

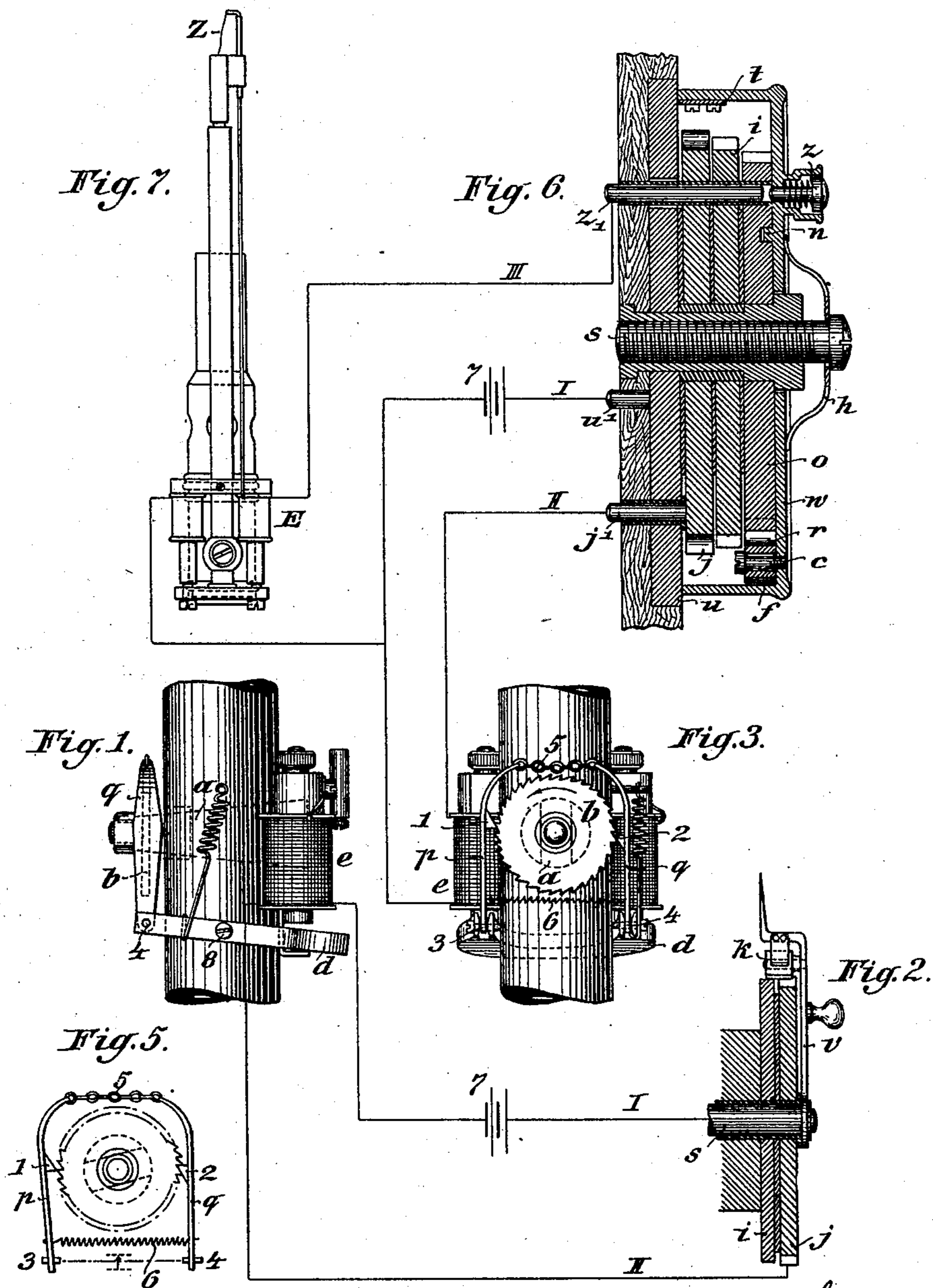
H. BORCHARDT.

MEANS FOR ELECTRICALLY CONTROLLING GAS COCKS.

(Application filed May 28, 1901.)

(No Model.)

2 Sheets—Sheet I.



Witnesses:

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No. 689,380.

Patented Dec. 24, 1901.

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(Application filed May 28, 1901.)

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2 Sheets—Sheet 2.

Fig. 8.

