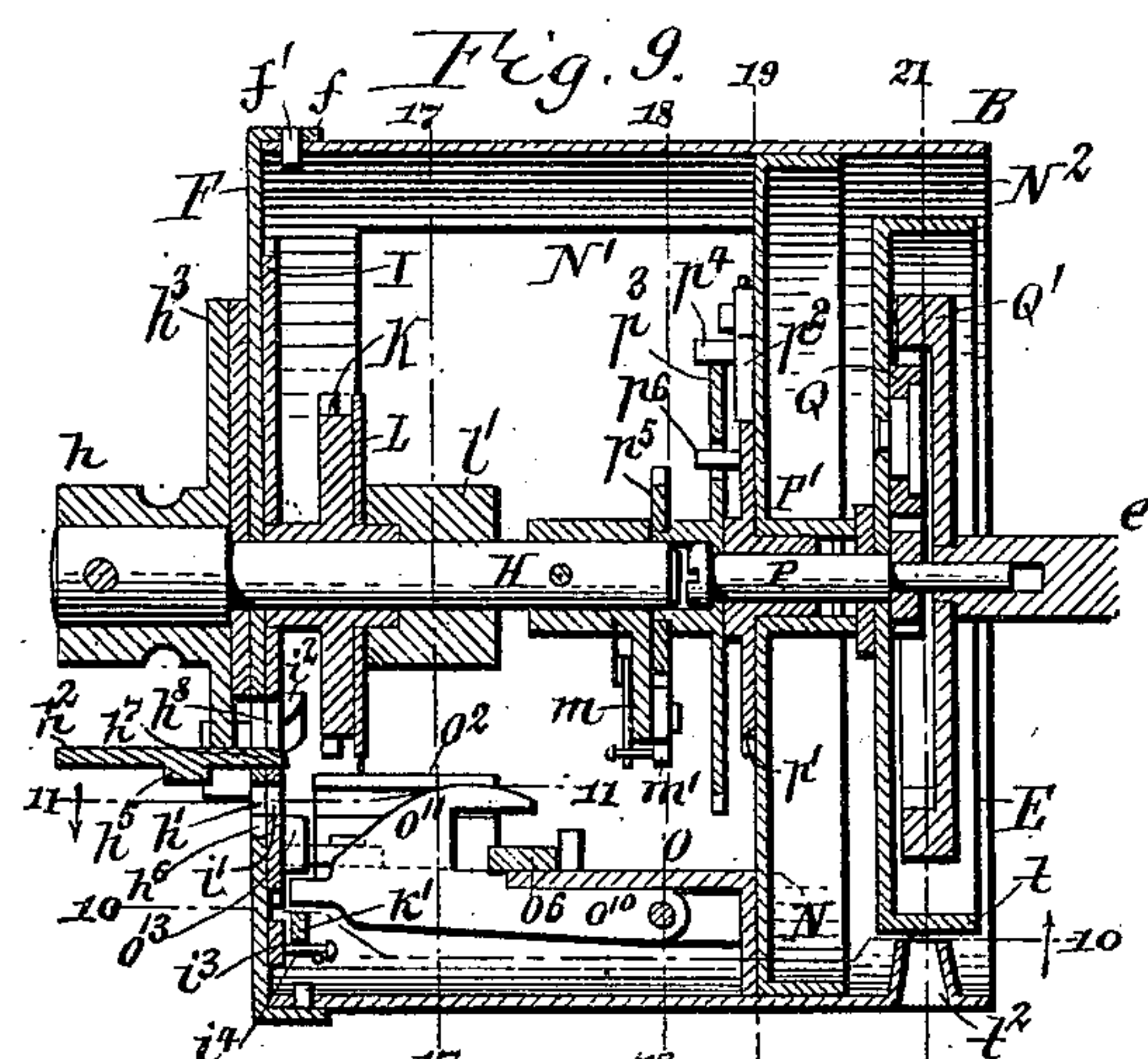
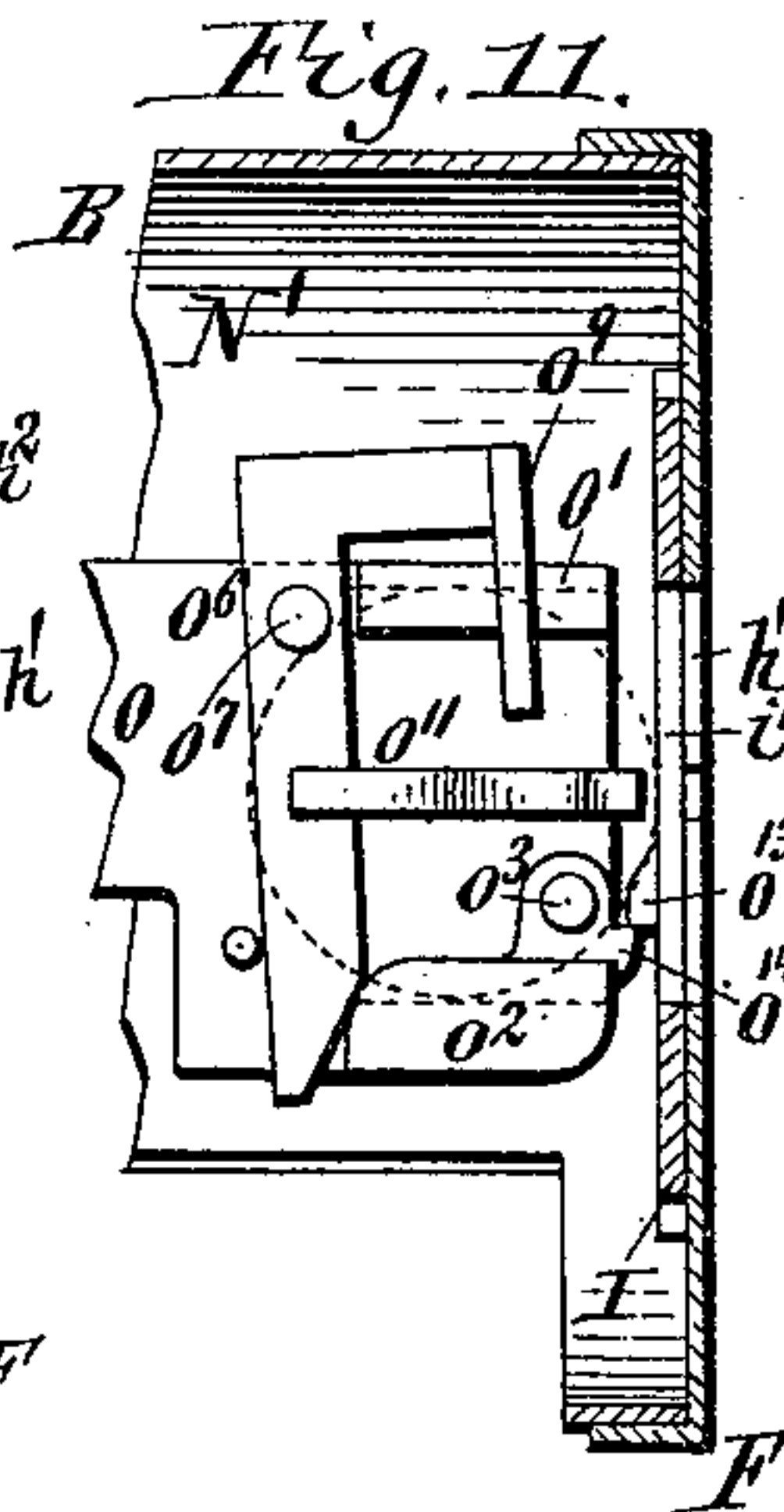
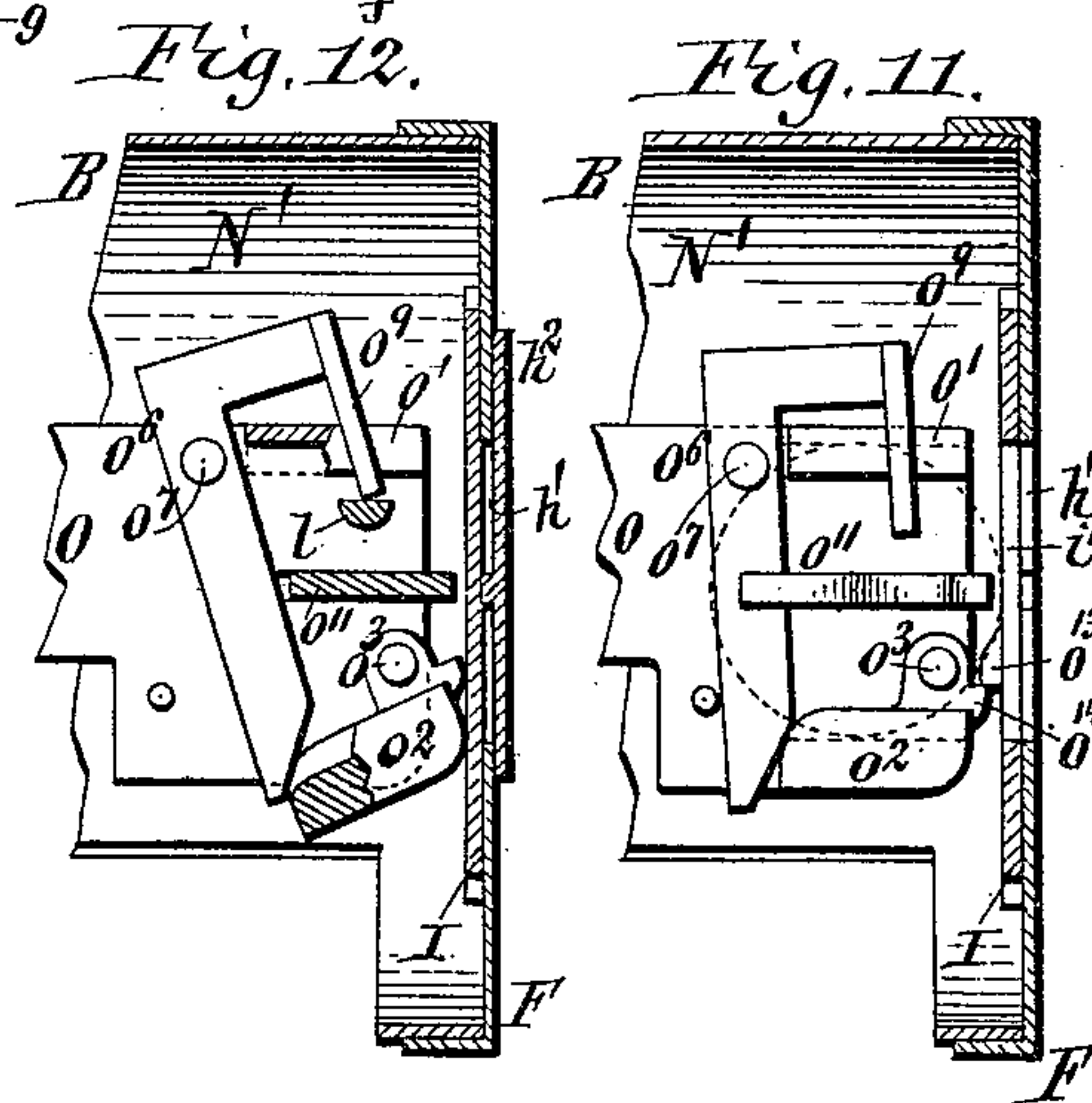
