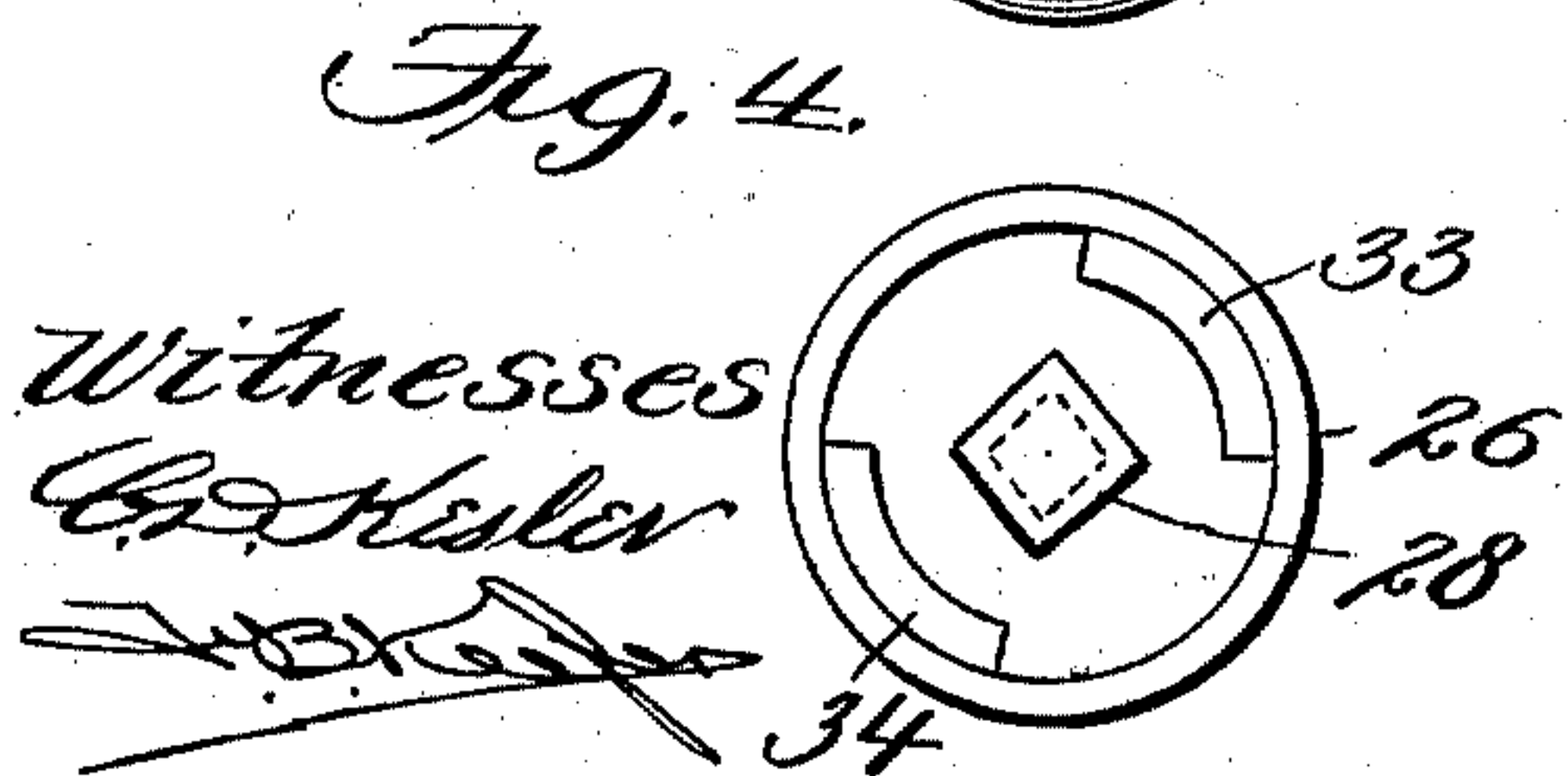
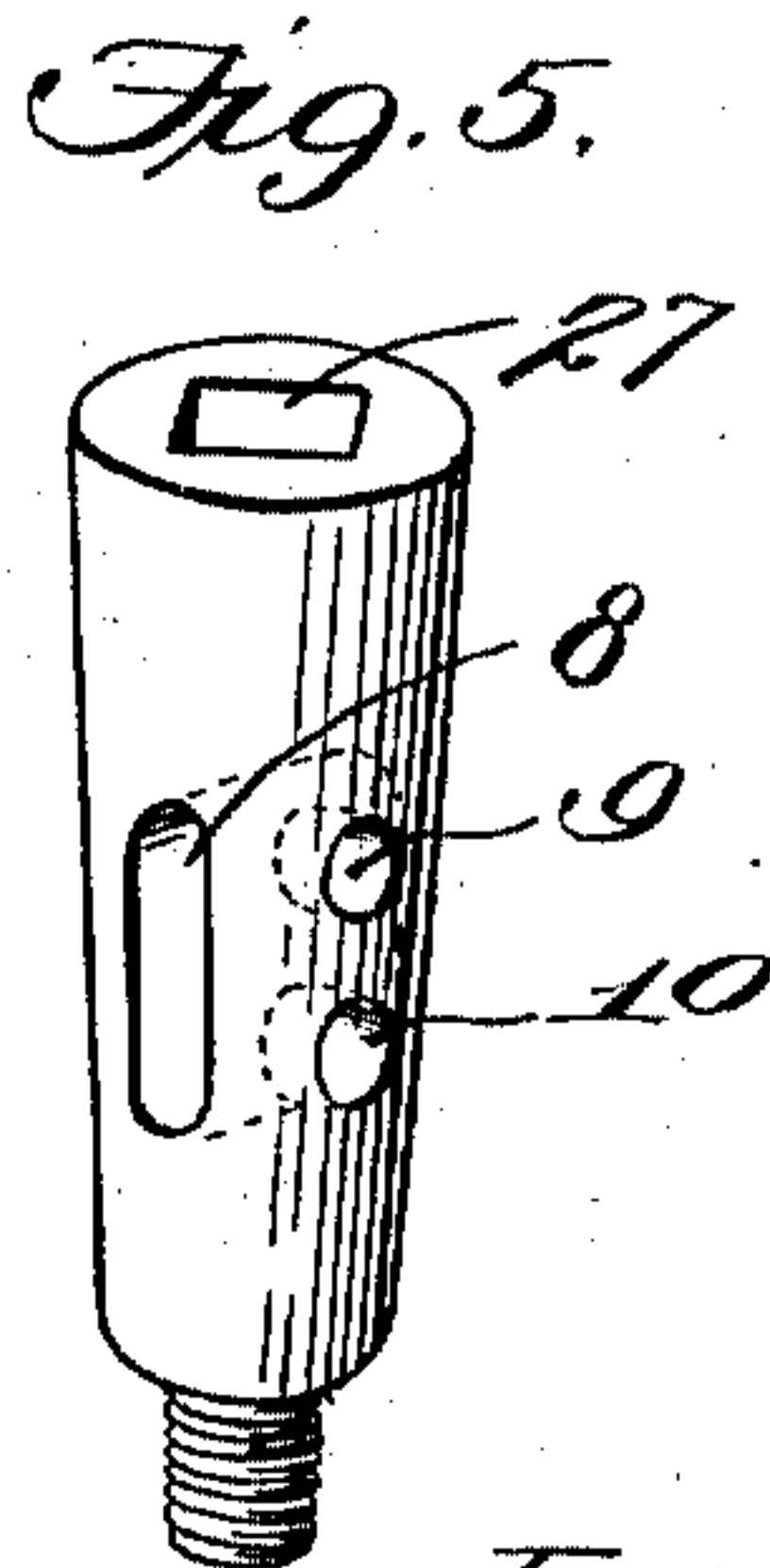