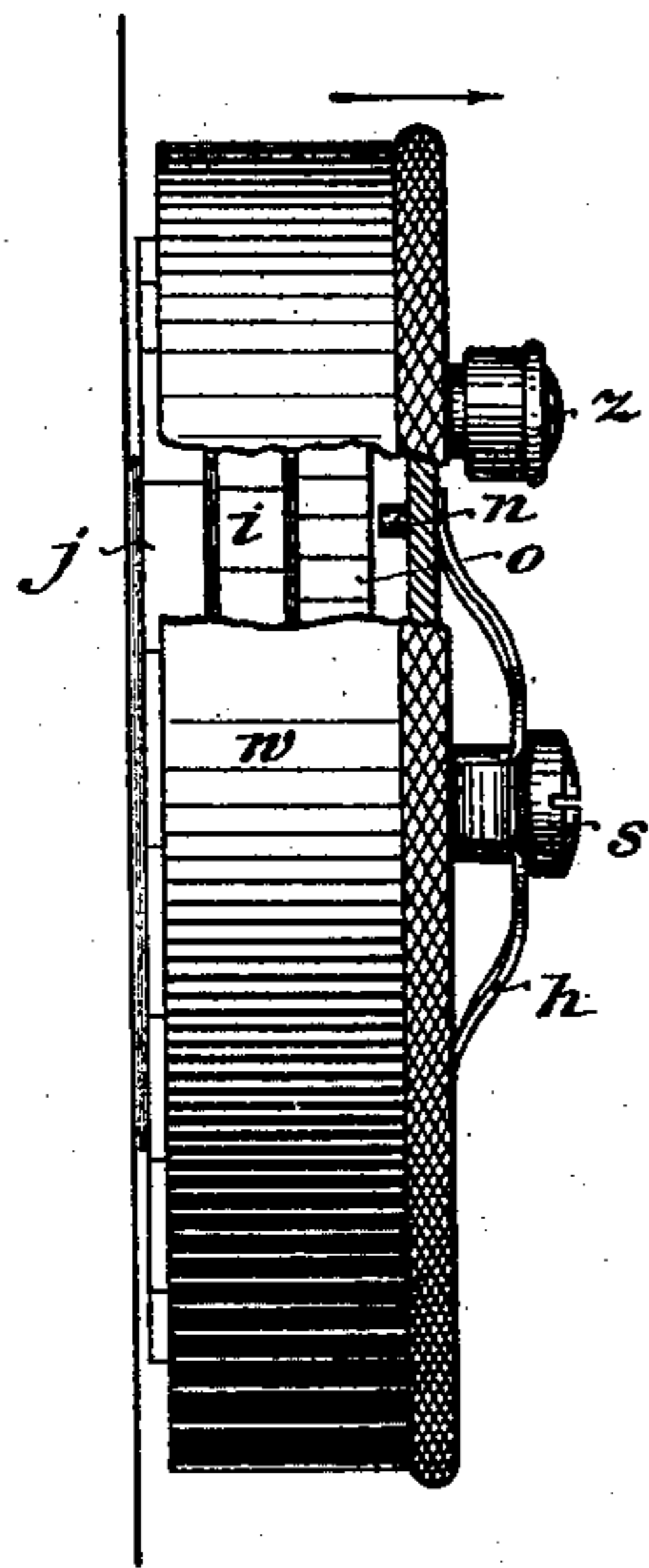


Fig. 9.