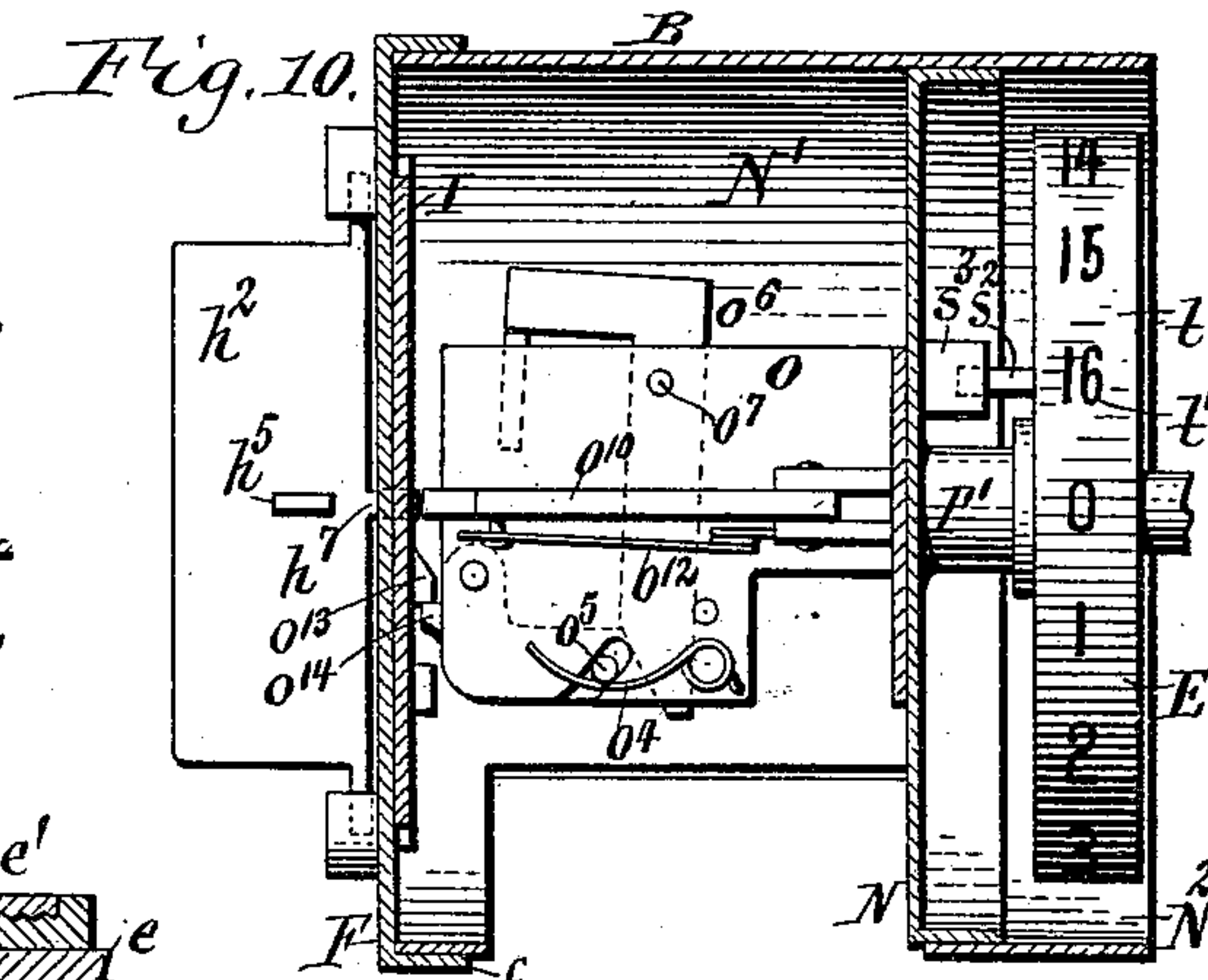
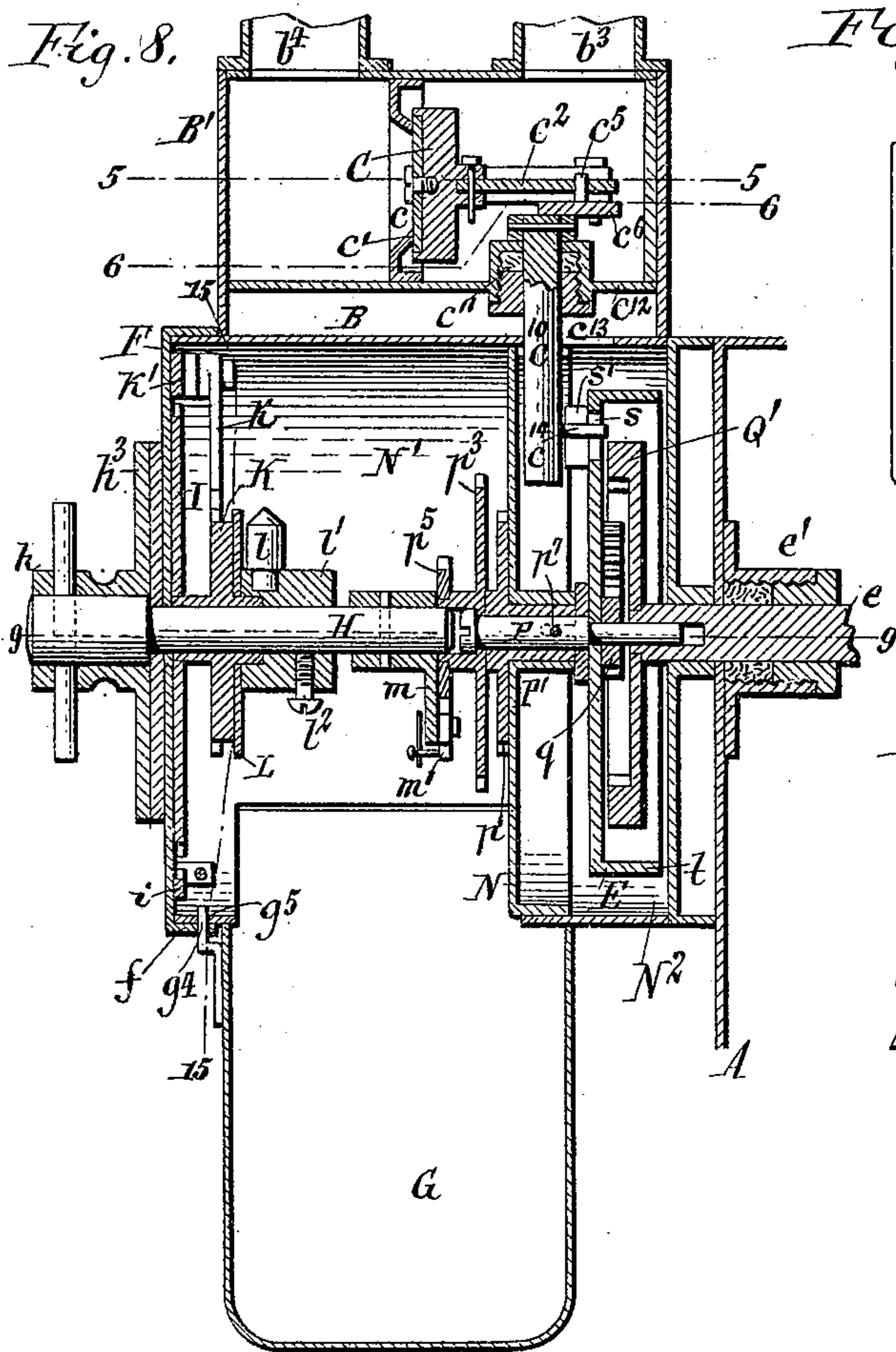