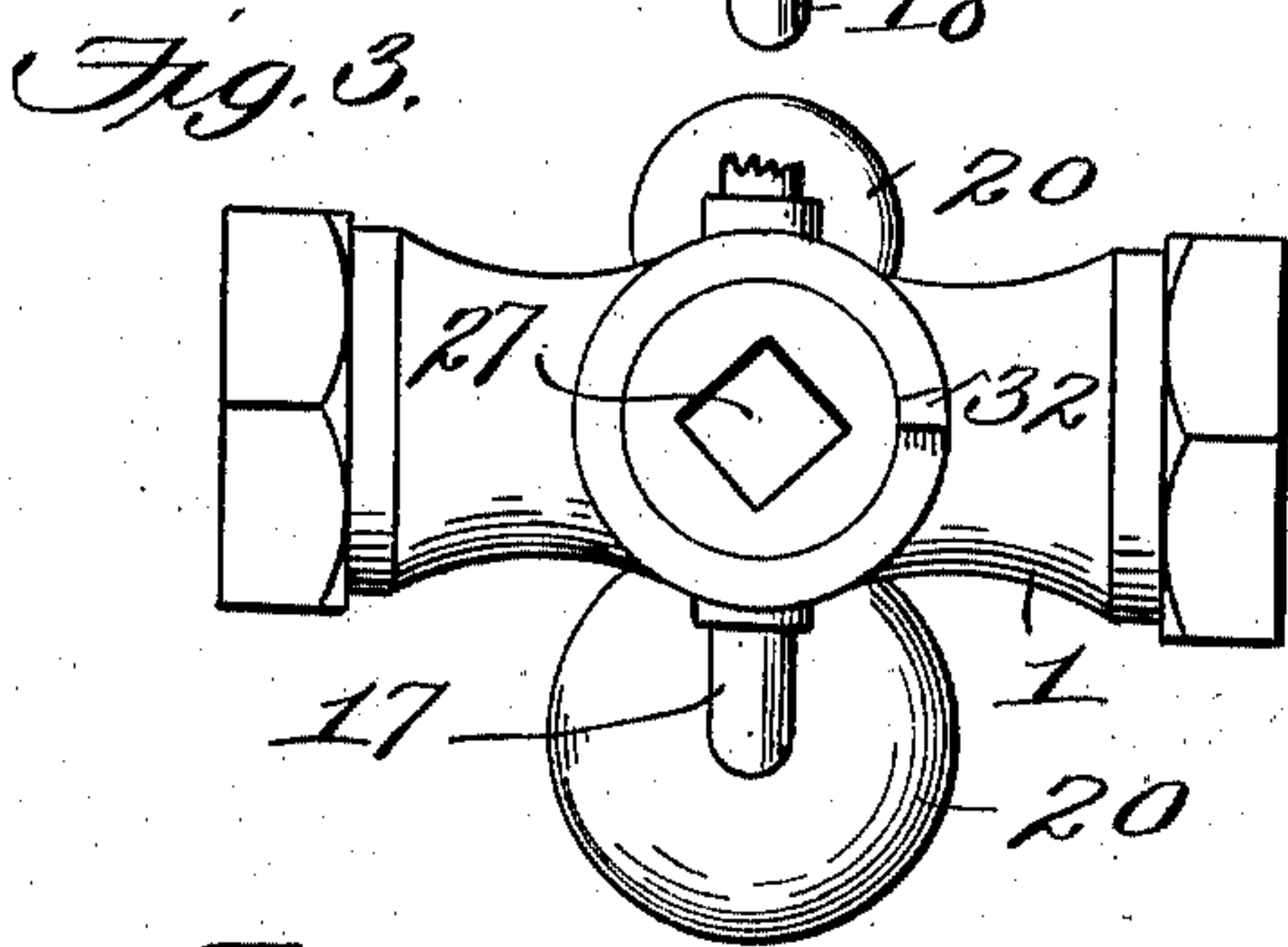