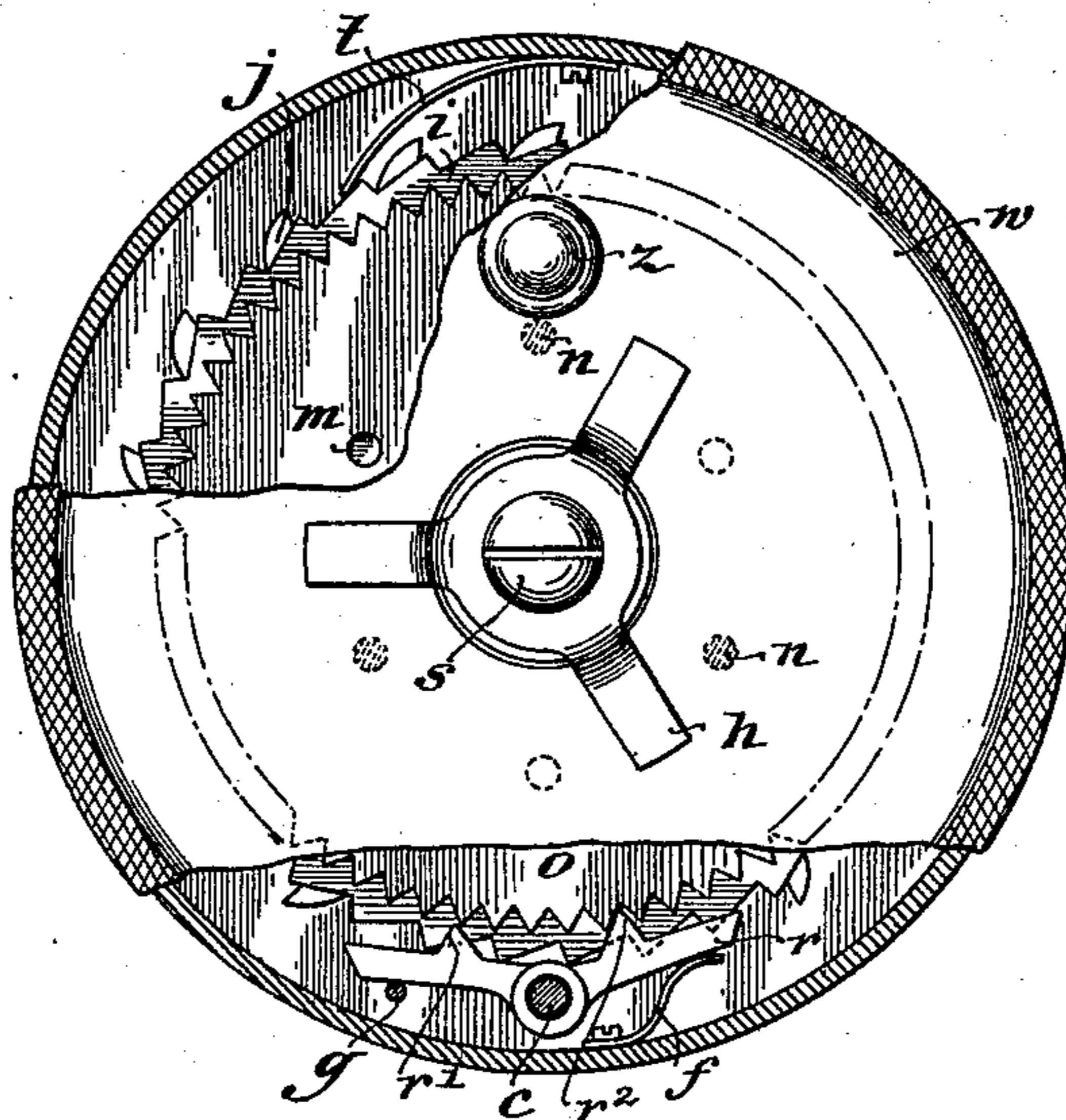


Fig. 10.

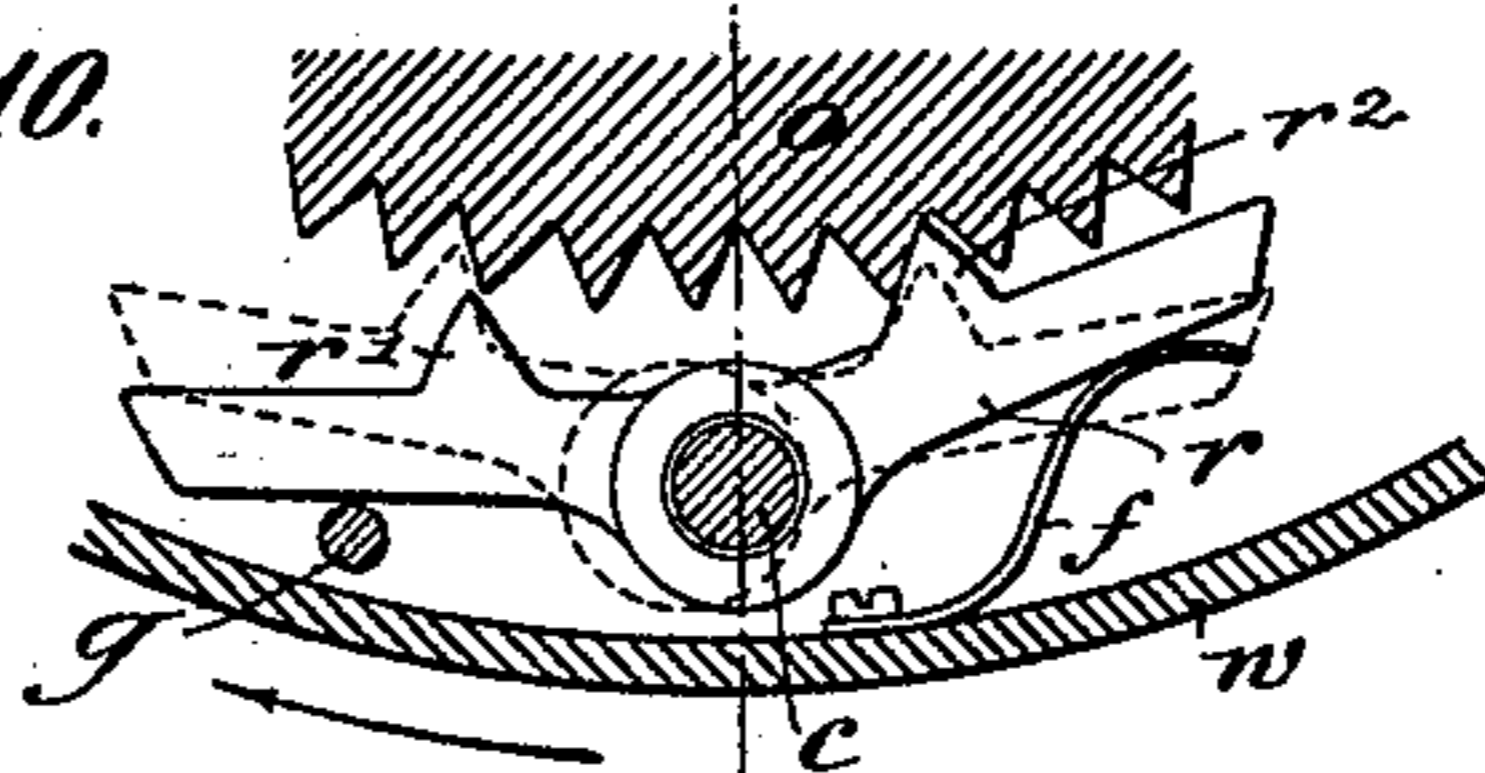


Fig. 4.
Open.