Patented Nov. 21, 1899.

(No Model.)

(Application filed May 29, 1899.)

4 Sheets—Sheet 2.



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No. 637,401.

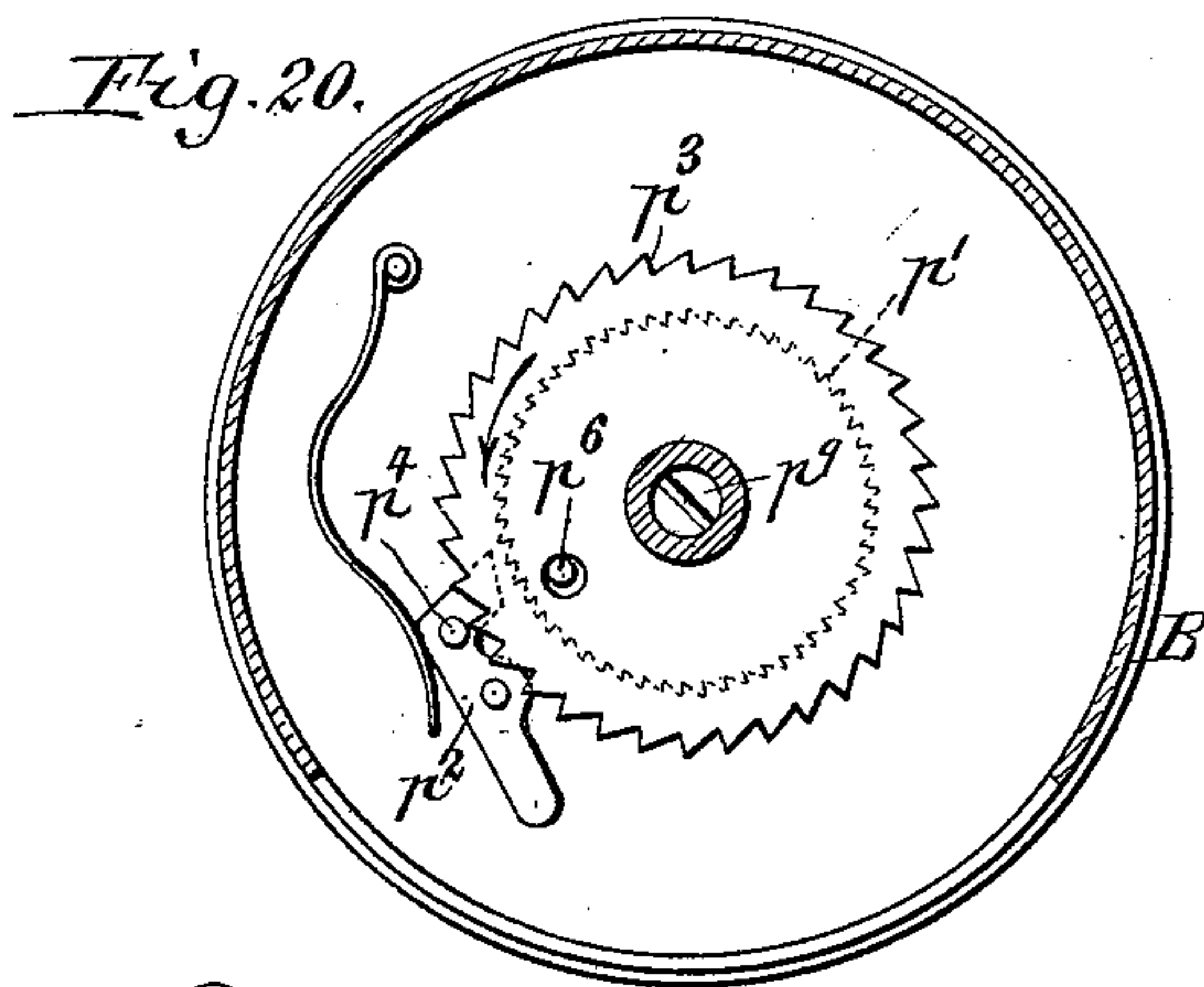
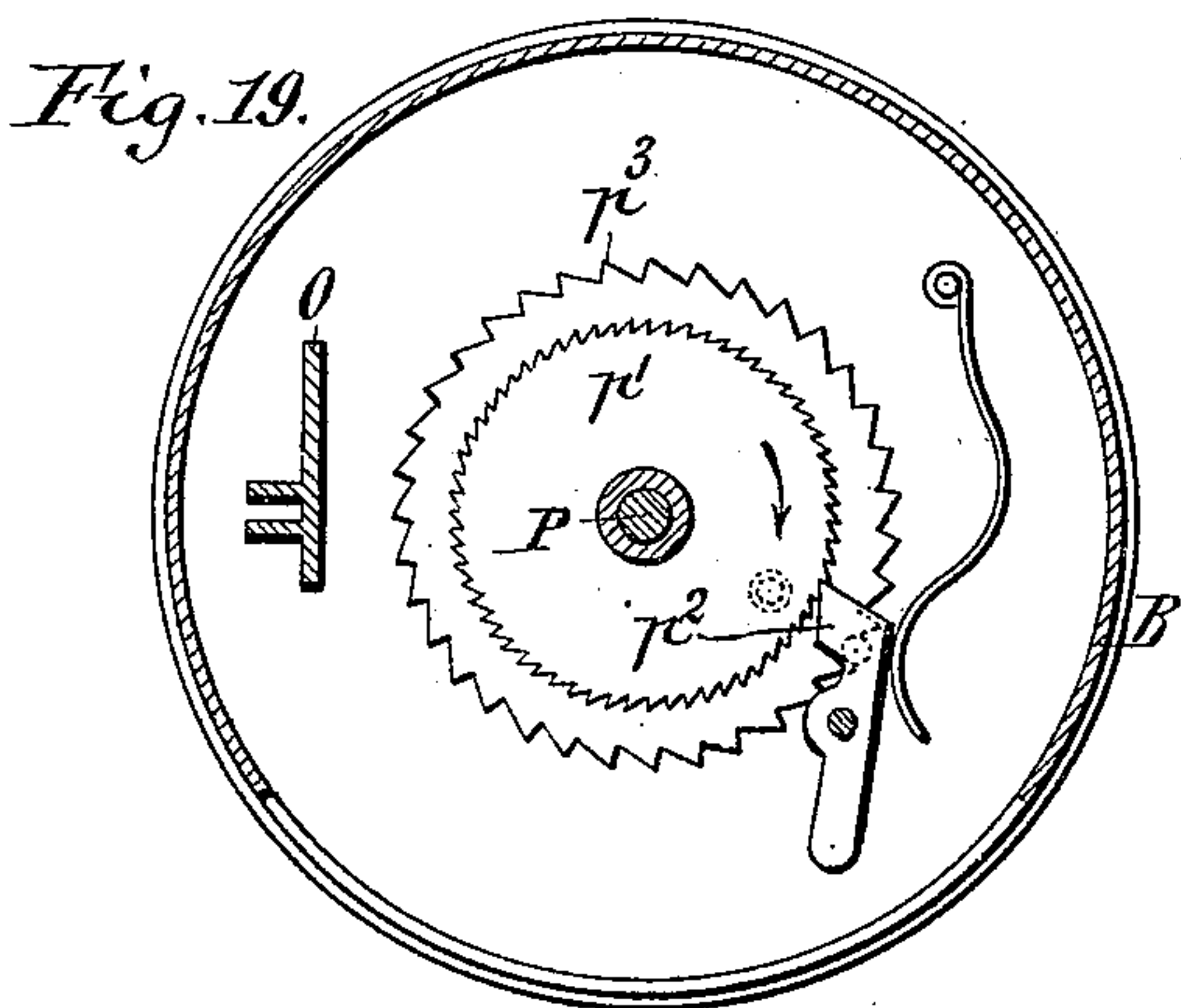
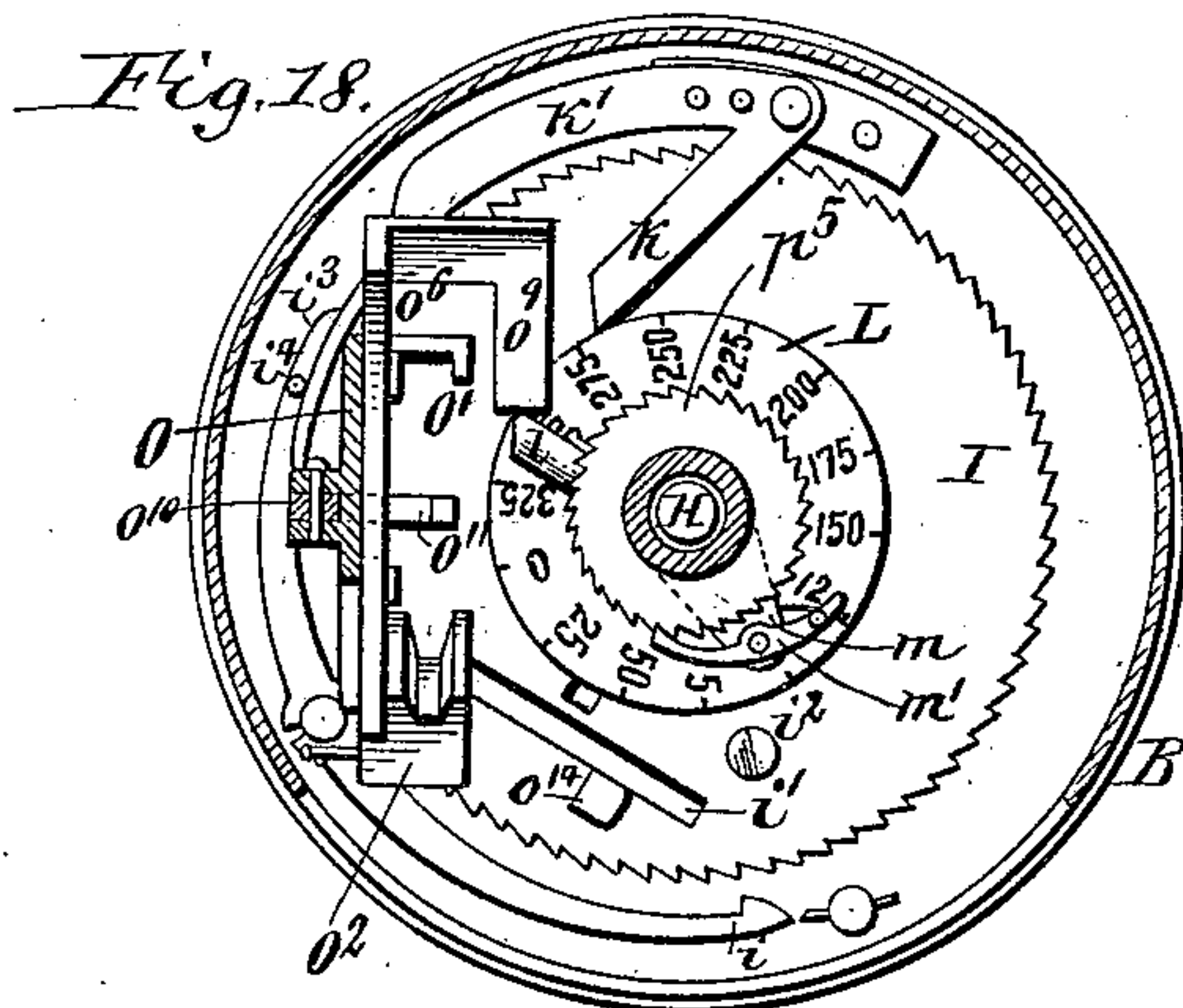
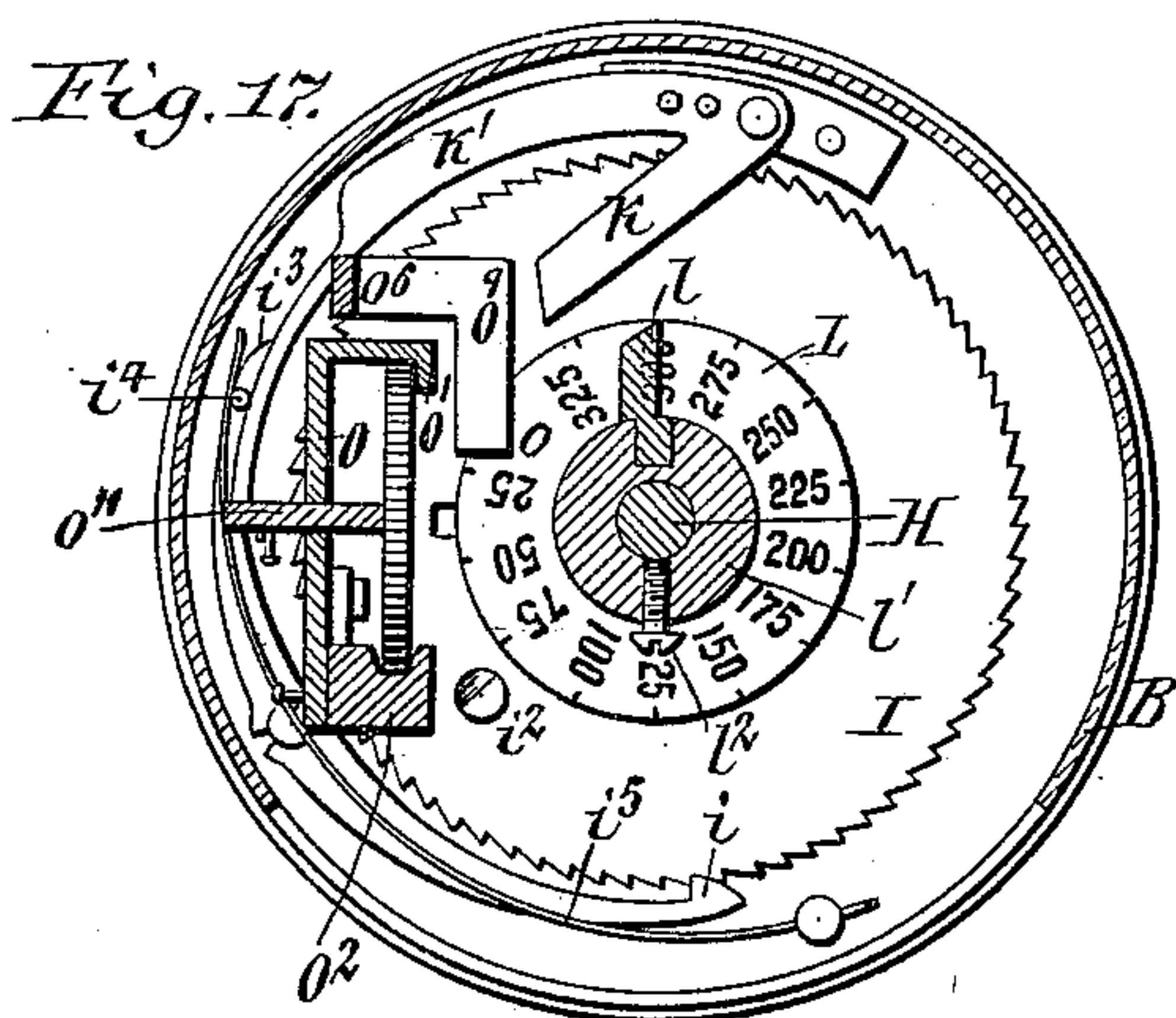
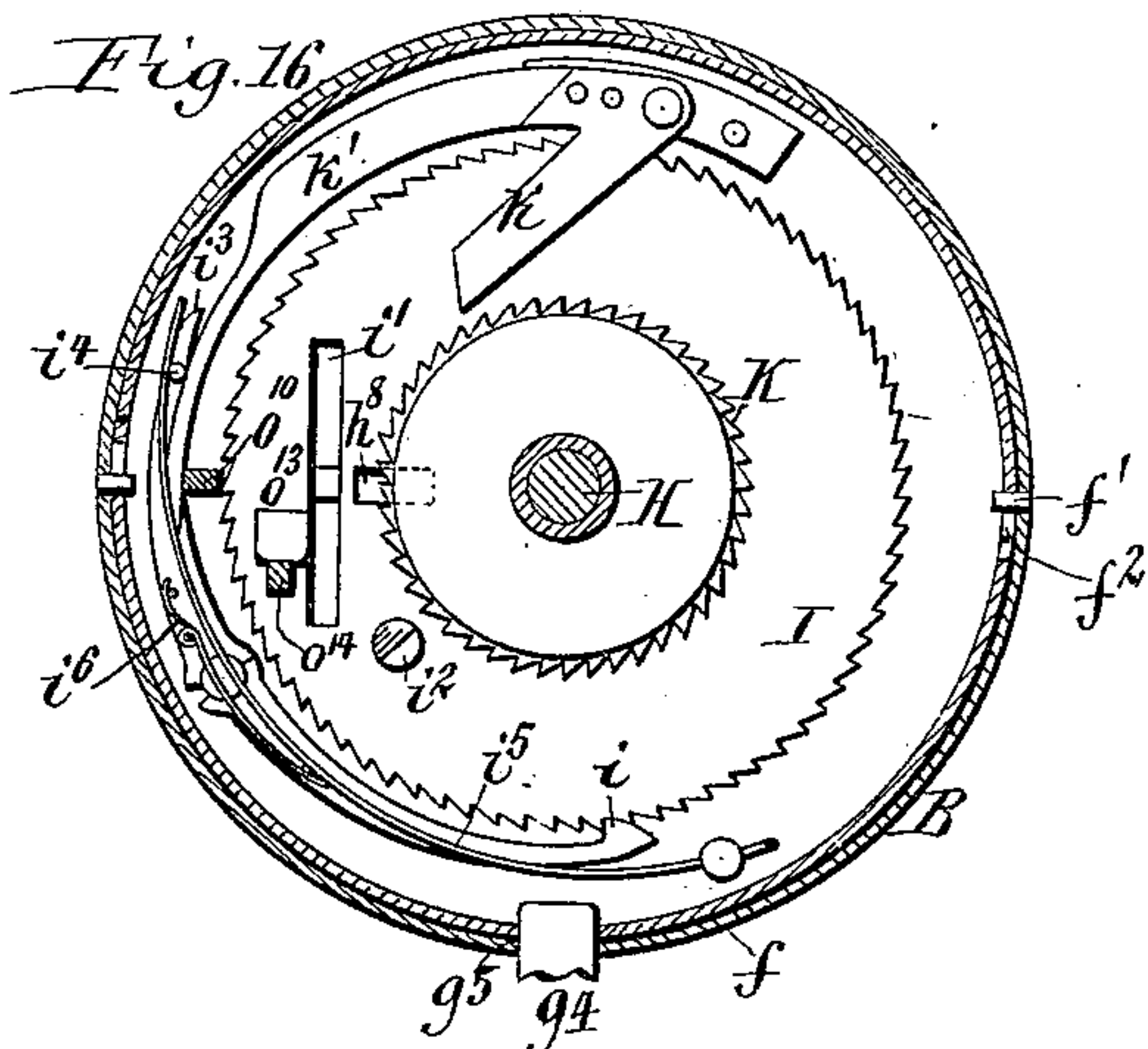
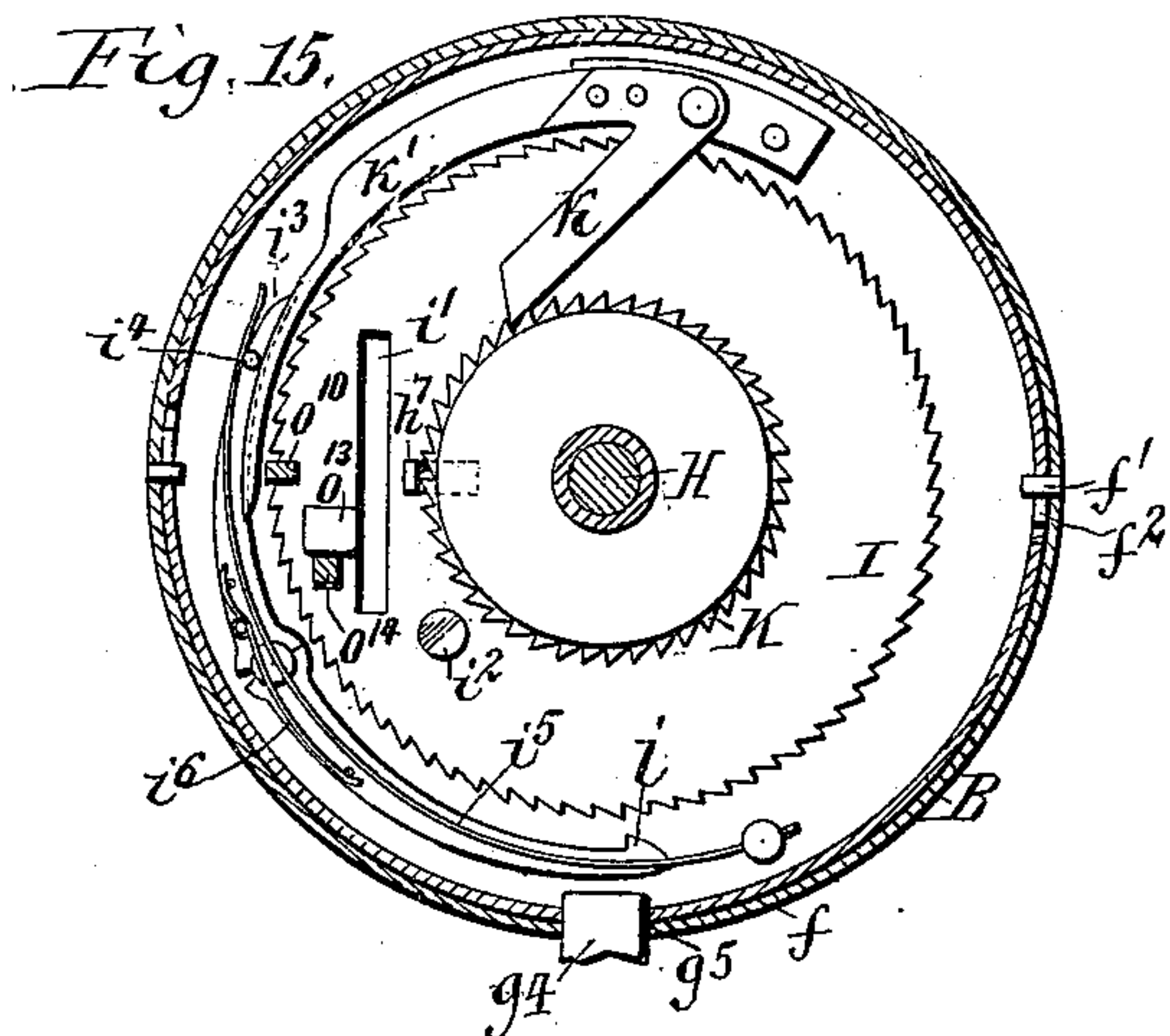
Patented Nov. 21, 1899.