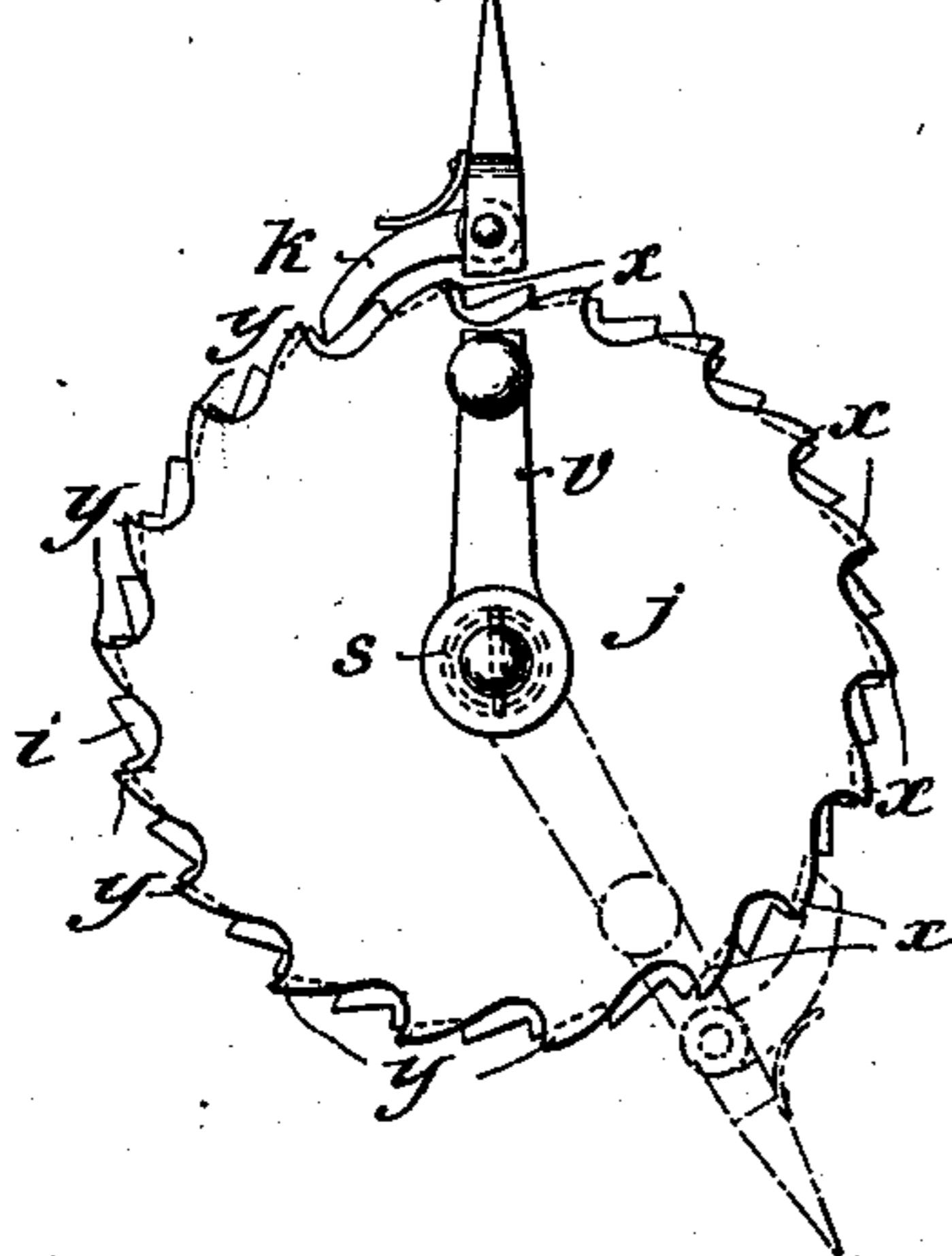
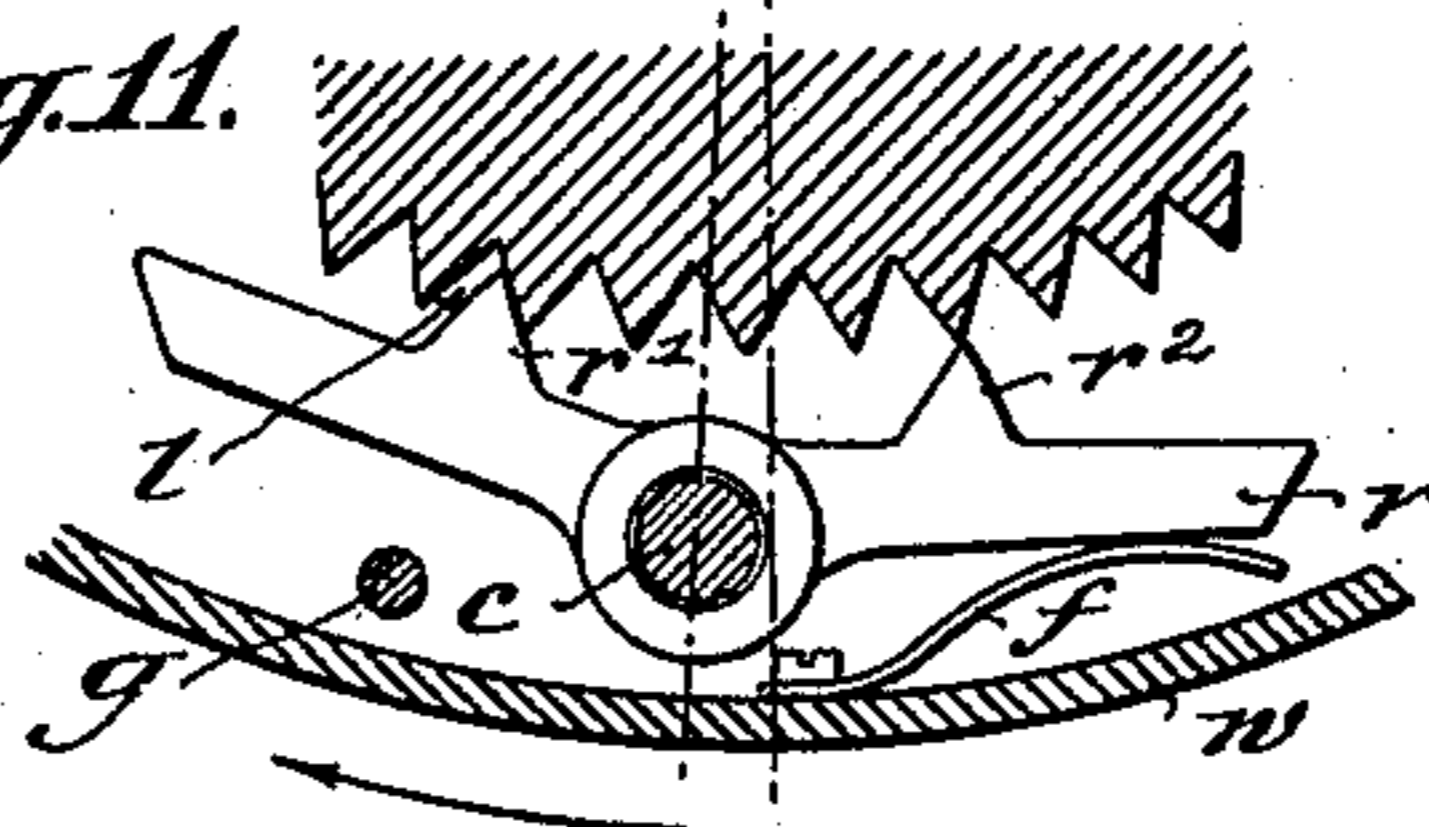