F. E. MORGAN & F. A. LANE.
PREPAYMENT VENDING APPARATUS.

(No Model.)

(Application filed May 29, 1899.)

4 Sheets—Sheet 3.



Henry L. Deck.
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UNITED STATES PATENT OFFICE.

FRANK E. MORGAN, OF NEW YORK, AND FREDERIC A. LANE, OF POUGHKEEPSIE, NEW YORK, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO D. H. BURRELL & CO., OF LITTLE FALLS, NEW YORK.

PREPAYMENT VENDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 637,401, dated November 21, 1899.

Application filed May 29, 1899. Serial No. 718,680. (No model.)

To all whom it may concern:

Be it known that we, FRANK E. MORGAN, a resident of the city and county of New York, and FREDERIC A. LANE, a resident of the city of Poughkeepsie, county of Dutchess, State of New York, citizens of the United States of America, have invented new and useful Improvements in Prepayment Vending Apparatus, of which the following is a specification.

10 This invention relates to a prepayment vending apparatus which is mainly designed for use in connection with fluid-meters—for instance, gas-meters; but some of the devices forming part of this apparatus are also applicable to other uses.

In prepayment vending apparatus for gas-meters it is necessary that the apparatus should be incapable of being actuated in the purchasing direction by the movement of the meter, because if the supply of gas to the meter continues from any cause after the prepayment apparatus has been returned to the initial point and the purchased volume of gas has been delivered and the prepayment apparatus does not prevent the movement of the meter such movement and the delivery of gas will continue. This can happen, for instance, when the valve mechanism is imperfect, so that the valve does not close tightly, or when the valve leaks. In that case the delivery of gas will continue unless the prepayment apparatus positively prevents the movement of the meter. Various frictional devices have been resorted to for rendering the actuation of the prepayment apparatus from the meter difficult in such circumstances, but none of them, so far as we know, positively prevents such actuation.

One object of our invention is to provide a mechanism which positively locks the prepayment apparatus against actuation from the meter.

Another object of this invention is to provide simple and convenient means for adjusting the prepayment apparatus to the price of the gas or other fluid, so that when the price is changed the prepayment apparatus can be readily adjusted to the new price.

Other objects of our invention are to improve the construction, arrangement, and operation of the various parts and groups of parts which compose the apparatus, as will be hereinafter fully set forth.

In the accompanying drawings, consisting of four sheets, Figure 1 is a front elevation, on a reduced scale, of the upper part of a gas-meter which is provided with our improved prepayment vending apparatus. Fig. 2 is a top plan view of the same with the top plate of the meter removed. Fig. 3 is an end elevation of the same, showing the cover of the coin-slot open and the parts in the position for receiving the coin. Fig. 4 is a similar view showing this cover closed and the purchasing-shaft partly turned. Fig. 5 is a horizontal section through the valve and connecting parts in line 5 5, Fig. 8. Fig. 6 is a similar section in line 6 6, Fig. 8. Fig. 7 is a vertical transverse section in line 7 7, Fig. 5. Fig. 8 is a vertical longitudinal central section of the vending apparatus. Fig. 9 is a horizontal section in line 9 9, Fig. 8, showing the parts in the position for receiving the coin. Fig. 10 is a vertical longitudinal section in line 10 10, Fig. 9, viewed from the outer side in the direction of the arrow. Fig. 11 is a vertical longitudinal section through the coin-slot in line 11 11, Fig. 9, viewed from the inner side in the direction of the arrow and showing the parts of the coin-holder in the position for receiving the coin. Fig. 12 is a similar view showing the parts of the coin-holder in the position for discharging the coin. Fig. 13 is a horizontal section through the coin-holder corresponding with Fig. 9, but showing the coin partly inserted. Fig. 14 is a similar view showing the coin fully inserted. Fig. 15 is a vertical cross-section taken in line 15 15, Fig. 8, immediately behind the two front ratchet-wheels and looking forward, showing the pawl of the large ratchet-wheel disengaged and that of the small ratchet-wheel engaged. Fig. 16 is a similar section showing the position of these pawls reversed. Fig. 17 is a vertical cross-section in line 17 17, Fig. 9, looking forward and showing the coin inserted in the coin-holder. Fig. 18 is a similar cross-section in line 18 18, Fig. 9, showing the parts in the position in which they are ready to discharge the coin from the holder.

Fig. 19 is a cross-section in line 19 19, Fig. 9, looking forward and showing the locking ratchet-wheel and the releasing ratchet-wheel of the intermediate shaft both locked. Fig. 20 is a view showing the same ratchet-wheels viewed from the front and showing the pawl of the locking ratchet-wheel disengaged by the releasing ratchet-wheel. Fig. 21 is a cross-section in line 21 21, Fig. 9, looking forward and showing the gears connecting the meter-actuated shaft with the intermediate shaft. Figs. 22 and 23 are horizontal sections through the valve-actuating disk in lines 22 22 and 23 23, Fig. 21, respectively. Fig. 24 is a longitudinal central section, on an enlarged scale, of the intermediate shaft and connecting parts. Fig. 25 is a longitudinal section showing a modified construction of the gearing connecting the intermediate shaft with the meter-actuated shaft. Fig. 26 is a sectional rear elevation of this gearing and the casing. Figs. 27, 28, and 29 are perspective views showing the parts of which the valve-casing is composed, 27 representing the inner piece and partition, 28 the angle-plate, and 29 the inclosing shell. Fig. 30 is a fragmentary inside elevation showing one of the bayonet-joints by which the front head of casing of the prepayment mechanism is attached to the body of the casing.

Like letters of reference refer to like parts in the several figures.

A, Figs 1 to 3, represents the casing of an ordinary gas-meter provided in its upper portion with the usual chamber, which contains the flag-arms a and rods a' , the vertical shaft a^2 , operated thereby, the registering mechanism a^3 , operated from the shaft a^2 , and a horizontal shaft a^4 , which connects with the prepayment apparatus and which is rotated from the registering mechanism or from any other moving part of the meter by any suitable means. As shown in Fig. 2, this shaft a^4 is rotated from the registering mechanism a^3 by a worm a^5 , meshing with a gear-wheel a^6 on an underlying shaft a^7 , which carries a pinion a^8 , meshing with a gear-wheel a^9 on the inner end of the shaft a^4 . All of these parts may, however, be of any other usual or suitable construction.

B represents the casing of the prepayment apparatus, preferably of the form of a horizontal cylinder and secured by soldering or otherwise to the outside of the meter-casing A on the inlet side thereof in line with the meter-actuated shaft a^4 .

B', Figs. 1 to 8 and 27 to 29, represents the valve-casing, which is mounted on the casing B of the prepayment apparatus and which is divided by a partition b into an inlet-compartment b' and an outlet-compartment b^2 . The inlet-compartment b' is provided at its top with an inlet-nipple b^3 , to which the service-pipe is connected, and the outlet-compartment is provided with a similar nipple b^4 , which is connected by a U-piece b^5 with the usual inlet-pipe b^6 of the meter.

b^7 represents the usual outlet-pipe of the meter, arranged at the opposite end of the latter.

C, Figs. 5, 7, and 8, represents the valve, which is arranged vertically in the inlet-compartment b' , so as to move horizontally toward and from the partition b . The latter is provided with an opening c , which is controlled by the valve and provided with an annular valve-seat c' . The valve is actuated, preferably, by the following parts: c^2 represents a sliding cross-head which is attached to the valve and guided between grooved horizontal guide-bars c^3 , secured to the partition b . This cross-head is provided with a transverse slot c^4 , in which engages an upwardly-projecting pin c^5 , which is secured to a horizontal lever c^6 , arranged underneath the cross-head and pivoted to one of the guide-bars c^3 near the free end thereof. This lever is provided near its end with a longitudinal slot c^7 , in which engages the pin c^8 of a crank c^9 . The latter is secured to the upper end of a vertical rock-shaft or spindle c^{10} , which extends downwardly through a stuffing-box c^{11} in the bottom c^{12} of the inlet-compartment b' and into the casing B of the prepayment apparatus. This casing is provided with an opening c^{13} for the passage of this spindle. By rocking the latter the valve is moved toward or from its seat.

The valve-casing B' is preferably constructed of four pieces, as shown in Figs. 27, 28, and 29. These consist of the following parts: d represents a four-sided inclosing shell which is open at the top and bottom, Fig. 29, and adapted to be soldered to the top of the cylindrical casing B. d' represents an inner piece, which is composed of the top plate d^2 and the bottom plate d^3 of the valve-casing, an upright side plate d^4 , which connects these plates on one side and is formed in one piece therewith, preferably of sheet-brass, and the partition b , which is secured by soldering between these top and bottom plates. d^5 is an angle-plate which is fitted between the top and bottom plates to close the open end and side of the inlet-compartment b' and support these plates. In assembling the parts this angle-plate is placed between the top and bottom plates of the inner piece d' , and the latter is then inserted into the shell d and secured therein by soldering, thus forming a strong valve-casing of sheet metal in a simple and inexpensive manner.

The lower end of the valve-spindle c^{10} is provided with a rearwardly-projecting pin or finger c^{14} , Figs. 8, 21, and 22, which is engaged by a rotary disk E, so that the rotary movement of this disk in one or the other direction opens or closes the valve. This disk is rotated by the purchasing movement in the proper direction to open the valve and is turned back by the action of the meter until it is returned to the starting-point, when it closes the valve.

The purchasing movement is applied by the

purchaser after inserting the coin to a hand-actuated shaft which is capable of movement either in the purchasing or in the return direction and is transmitted to the valve-actuating disk by an intermediate shaft, which is capable of movement only in the purchasing direction, while the return movement is imparted to the valve-actuating disk by gearing connecting it with the meter-actuated shaft. The latter is made for convenience in two sections, a section a^4 , already described, which is connected with a moving part of the meter and mounted in the meter, and a section e , which is mounted in the casing of the prepayment apparatus and which projects through the rear wall thereof, so that it can be inserted through a stuffing-box e' , secured to the side wall of the meter-casing, and be coupled to the section a^4 by any suitable means—for instance, by a pin e^2 and slot e^3 , Fig. 2.

The front end of the cylindrical casing B of the prepayment apparatus is closed by a removable circular head F, Figs. 1 to 4, 8, 9, and 30, which is provided with a rearwardly-projecting marginal flange f , which fits around the front end of the casing B. This head is secured to the casing by inwardly-projecting studs f' , secured to the flange f and entering angular or bayonet-joint slots f^2 in the front end of the casing.

G, Figs. 1 to 4 and 8, represents the coin-receptacle, which is connected on one side to the under side of the casing B by a hinge g and fastened on the opposite side by a hasp and staple g' g^2 and lock g^3 . In order to prevent the removal of the head F except when the coin-receptacle has been unlocked, the latter is provided on its upper front side with an upwardly-projecting lip g^4 , which engages in a slot g^5 in the lower portion of the flange f of the head and in a similar slot in the casing B when the coin-receptacle is in its normal position, as represented in Fig. 8. Upon unlocking the receptacle and swinging it down on its hinge this lip is withdrawn from the slots, and the head can now be removed, if desired.

H represents the hand or purchasing shaft, which is journaled horizontally in the head F and provided on the outer side thereof with a knob or handle h .

h' represents the coin-slot arranged in the head F vertically on one side of the shaft H, and h^2 is a cover which is hinged to the outer side of the head, between the coin-slot and the shaft, so that this cover swings toward the shaft in opening the cover.

h^3 is a mutilated disk which is secured to the purchasing-shaft H on the outer side of the head and provided with a straight side h^4 , which is so arranged that when it is placed parallel with the coin-slot or vertically, as shown in Fig. 3, the hinged cover h^2 can be opened, while in all other positions of the disk the circular marginal part thereof projects over the hinged cover and prevents the opening of the same, as shown in Fig. 4.

I represents a ratchet-wheel which is secured to the shaft H adjacent to the inner or rear side of the head F. This ratchet-wheel has its teeth faced in such direction that the pawl i , engaging therewith, permits the rotation in the purchasing direction, but prevents rotation in the return direction. This ratchet-wheel is provided with a coin-slot i' , which corresponds with the coin-slot h' in the head F and compels the return of this ratchet-wheel to the initial position, in which both slots coincide, before a coin can be inserted. The hinged cover h^2 is provided on its rear side with a projection h^5 , Figs. 9 and 13, which enters the coin-slot h' in the head when the cover is closed and pushes the coin beyond the coin-slot in the head. The coin-slot in the head is provided with a notch h^6 , Fig. 3, to accommodate this projection, which is somewhat wider than the coin-slot. The hinged cover h^2 is also provided with a tail-piece h^7 , which projects into a slot h^8 in the ratchet-wheel I when the cover is open, Figs. 9 and 10, and prevents the ratchet-wheel from being turned in either direction while the cover remains in that position.

The ratchet-wheel I is provided on its rear side with a projection i^2 , Figs. 14, 15, 16, and 17, which strikes against the outer portion of the coin during the first part of the purchasing rotation of the ratchet-wheel and forces the coin still farther back.

K represents a ratchet-wheel which is secured to the purchasing-shaft H in rear of the ratchet-wheel I. This ratchet-wheel is so much smaller in diameter than the ratchet-wheel I that it does not obstruct the coin-slot in the latter, and its teeth face in the opposite direction, so that the pawl k , which engages therewith, prevents the shaft from rotating in the purchasing direction, but permits rotation in the return direction.

The ratchet-wheel K will be referred to as the "purchasing" ratchet-wheel and the wheel I as the "return" ratchet-wheel. The pawls i and k of these ratchet-wheels are so arranged that they are simultaneously shifted, one into engagement and the other out of engagement, so that the purchasing-shaft H is held either against purchasing rotation or against return rotation. This is conveniently accomplished by the following means: The pawls i and k are pivoted to the inner side of the head F and provided, respectively, with tailpieces i^3 and k' , which extend past each other, Figs. 15 to 18. The tailpiece i^3 is provided with a rearwardly-projecting pin i^4 , which bears against the outer side of the tail-piece k' , and this pin is pressed toward the shaft H by a spring i^5 , thus holding the pawl k in engagement and the pawl i out of engagement, since the tailpiece k' projects from the pivot of the pawl k in the same direction as the pawl, while the tailpiece i^3 projects in the opposite direction. By applying an outward pressure against the tailpiece k' the pawl k is disengaged and the pawl i thrown into

engagement. The tailpiece i^3 is jointed to the pawl i and held yielding in position by a spring i^6 , so that the head of the pawl can yield outwardly in riding over the teeth of the ratchet-wheel during the forward rotation of the latter.

l represents a trip-arm which is secured to the purchasing-shaft H in rear of the ratchet-wheel K , and L is a graduated disk secured to the rear side of the wheel. This disk has on its rear side a circular graduation showing the number of feet of gas which can be purchased by a corresponding rotation of the purchasing-shaft.

The trip-arm l is secured to the shaft H by a hub l' and set-screw l^2 , Figs. 8, 9, and 17, or by other suitable means, so that this arm can be circumferentially adjusted on the shaft to bring it opposite the desired figure on the graduated disk, thereby adjusting the extent of the purchasing rotation of the shaft accordingly. If the price of gas is changed, a corresponding change in the extent of the purchasing rotation is necessary, and this is effected by changing the position of the trip-arm circumferentially.

m is a pawl arm or carrier which is secured to the rear end of the purchasing-shaft H and which carries a pawl m' for transmitting the purchasing rotation of the shaft H to an intermediate shaft which is arranged in rear of the purchasing-shaft and in line therewith.

The coin, which is inserted into the casing B through the coin-slot in the head F and return ratchet-wheel I , enters a stationary coin-holder, which is most clearly shown in Figs. 9 to 14, 17, and 18, and constructed as follows:

N is an upright transverse partition which is secured in the cylindrical casing B at a short distance in front of the rear end of the casing and which divides the latter into a deep front compartment N' and a shallow rear compartment N^2 . The coin-holder is arranged vertically in this front compartment and in rear of the coin-slot in the head F , so as to receive the coin from the same.

O represents the upright side wall of the coin-holder, which is secured at its rear end to the partition N and projects forwardly therefrom. The front portion of this side wall is provided at its top with a fixed coin guide or jaw O' and at its bottom with a movable coin support or guide O^2 , both arranged on the inner side of the side wall and provided with grooves or lips of the proper form and size to guide and hold the coin until discharged from the holder. The coin-support O^2 is pivoted at its front end to the side wall O by a transverse pivot O^3 , so that its rear end can be dropped for discharging the coin. This coin-support is yieldingly held in its normal horizontal position, Figs. 10 and 11, by a spring O^4 , secured to the outer side of the wall O and bearing under an outwardly-projecting stud O^5 on the coin-support O^2 . The rear end of the coin-support is lowered by a vertical releasing-lever O^6 , which is arranged

on the inner side of the wall O in rear of the top guide O' and coin-support O^2 , and pivoted to the wall O by a transverse pivot O^7 . This lever engages with its lower beveled end against the rear end of the coin-support O^2 and is provided at its upper end with an overhanging head O^9 , which stands in the path of rotation of the trip-arm l . The latter reaches the head of the releasing-lever at the end of the purchasing rotation and raises the same, thereby swinging the lower end of the lever forwardly, depressing the rear end of the coin-support O^2 , and discharging the coin, Figs. 12 and 18.

O^{10} is an unlocking-lever which is arranged lengthwise and horizontally in the coin-holder between the top guide O' and the coin-support O^2 . This lever is pivoted at its rear end to the outer side of the wall O by a vertical pivot, so that its front end can swing transversely with reference to the coin-slot and the coin-holder. This lever is provided at its front end with a head O^{11} , which plays in a slot formed in the front portion of the wall O and which has an inclined inner face. The lever is held normally with this inclined inner face projecting across the coin-holder by a spring O^{12} , secured to the outer side of the wall O and bearing against a stud near the front end of the lever. The front end of the lever stands in such relation to the tailpiece k' of the pawl k of the purchasing ratchet-wheel K that an outward movement of the lever will press the tailpiece k' outwardly and release the purchasing ratchet-wheel K and lock the return ratchet-wheel I , while the return movement of the unlocking-lever to its normal position will allow the pawls to return to their normal position, in which the purchasing ratchet-wheel K is locked and the return ratchet-wheel I is unlocked. In the normal position of these parts the unlocking-lever O^{10} projects with its head into the coin-holder and its end is out of contact with the tailpiece of the pawl k of the purchasing ratchet-wheel K and the latter is locked by its pawl, while the return-ratchet is unlocked, as shown in Fig. 15. The purchasing-shaft H is therefore locked against purchasing rotation, but free to be rotated in the return direction until it has reached the initial point, when the return rotation is arrested by a stop O^3 on the return ratchet-wheel I striking upon a nose O^{14} on the front end of the coin-support O^2 , Figs. 9, 11, 15, and 16, or any other suitable construction. The coin-slot of the return ratchet-wheel I now coincides with that in the head F and the hinged cover can be opened, Fig. 9. The coin is now inserted through the slots, but the purchasing-shaft cannot be turned in either direction until the cover is closed, because the return ratchet-wheel I is locked by the tailpiece k' of the cover. As the coin is pushed into the coin-holder it pushes the unlocking-lever O^{10} aside, Figs. 14 and 17, and this lever shifts the pawls i and k , unlocking the purchasing ratchet-wheel K and locking the re-

turn ratchet-wheel I. The hinged cover being closed, the purchasing-shaft can now be turned in the purchasing direction, but not in the return direction, so long as the coin remains in the coin-holder, thereby compelling the rotation of the shaft to be continued in the purchasing direction until the coin is discharged from the coin-holder. When the purchasing rotation has been completed, the trip-arm l strikes the head of the releasing-lever O^6 , Figs. 12 and 18, and moves the latter so as to tilt the coin-support O^2 , thereby discharging the coin from the holder and dropping it into the receptacle below. The discharge of the coin from the holder releases the unlocking-lever O^{10} , which immediately returns to its normal position, thereby allowing the pawls i and k to return also to their normal positions, in which the purchasing ratchet-wheel K is locked and the return ratchet-wheel I is unlocked. The insertion of the coin into the stationary coin-holder therefore simply moves the unlocking-lever and through the latter releases the purchasing ratchet-wheel and locks the return ratchet-wheel. The coin remains stationary in the holder, holding the unlocking-lever and the pawls in this position until the coin is discharged from the holder, when the unlocking-lever and the pawls return to their normal position, and the further purchasing rotation is prevented. The point of the rotation of the purchasing-shaft at which this takes place is controlled by the position of the trip-arm l , as above explained. The purchasing-shaft is therefore capable of rotation in either direction—the purchasing direction or the return direction.

The intermediate shaft, which receives the purchasing rotation from the purchasing-shaft H, and the parts connected with said intermediate shaft are most clearly shown in Figs. 8, 9, 19, 20, and 24 and are constructed as follows:

P represents a shaft which is arranged in line with the purchasing-shaft H and in rear thereof and which is supported in a bearing P' , formed on the rear side of the partition N. This bearing is somewhat larger in diameter than the shaft P and contains a hollow shaft p , which turns in the bearing and in which the shaft P turns. The hollow shaft p carries on the front side of the partition N a ratchet-wheel p' , which has its teeth so arranged that a pawl p^2 , engaging therewith, prevents this wheel from turning in the purchasing direction. This ratchet-wheel will be designated as the "locking" ratchet-wheel. Loosely mounted upon the front end of the shaft P, which projects forwardly beyond the locking ratchet-wheel p' , is mounted a ratchet-wheel p^3 , which has its teeth turned in the opposite direction. This ratchet-wheel will be designated as the "releasing" ratchet-wheel. The pawl p^2 is provided with a forwardly-projecting stud p^4 , by which it engages with the re-

leasing ratchet-wheel p^3 and which locks this wheel against rotation in the return direction.

p^5 is an actuating ratchet-wheel which is secured to the front end of the hub of the releasing ratchet-wheel p^3 and receives its motion from the pawl m' on the rear end of the purchasing-shaft, so that the purchasing rotation of this shaft is transmitted to this ratchet-wheel, while the return rotation of the purchasing-shaft does not affect the actuating ratchet-wheel.