Fig. 11.



Witnesses:

Closed

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UNITED STATES PATENT OFFICE.

HUGO BORCHARDT, OF BERLIN, GERMANY.

MEANS FOR ELECTRICALLY CONTROLLING GAS-COCKS.

SPECIFICATION forming part of Letters Patent No. 689,380, dated December 24, 1901.

Application filed May 28, 1901. Serial No. 62,235. (No model.)

To all whom it may concern:

Be it known that I, HUGO BORCHARDT, engineer, a citizen of the United States of America, residing at 91 Kurfürstenstrasse, Berlin, Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Means for Electrically Controlling Gas-Cocks; 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.

This invention relates to electrical apparatus for opening and closing gas-cocks adapted for use in connection with distance gas-igniting devices; and it comprises both the special arrangement of the electromagnetic operating or controlling mechanism to control or adjust the position of the plug of the gas-cock and, as far as practicable, to secure it against any accidental displacement which, whether for purposes of opening or closing, is capable of being turned in one direction only—viz., to either of several positions at an angle of ninety degrees to each other—and the novel construction of the electrical switch apparatus by which, by the aid of a contact-maker or switch movable in a circle over a series of contacts, the electrical system is operated. One important feature of the latter apparatus is that the number of contacts within the circle controlled by the said switch is equal to the number of forward movements which the ratchet-wheel on the gas-cock is required to perform in order to open or close the cock, so that the situation at any time occupied by the switch shall indicate what the position of the gas-cock at that moment happens to be. Means are also provided whereby when the cock has reached either of its main positions—i. e., is full “on” or full “off”—an arresting effect for preventing accidental displacement may be produced. The arrangement adapted in order to insure exactitude of the respective positions and also when required a regular or normal succession of contacts consists of a catch device serving to lock the switch against rearward rotation, the preferred form in which this arrangement is carried out being that of a pawl, which itself is adapted conveniently to act as a contact-

making switch in conjunction with contacts constructed in the shape of arresting-teeth.

A further improvement in the controller arrangement with the revoluble controlling-switch or contact-maker is that the rate of progress or speed of the latter as it turns is confined within predetermined limits by means of a swinging anchor controlled by a spring whereby the possibility of too rapid a succession of contacts, which might lead to faulty operation of the switch device, is obviated; and, lastly, the novel arrangement of the gas-cock opener is for distance lighting purposes supplemented by the combination of the controller with an additional switch, which serves to close an electrical gas-igniting circuit, but which can only be effectively operated while the gas-cock is open.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the electromagnetic controlling mechanism for controlling a gas-cock fitted with a ratchet-wheel, whereof Fig. 3 is a front elevation, Fig. 2 is a side elevation, and Fig. 4 a front elevation, of one form of the switch mechanism, whereof the contact-maker arm or switch is locked against rearward rotation, the locking or arresting pawl being at the same time adapted to act as a means for closing the circuit. Fig. 5 is a detail view showing the ratchet-wheel of the plug of the gas-cock in conjunction with its two operating-pawls, which are so coupled together as to limit the extent of their swinging movement or throw. Fig. 6 is a section, Fig. 8 is a side elevation, and Fig. 9 a front view, of a form of apparatus which comprises arresting devices constructed according to this invention and is also provided with an igniting-contact by means of which electrical gas-lighting apparatus—such, for example, as is sketched in Fig. 7—may be controlled. Figs. 10 and 11 are enlarged detail views showing in two different positions the speed-checking mechanism, which operates under the action of a spring-controlled anchor.

The electromagnetic gas-cock-controller mechanism represented in Figs. 1 and 3 is arranged as follows:

Within its socket the plug *a* of the cock is

made capable of turning in a circle, so that as it is turned in one direction to different positions at ninety degrees to each other it alternately closes and opens a passage for the gas leading to a burner or set of burners. To the plug *a* is secured a ratchet-wheel *b*, in the teeth of which engage the pawls 1 and 2 of two pawl-carrying arms *p* and *q*, placed opposite each other and adapted to be set in operation by the armature *d* of the electromagnet *e*, which armature oscillates on a pivot 8. The pawl-arms *p* and *q* are linked at 3 and 4 to the ends of the fork terminating the armature *d* in such a manner that they are capable of performing the necessary oscillatory motion in the plane of the ratchet-wheel *b*, toward which they are drawn by their common spring 6. The pawls 1 and 2 point in opposite directions, and as, yielding to the attraction of the electromagnet *e*, both pawl-arms *p* and *q* are simultaneously lowered one pawl only—say 1—acts in the direction in which the ratchet-wheel should be fed forward, moving it one-half of a tooth space, (during the second half of the downward throw or stroke of the pawl,) and, conversely, as the armature *d* is released and acted upon by its spring both pawls *p* and *q* are raised, when the second pawl 2 feeds the ratchet-wheel another half-tooth space forward. What happens during this second half of the movement of the pawl is illustrated in Fig. 5, while by reference to Fig. 3 it will be seen that the pawl 1 is still after completing its feeding movement at half-tooth. Thus every time that the armature *d* acts by being attracted by the electromagnet and then released such double action corresponds to a forward movement of the ratchet-wheel *b* through the space of one tooth. An improved device is provided with the object of preventing the ratchet-wheel *b* from moving beyond its proper position either of its own accord or under any undue influence. To this end the two pawl-arms *p* and *q* are joined together by a movable connection, preferably a chain 5 of suitable length, the connection being such that while it admits of each pawl-arm separately swinging within limits in going back over the next succeeding tooth of the wheel it yet prevents the two pawl-arms from simultaneously moving apart to the extent to which, supposing an independent rotation of the ratchet-wheel *b*, the pawls would be forced apart and the distance between their points increased beyond what is necessary to insure a proper engagement between either pawl and the ratchet-wheel. In the arrangement shown the scope allowed for oscillation is limited to one-half of the height of a tooth of the ratchet-wheel *b*. Hence if it were attempted to move the ratchet-wheel *b* forward independently the outward points of its teeth would be arrested by the pawls 1 and 2, which cannot move apart far enough to prevent this, so that the motion of the ratchet-wheel in this direction is properly checked, while its rotation in the oppo-

site direction is prevented by the pawls as a matter of course.

The electromagnet *e* of the controller mechanism is comprised within the same circuit (III) with a switch arrangement, the principle of which I will first describe with reference to the particular form of apparatus shown in Figs. 2 and 4. The essential condition is that the contact-maker or switch proper, which is here shown as assuming the shape of an index-arm *v*, fitted with a handle or knob, shall be capable of being turned successively in one direction over as many contacts as there are different positions at ninety degrees to each other to which it is required that the ratchet-wheel *b* should be movable for the purpose of turning the cock from the "open" to the "closed" position, or vice versa. While the pawl *k* of the switch is in engagement with the stationary disk *i*, provided with insulated ratchet-teeth or itself constructed of insulating material, rearward rotation is prevented. Besides, the pawl *k* is in this form of apparatus made to act as a circuit-closing device, operating in conjunction with a second metal disk *j*, having projections in the shape of ratchet-teeth and joined to the conductor II of the electrical circuit. The other conductor I, which comprises the battery 7 or source of current, may be connected with the pivot *s* of the switch-arm *v*, which thus completes the electrical connection to the pawl *k*. So long as this pawl is in engagement with the teeth of the insulated disk *i*, which are behind and in different planes from the teeth of the contact-disk *j*, it completes no circuit; neither can it be moved rearward toward the preceding contact-tooth *x* or *y*, as the case may be. In turning the switch-arm *v* forward the pawl *k* is, with a view to the proper closing of the circuit, made to pass over the contacts in succession, rearward motion being in this case also obviated by the ratchet-wheel arrangement. Consequently when once the pawl *k* has been engaged either in a contact-tooth space or contact-field or in an insulated-tooth space an attempt to produce rearward motion cannot result in the circuit being either interrupted or closed, as the case may be, because the insulated ratchet-teeth of the disk *i* will in all cases oppose any such rearward motion. The contacts *x*, which occupy one-half of the periphery of the disk *j*, as they are successively touched by the pawl *k* will close the circuit of the electromagnet *e* as many times as the gas-cock-opening ratchet-wheel *b* is required to perform movements in order to turn the cock ninety degrees, so as to bring it from the open to the closed position. The corresponding initial position of the switch-arm *v*, Fig. 4, and the other position beyond the contacts *x* which is reached after turning one hundred and eighty degrees should be marked "Open" and "Closed," respectively, to enable the position of the cock at the time to be read off. When it is desired to reopen the cock, the switch-arm *v* is

turned farther in the given direction until its starting-point is reached, during which movement the pawl k will cooperate with the contacts y , occupying the second half of the disk j , and will thus close the circuit as many times as is necessary to turn the cock to the open position. Any intermediate position of the switch-arm v in contact with the teeth x or y corresponds to a partial closing or opening of the cock, as will be seen by reference to Figs. 4 and 5, so that the position of the cock may at any time be ascertained.