The releasing ratchet-wheel p^3 is coupled with the locking ratchet-wheel p' by a slack coupling, which permits of a slight rotary movement of the releasing ratchet-wheel independent of the locking ratchet-wheel. A simple form of such a coupling (shown in the drawings) consists of a forwardly-projecting stud p^6 , secured to the locking ratchet-wheel and entering a slightly-larger opening in the releasing ratchet-wheel. Upon turning the latter in the purchasing direction, (indicated by the arrows in Figs. 19 and 20,) which is the only direction in which it can be turned, its rotation independent of the locking ratchet-wheel lifts the pawl p^2 out of engagement with the locking ratchet-wheel and unlocks the latter, so that this wheel can now be turned in the purchasing direction. Upon stopping this rotation the pawl drops back and again locks the locking ratchet-wheel. The teeth of the releasing ratchet-wheel are preferably considerably larger than those of the locking ratchet-wheel in order to produce a considerable releasing movement of the pawl. The hollow shaft p , to which the locking ratchet-wheel is secured, is coupled to the inner shaft P, preferably by a cross-pin p^7 , secured in the shaft P and entering notches in the rear end of the hollow shaft p . The locking ratchet-wheel is therefore rigidly coupled with the inner shaft P through the intervention of the hollow shaft p . The latter and the inner shaft P constitute the intermediate shaft, which shaft is composed of these two parts mainly for convenience in assembling the parts.

The valve-actuating disk E is mounted loosely on the inner shaft P in rear of the bearing P' . A washer P^8 is interposed between the disk E and the bearing P' . The hollow shaft p is inserted into the bearing P' from the front and the inner shaft P from the rear. The releasing ratchet-wheel p^3 and the actuating ratchet-wheel are then applied to the projecting front end of the shaft P, and the parts are secured by a screw p^9 , which enters the front end of the shaft P. This screw bears with its head against the projecting end of the shaft P, but clears the shoulder in the hub of the releasing ratchet-wheel, Fig. 24, so that the latter is held in place on the shaft and is free to turn on the same in performing its limited rotary movement independent of the locking ratchet-wheel.

The intermediate shaft Pp is positively

locked against rotation in either direction by power applied to the shaft directly, as the releasing ratchet-wheel and the locking ratchet-wheel face in opposite directions and are both locked by the pawl. Movement can be applied to this shaft only by a power which moves the releasing ratchet-wheel in the direction in which it disengages the pawl from the locking ratchet-wheel, and this movement takes place only in the purchasing direction. The intermediate shaft is therefore capable of movement only in the purchasing direction, and this movement can be applied to the shaft only through the releasing ratchet-wheel, while the shaft is locked against movement in the reverse direction under all circumstances and is also locked against movement in either direction by power applied directly to the shaft.

q is a gear-wheel which is secured to the inner shaft P on the rear side of the valve-actuating disk E . Q is a gear-wheel which is mounted on a stud or arbor on the rear side of the disk E and which meshes with the pinion q .

Q' , Figs. 9 and 21, is an internally-toothed gear-wheel which is secured to the front end of the section e of the meter-actuated shaft, mounted in the rear portion of the casing B . This internal gear-wheel meshes with the gear-wheel Q on the disk E . The rear end of the purchasing-shaft H enters the front end of the hub of the releasing ratchet-wheel p^3 and actuating ratchet-wheel p^5 , and the rear end of the inner shaft P enters an axial bore in the front end of the section e of the meter-actuated shaft, as represented in Figs. 8, 9, and 24, whereby these several shafts are retained in alinement. The section e of the meter-actuated shaft being coupled to the section a^4 thereof, Fig. 2, the internally-toothed gear-wheel Q' is held against movement except by the operation of the meter. The purchasing rotation of the intermediate composite shaft Pp , therefore, by the rotation of the gear-wheel q drives the gear-wheel Q' around on the inner side of the internal gear-wheel Q and so rotates the valve-actuating disk E in one direction. On the other hand, the rotation of the meter-actuated shaft e by the action of the meter causes the rotation of the valve-actuating disk E in the opposite direction through the same train of gear-wheels. The same rotation of the valve-actuating disk can also be produced by the train of gear-wheels represented in Figs. 25 and 26, in which r represents a gear-wheel secured to the rear end of the inner shaft P , r' r^2 gear-wheels secured to a shaft r^3 , which is journaled in the valve-actuating disk E , and r^4 a gear-wheel which is secured to the front end of the section e of the meter-actuated shaft. The wheel r meshes with the wheel r' and the wheel r^2 with the wheel r^4 .

The valve-actuating disk E is provided with an opening s , Figs. 21 and 22, in which the arm c^{14} of the valve-spindle c^{10} engages

when the valve is closed, the spindle being arranged on the front side of the disk, Fig. 8. The purchasing movement of the valve-actuating disk takes place in the direction of the arrow, Fig. 22, and turns the valve-spindle at once so far as to open the valve. During the continued purchasing movement of the valve-actuating disk the arm c^{14} rests against the side of the disk in the position indicated by dotted lines and the same is the case during the return movement of the disk caused by the action of the meter, so that the contact of the side of the disk with this arm holds the valve open and prevents the accidental closing of the same. The disk is provided on its front side, immediately in rear of the opening s , with a projection s' , which strikes against the arm c^{14} as the disk reaches its initial position during its return movement. This projection turns the spindle back so as to close the valve, and the arm c^{14} again enters the opening s of the disk E , whereby the valve is held in its closed position. The disk is also provided on its front side with a stop s^2 , Figs. 21 and 23, which is adapted to strike a stop s^3 on the rear side of the partition N when the disk has reached its initial position and which prevents the disk from turning backward beyond this position. This stop s^2 also strikes the opposite side of the stop s^3 when the disk has completed a revolution in the purchasing direction, so that the disk cannot make more than one revolution. When the purchasing rotation, which is imparted to the intermediate shaft and the valve-actuating disk upon the insertion of a coin, is only part of a revolution, this purchasing movement can be repeated upon the insertion of additional coins until the valve-actuating disk has reached the limit of the rotary movement.

The peripheral flange t of the disk E is provided on its face with a graduation t' , indicating the number of feet of gas which correspond with the rotary movement of the disk, and one character of this graduation is exposed at a time through an opening t^2 in the casing B , as shown in Figs. 1, 9, and 21, so that the consumption can be observed and a new purchase can be made, if desired, before the purchased volume of gas is exhausted. This rotary-valve-actuating device is preferably a disk, as that form of the device is well adapted to prevent accidental rotation of the valve-spindle while the valve is open; but we do not wish to limit ourselves to this form, as the device may be changed in various ways, and it is also obvious that other features of our improved mechanism may be changed in various respects without departing from the principle thereof.

As before described, the intermediate shaft, to which the purchasing rotation is transmitted from the purchasing-shaft, is positively locked against rotation by power applied directly to the shaft. Hence it cannot be rotated by the meter-actuated shaft e a^4 . If

the valve should not seat itself from any imperfection in the parts or should leak, the supply of gas to the meter would continue after the valve-actuating disk E has been returned by the action of the meter to the starting-point, and the gas-pressure would tend to continue the movement of the meter. If the intermediate shaft were not locked, the movement of the meter would be transmitted to this intermediate shaft in the purchasing direction through the gear-wheels connecting the shaft *e* with the shaft P, because the disk E is stationary when it has reached the starting-point and the delivery of gas would continue. This is impossible in our apparatus because the locked intermediate shaft prevents the rotary movement of the meter-actuated shaft after the disk E has returned to the starting-point. The meter mechanism is therefore also locked and cannot operate and deliver gas. The first effect of this is to throw the gas-pressure of the meter on the disk E, which would tend to forcibly close the valve if it is partly open. If the valve should not close under this pressure, the meter would stop unless the pressure should be sufficiently great to break the parts, or some of them, which prevent the meter from working, and in that case the defect would become at once apparent, so that it can be remedied.

We claim as our invention—

1. The combination with a coin-released shaft capable of rotation in the purchasing direction and also in the return direction, means for locking said shaft against movement in the purchasing direction, a meter-actuated shaft, and intermediate mechanism which receives the purchasing rotation from the coin-released shaft and the delivery rotation from the meter-actuated shaft, of a coin-holder, and an unlocking member which is moved out of its normal position by the insertion of the coin and thereby unlocks said coin-released shaft, substantially as set forth.

2. The combination with a coin-released shaft capable of rotation in the purchasing direction and also in the return direction, means for locking said shaft against movement in the purchasing direction, a meter-actuated shaft, and intermediate mechanism connecting the coin-released shaft and the meter-actuated shaft, of a stationary coin-holder, and an unlocking member which is moved out of its normal position by the insertion of the coin and thereby unlocks said coin-released shaft, substantially as set forth.

3. The combination with a coin-released shaft provided with two detent devices operating alternately and in opposite directions, one to prevent the rotation of the shaft in the purchasing direction and the other to prevent the return rotation, of a coin-holder, and an unlocking member which is moved by the insertion of the coin and disengages said purchasing detent device and engages said return detent device, substantially as set forth.

4. The combination with a coin-released shaft provided with detent devices which permit rotation of the shaft either in the purchasing direction or in the return direction and which prevent backward movement of the shaft, of a stationary coin-holder, and an unlocking member which is controlled by the coin and which releases said shaft for the purchasing rotation upon the insertion of the coin and for the return rotation upon the delivery of the coin, substantially as set forth.

5. The combination with a coin-released shaft provided with two detent devices operating alternately and in opposite directions, of a stationary coin-holder, and an unlocking-lever which is moved out of its normal position by the insertion of the coin and which returns to said position upon the delivery of the coin and shifts both detent devices simultaneously, substantially as set forth.

6. The combination with the coin-released shaft, of two ratchet-wheels secured thereto and having their teeth facing in opposite directions, two pawls adapted to engage with said wheels alternately and having overlapping tailpieces, and means whereby said tailpieces are shifted simultaneously, thereby throwing one pawl into engagement and the other out of engagement, substantially as set forth.

7. The combination with the casing provided with an opening for the insertion of the coin, and the coin-released shaft, of a ratchet-wheel having a corresponding opening and secured to said shaft adjacent to the inner side of the casing, a pawl adapted to engage said wheel and prevent its rotation contrary to the purchasing direction, a ratchet-wheel also secured to said shaft within the casing and having its teeth turned in the opposite direction, a pawl adapted to engage said wheel and prevent its rotation in the purchasing direction, and means whereby said pawls are simultaneously shifted, one into engagement and the other out of engagement, substantially as set forth.

8. The combination with the coin-released shaft, of two ratchet-wheels secured thereto and having their teeth facing in opposite directions, two pawls adapted to engage with said wheels alternately, one being in engagement and the other out of engagement, and provided with overlapping tailpieces, a stationary coin-holder, and an unlocking-lever which is moved out of its normal position upon the insertion of the coin and returns to said position upon the delivery of the coin and which bears against said tailpieces and shifts both pawls simultaneously, substantially as set forth.