In Figs. 6, 8, and 9 a more perfect form of switch apparatus is presented, in which the contact-making switch is constructed in the shape of a case or cap w , adapted to turn on a pivot s . The contact-spring t , secured internally to the contact-making cap w , here supplies the place of the pawl k of the switch arrangement first described and, as in that arrangement, acts in conjunction with two disks i and j , rigidly secured to the base-plate; but in the present case the toothed contact-disk j is arranged behind the toothed disk i . A third toothed disk o , moreover, is added and in combination with a swinging anchor r constitutes an auxiliary device whereby any unduly-rapid motion is prevented of the contact-making cap w , which latter to facilitate its operation by hand is preferably provided with a milled flange, for if the cap were turned too quickly it might happen that the contact-pawl would accidentally skip past one of the contacts, the effect of which would be a faulty operation of the mechanism and a wrong adjustment of the gas-cock opener. The anchor r , which operates through the medium of two pawl-teeth r' r'' , is mounted upon an inwardly-projecting pin c of the cap w , so as to be capable of oscillatory motion and of following the motion of the cap as the latter is turned. Under the influence of a spring f it constantly tends to swing back to its main position, as shown in Figs. 9 and 10, the extent of its swinging movement being, however, limited by a stop g , while the time taken up in such movement, which is dependent upon the power of the spring, determines the force of the arresting effect. Now this arresting or "brake" effect is produced as follows: As the contact-cap is turned in the direction of the arrow the inner incline of the pawl-tooth r'' by coming into contact with one of the teeth of the disk o receives counter-pressure, whereby the anchor r , overcoming the pressure of the spring f , becomes reversed and after passing through an intermediate position (indicated in dotted lines in Fig. 10) returns to the position which it is shown to occupy in Fig. 11. At this juncture one pawl-tooth r' is fully engaged in a tooth-space of the disk o , while the other pawl-tooth r'' is just about to drop into engagement with the following tooth-space of the said disk o by sliding off the preceding tooth-point. Now this movement which takes place as the rotation of the cap is continued

and whereby the anchor swings back to its main position, Figs. 9 and 10, is completed in a period of time the length of which depends upon the power of the spring f and the weight of the anchor r ; but inasmuch as at the moment of commencing the oscillatory movement there remains a gap l between the front of the pawl-tooth r' and the side of the ratchet-tooth of the disk o , standing opposite, it follows that with a normal speed of rotation the anchor r has time to complete its oscillatory movement, and while it is doing so the pawl-tooth r' , referred to, may become disengaged from the tooth-disk o in time to avoid its being interfered with by the side of the ratchet-tooth opposite. As the rotary movement is continued the free backward-and-forward oscillation of the anchor r is repeated, unimpeded by any reaction in the nature of a brake effect, provided always that a predetermined speed limit is not exceeded. When this happens to be the case, however, and when the open path or way afforded by the gap l is as a result of the continued rotation traveled through in less time than the oscillating anchor requires to return to its main position, the front of the pawl-tooth r' will catch against the face of the ratchet-tooth facing it, and thus bring about an instantaneous arresting effect, preventing the contact-cap from being turned any farther. It will thus be seen that whereas the cap may at any time be continued to be turned at a less than normal speed any possibility of turning it with excessive rapidity is effectually guarded against. In order to secure this switch arrangement against any accidental displacement from either of its main positions corresponding to the open and closed positions of the gas-cocks, respectively, the following additional arresting or locking device is provided: The contact-making cap w , in addition to its rotary motion, is capable of axial displacement parallel to the axis of the central pin s , to the head of which a spring h is attached, serving to press the cap w down in the direction of the base-plate of the switch. From the inner surface of the cap w project a number of studs n , and in the front surface of the body formed by the combined disks j i o , opposite the said inner cap-surface, or, to be strictly accurate, in the toothed disk o , there are formed corresponding perforations or recesses in such positions that their studs or pins n shall engage with them when either of the main positions of the revoluble switch-cap is reached. In the form shown the three studs n , arranged on the peripheries of three different circles, have two sets of three perforations m , each in positions calculated to insure the requisite engagements provided for them. The position indicated in Figs. 6 and 9 corresponds to that position of the cap w , which indicates that the gas-cock is open. If it be desired to close it, it is necessary before the switch-cap w can be turned from left to right to disengage its studs from their

perforations by pulling the cap outward. Then as the cap is turned the studs n will slide over the surface of disk o and in so doing will serve to maintain the cap in the pulled-out position in opposition to the action of the spring h , and when as the cap continues to be turned the other main position, corresponding to the closing of the gas-cock, is reached the studs n will under the pressure of spring h once more catch in the holes m , and thereby temporarily lock the cap against accidental displacement, for in order to turn it again it will be necessary intentionally to raise it by hand, so as to move the studs n out of engagement with the holes m . The same object, however, may be attained by the employment of a single projecting stud and the provision of two holes.

In view of the fact that the cock-opening arrangement herein described is especially designed for use in connection with gas-igniting apparatus, there is represented in the drawings as part of the controller mechanism shown in Figs. 6, 8, and 9 a convenient circuit-closing device enabling the lighting to be effected electrically, but only while the cock is in the open position. This device consists of a contact knob or button z , arranged upon the revoluble switch-cap w , which in the open position, Fig. 6, is in a position coinciding with that of a contact-pin z' , fixed within the controller. If while the parts are thus disposed the button z be pressed, it will close a circuit which may consist of a conductor I, including the battery 7, and of another conductor III, which may, for example, lead to a pilot-jet-igniting arrangement comprising an electromagnet E and an igniting-wire Z, Fig. 7. The igniting effect is here produced simultaneously by the operation of an electromagnet-armature, which serves for forward oscillation of the heating the wire Z by sending current through it. The conductor I, moreover, is connected through a pin u' with the metal base-plate u of the switch, which plate is by the metal setting or socket of the central pin s electrically connected both with the toothed disk o and the switch-cap w and also, therefore, with the auxiliary contacts t and z , with which the said cap is provided. On the other hand, the circuit through the electromagnet e of the controlling or cock-opening arrangement which is formed by the conductor II comprises the pin j' of the contact-disk j , with the teeth x and y of which contact is made. In the arrangement described, after the contact switch-cap w has been turned out of the position indicating that the cock is open, Fig. 9, it is no longer possible to close the igniting-circuit I III by pressing the contact-button z , so that any untimely operation of the igniting-contact, whether in any intermediate position or while the cock is closed, and any disturbance liable to result therefrom, are effectually avoided.

What I claim is—

1. The combination, with a gas-cock, and a ratchet-toothed wheel secured to the plug of the said gas-cock; of an electromagnet, a pivoted armature-lever, two arms pivoted to the said lever on opposite sides of the said wheel each said arm being provided with a pawl, and a spring coupling the said arms and causing the said pawls to engage operatively with the teeth of the said wheel, substantially as set forth.

2. The combination, with a gas-cock, and a ratchet-toothed wheel secured to the plug of the said gas-cock; of an electromagnet, a pivoted armature-lever, two arms pivoted at one end to the said lever on opposite sides of the said wheel each said arm being provided with a pawl for revolving the said wheel, a series of links connecting the other ends of the said arms, and a spring coupling the said arms, substantially as set forth.

3. The combination, with a gas-cock, and an electromagnet and intermediate driving mechanism for revolving the plug of the gas-cock step by step; of a revoluble switch member provided with a contact-pawl, a stationary and insulated ratchet-toothed wheel engaging with the said pawl, and a stationary wheel included in circuit with the electromagnet and pawl and provided with contact-teeth which are arranged out of line with the teeth of the insulated ratchet-toothed wheel, both of the said stationary wheels being arranged concentric with the said revoluble switch member, substantially as set forth.

4. The combination, with a gas-cock, and an electromagnet and intermediate driving mechanism for revolving the plug of the gas-cock step by step; of a revoluble switch member provided with a contact-pawl, and two stationary ratchet-toothed wheels arranged side by side concentric with the said revoluble switch member and with their teeth out of line with each other and in engagement with the said pawl, one of the said wheels being arranged in circuit with the electromagnet and pawl and the other being insulated, substantially as set forth.

5. The combination, with a gas-cock, and an electromagnet and intermediate driving mechanism for revolving the plug of the gas-cock step by step; of a revoluble switch member provided with a contact-pawl, a stationary wheel arranged concentric with the said revoluble switch member and provided with a series of contact-teeth which complete the circuit one after another as the said member is revolved; and an automatic brake which prevents the said revoluble switch member from being revolved too quickly, substantially as set forth.

6. The combination, with a gas-cock, and an electromagnet and intermediate driving mechanism for revolving the plug of the gas-cock step by step; of a revoluble switch member provided with a contact-pawl, a stationary

wheel arranged concentric with the said revoluble switch member and provided with a series of contact-teeth which complete the circuit one after another as the said member is
5 revolved; a stationary brake-wheel also arranged concentric with the said revoluble switch member and provided with teeth, and a spring-controlled anchor pivoted to the said revoluble member and provided with pawls
10 which engage alternately with the teeth of the brake-wheel, substantially as set forth.

7. The combination, with a gas-cock, and an electromagnet and intermediate driving mechanism for revolving the plug of the gas-
15 cock step by step; of a revoluble and laterally-movable switch member provided with a contact-pawl, a stationary wheel provided with a series of contact-teeth which complete the circuit one after another as the said member
20 is revolved, and spring-controlled locking mechanism normally preventing the said switch member from being revolved until it has been moved laterally, substantially as set forth.

8. The combination, with a gas-cock, and 25 an electromagnet and intermediate driving mechanism revolving the plug of the gas-cock step by step; of a revoluble switch member provided with a contact-pawl, a stationary wheel provided with a series of contact-teeth 30 which complete the main circuit through the said electromagnet one after another as the said switch member is revolved; an auxiliary electric circuit for the igniting devices, a stationary contact-pin arranged in the said aux- 35 iliary circuit, and a push-button for completing the auxiliary circuit carried by the said revoluble switch member and arranged to come opposite the said stationary contact-pin at a prearranged position of the plug of the 40 gas-cock, substantially as set forth.

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

HUGO BORCHARDT.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.