9. The combination with the casing provided with an opening for the insertion of the coin, and the coin-released shaft, of a ratchet-wheel having a corresponding opening and secured to said shaft adjacent to the inner side of the casing, a pawl adapted to engage said disk and prevent its rotation contrary to the purchasing direction, a ratchet-wheel also se-

cured to said shaft within the casing and having its teeth turned in the opposite direction, a pawl adapted to engage said wheel and prevent its rotation in the purchasing direction, a stationary coin-holder, and an unlocking member which is moved out of its normal position upon the insertion of the coin and returns to said position upon the delivery of the coin and shifts both pawls simultaneously, substantially as set forth.

10. The combination with a coin-released shaft, of a stationary coin-holder having a movable coin-support for the delivery of the coin, means whereby said support is held in its normal position, and a trip device which rotates with said shaft and whereby said support is moved and the coin delivered when the desired rotation has been effected, substantially as set forth.

11. The combination with a coin-released shaft, of a stationary coin-holder having a movable coin-support for the delivery of the coin, means whereby said support is held in its normal position, a trip device which rotates with said shaft and whereby said support is moved and the coin delivered when the desired rotation has been effected, and means whereby said trip device can be adjusted on said shaft to regulate the distance through which said shaft rotates before it causes the delivery of the coin, substantially as set forth.

12. The combination with a coin-released shaft, of a stationary coin-holder having a coin-support which is movable for the delivery of the coin, a trip device which rotates with said shaft and whereby said support is moved and the coin delivered when the desired rotation has been effected, means whereby said trip device can be circumferentially adjusted on said shaft to regulate the distance through which the shaft rotates before it causes the delivery of the coin, and a circumferentially-graduated device secured to said shaft adjacent to said trip device, substantially as set forth.

13. The combination with a coin-released shaft, of a stationary coin-holder having an upper coin-guide and a lower coin-support which is movable downwardly for the delivery of the coin, a spring whereby said support is held in its normal position, a releasing-lever, and a trip device which rotates with said shaft, actuates said lever and tilts said support when the desired rotation has been effected, substantially as set forth.

14. The combination with a coin-released shaft, of a stationary coin-holder having an upper coin-guide and a lower coin-support which is pivoted at its front end to swing vertically, a spring whereby said support is held in its normal position, a releasing-lever arranged behind said support and provided with a projecting actuating-head, and a trip device which rotates with said shaft and is adapted to engage the head of said lever, substantially as set forth.

15. The combination with a coin-released shaft provided with means whereby it is locked against movement in the purchasing direction, of a stationary coin-holder having a coin-support and a guide between which the coin is inserted and having between said support and guide an unlocking member which is moved by the insertion of the coin and thereby unlocks said shaft, substantially as set forth.

16. The combination with a coin-released shaft provided on its front portion with detent devices which operate alternately and in opposite directions, of a stationary coin-holder provided with an unlocking-lever which is pivoted at its rear end and engages near its front end with said detent devices, substantially as set forth.

17. The combination with a coin-released shaft and its casing having an opening for the insertion of the coin, of a movable cover adapted to close said opening and arranged on the outer side of the casing to swing toward said shaft in opening the cover, and a locking-plate which is secured to said shaft on the outer side of the casing and which clears said cover when the shaft is in its initial position but which overlaps said cover and prevents the opening of the same in all other positions of the shaft, substantially as set forth.

18. The combination with a coin-released shaft and its casing having an opening for the insertion of the coin, of a movable cover adapted to close said opening and hinged on the outer side of the case between said opening and said shaft, and a locking-plate which is secured to said shaft on the outer side of the casing and which has a straight side which allows the cover to be opened when the shaft is in its initial position and which plate overlaps the cover and prevents the opening of the same in all other positions of the shaft, substantially as set forth.

19. The combination with a coin-released shaft provided with detent devices which permit its rotation either in the purchasing or return direction and which prevent backward movement of the shaft, of an intermediate shaft which is locked against rotation in the return direction, a ratchet-wheel secured to the intermediate shaft, and an actuating-pawl which is carried by the coin-released shaft and engages constantly with said ratchet-wheel to transmit the purchasing rotation to the same, substantially as set forth.

20. The combination with a coin-released shaft provided with detent devices which permit its rotation either in the purchasing or return direction and which prevent backward movement of the shaft, of a stationary coin-holder, an unlocking member which is controlled by the coin, an intermediate shaft, and means whereby only the purchasing rotation of the coin-released shaft is transmitted to the intermediate shaft, substantially as set forth.

21. The combination with an intermediate

shaft, of a ratchet-wheel secured to the same, a pawl engaging said wheel and preventing rotation of the shaft in one direction, a loosely-mounted ratchet-wheel having its teeth facing in the opposite direction, a detent engaging said wheel and preventing rotation of the shaft in said opposite direction, said pawl and detent being connected to disengage the pawl of the fixed wheel when the loose wheel is turned in the direction permitted by its teeth, and a slack coupling connecting the loose wheel with the shaft, whereby the latter is locked against rotation in either direction by power applied to the shaft but permitted to be rotated in one direction by power applied to the loose wheel, substantially as set forth.

22. The combination with an intermediate shaft; of a ratchet-wheel secured thereto, a pawl engaging said wheel and preventing the rotation of the shaft in one direction, a loosely-mounted ratchet-wheel having its teeth facing in the opposite direction, a detent engaging said loose wheel and connected with the pawl of the fixed wheel to disengage the same from the fixed wheel by a rotary movement of the loose wheel, and a coupling consisting of a stud secured to one of said wheels and engaging in an enlarged opening in the other wheel, substantially as set forth.

23. The combination with a coin-released shaft provided with detent devices which permit rotation of said shaft either in the purchasing or return direction and which prevent backward movement, and an actuating-pawl carried by said shaft, of an intermediate shaft, an actuating ratchet-wheel with which said pawl engages and which is loosely mounted on said intermediate shaft, a releasing ratchet-wheel secured to said actuating-wheel to turn therewith, a locking ratchet-wheel secured to said intermediate shaft, a pawl engaging said locking-wheel and preventing its rotation in the purchasing direction, a detent engaging the releasing ratchet-wheel and connected with the pawl of the locking-wheel to disengage the same, and a coupling connecting said loose ratchet-wheel with said intermediate shaft, substantially as set forth.

24. The combination with a purchasing-shaft which is rotatable only in the purchasing direction by a coin-released mechanism, a delivery-valve, and a meter-actuated shaft arranged in line with said purchasing-shaft, of a rotary valve-actuating device arranged between said purchasing-shaft and the meter-actuated shaft, and a train of gearing which connects both shafts with the valve-actuating device and whereby the latter is turned in one direction from the purchasing-shaft and in the other direction from the meter-actuated shaft, substantially as set forth.

25. The combination with a purchasing-shaft which is rotatable only in the purchasing direction by a coin-released mechanism, a delivery-valve, and a meter-actuated shaft arranged in line with said purchasing-shaft,

of a rotary valve-actuating disk arranged between said purchasing-shaft and the meter-actuated shaft and axially in line therewith, gear-wheels secured respectively to said purchasing-shaft and said meter-actuated shaft adjacent to said disk, and a gear-wheel mounted on said disk and meshing with the gear-wheels of said shafts, substantially as set forth.

26. The combination with a shaft which is rotatable only in the purchasing direction by a coin-released mechanism and which is provided with an externally-toothed wheel, a delivery-valve, and a meter-actuated shaft provided with an internally-toothed wheel, of a rotary valve-actuating device, and a gear-wheel mounted thereon and meshing with said externally and internally toothed wheels, substantially as set forth.

27. The combination with a purchasing-shaft which is rotatable only in the purchasing direction by a coin-released mechanism, a meter-actuated shaft, a delivery-valve provided with an actuating-arm, and a rotary disk arranged between said shafts and connected by a train of gearing therewith, said disk being arranged to bear with its flat side against said actuating-arm to hold the valve open and having on its flat side means for shifting said arm to open or close said valve, substantially as set forth.

28. The combination with a purchasing-shaft which is rotatable only in the purchasing direction by a coin-released mechanism, a meter-actuated shaft, and a delivery-valve provided with an actuating-arm, of a rotary disk arranged between said shafts and connected by a train of gearing therewith, said disk having on its flat side means for shifting said arm to open or close said valve and having on its peripheral face a graduation, and a casing having an opening through which said graduation is exposed, substantially as set forth.

29. The combination with a coin-released shaft provided with detent devices which permit its rotation either in the purchasing or return direction and prevent backward movement, of an intermediate shaft, means whereby only the purchasing rotation is transmitted from the coin-released shaft to the intermediate shaft and the latter is locked against movement in either direction from the meter-actuated shaft, a delivery-valve, and a rotary valve-actuating device connected by a train of gearing with the intermediate shaft and the meter-actuated shaft, substantially as set forth.

30. The combination with the coin-released shaft and the meter-actuated shaft, of an intermediate shaft which is locked against movement in either direction from the meter-actuated shaft but is free to be moved in the purchasing direction from the coin-released shaft, a delivery-valve, and a valve-actuating device which opens the valve upon the rotation of the coin-released shaft in the purchas-

ing direction and closes the valve by the rotation of the meter-actuated shaft, substantially as set forth.

31. The combination with the casing of the coin-released mechanism provided with a partition having a bearing, of a hollow shaft journaled in said bearing, a locking ratchet-wheel secured to said hollow shaft in front of said partition, an inner shaft arranged in said hollow shaft and coupled thereto and provided at its front end with a releasing ratchet-wheel, and a gear-wheel secured to said inner shaft in rear of said partition and meshing with gears connecting with a meter-actuated shaft, substantially as set forth.

32. The combination with a coin-released shaft and the intermediate shaft arranged in rear thereof, the meter-actuated shaft arranged in rear of said intermediate shaft, a rotary valve-actuating device mounted loosely on said intermediate shaft, and the casing inclosing said shafts, of a valve-casing mounted on said casing and provided with a horizontally-moving valve, and a vertical valve-spindle having its upper end arranged in said valve-casing and connected with said valve and having its lower end arranged in the casing of the coin-released mechanism adjacent

to said valve-actuating device and engaging therewith, substantially as set forth.

33. The combination with the casing of the coin-released mechanism and its removable head, said casing and head being provided at their lower sides with registering openings, of a coin-receptacle hinged to said casing and provided at its upper end with an upwardly-projecting lip which projects into said openings when the receptacle is closed, and locks the head to the casing and receptacle, substantially as set forth.

34. The combination with the casing of the coin-released mechanism, of a valve-casing, having a four-sided inclosing shell, and an inner piece composed of the top and bottom plates of the valve-casing and a side wall formed in one piece and a partition secured between said top and bottom plates and provided with a valve-seat, substantially as set forth.

Witness our hands this 26th day of May, 1899.

FRANK E. MORGAN.
FREDERIC A. LANE.

Witnesses:

LOOMIS BURRELL,
EDWARD WILHELM.