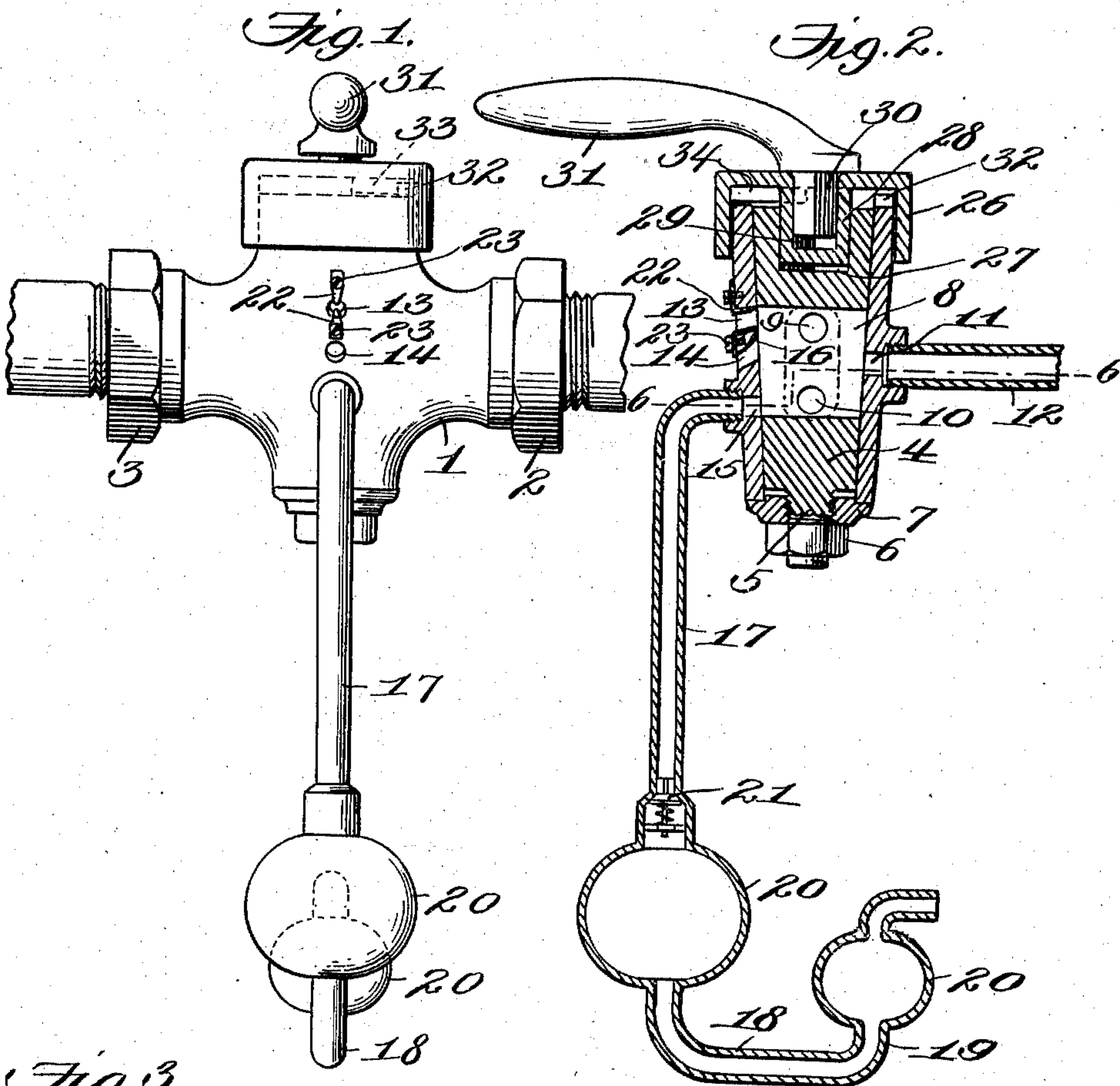


C. WALKER.  
DRAIN VALVE.  
APPLICATION FILED FEB. 25, 1910.

965,772.

Patented July 26, 1910.

2 SHEETS—SHEET 1.



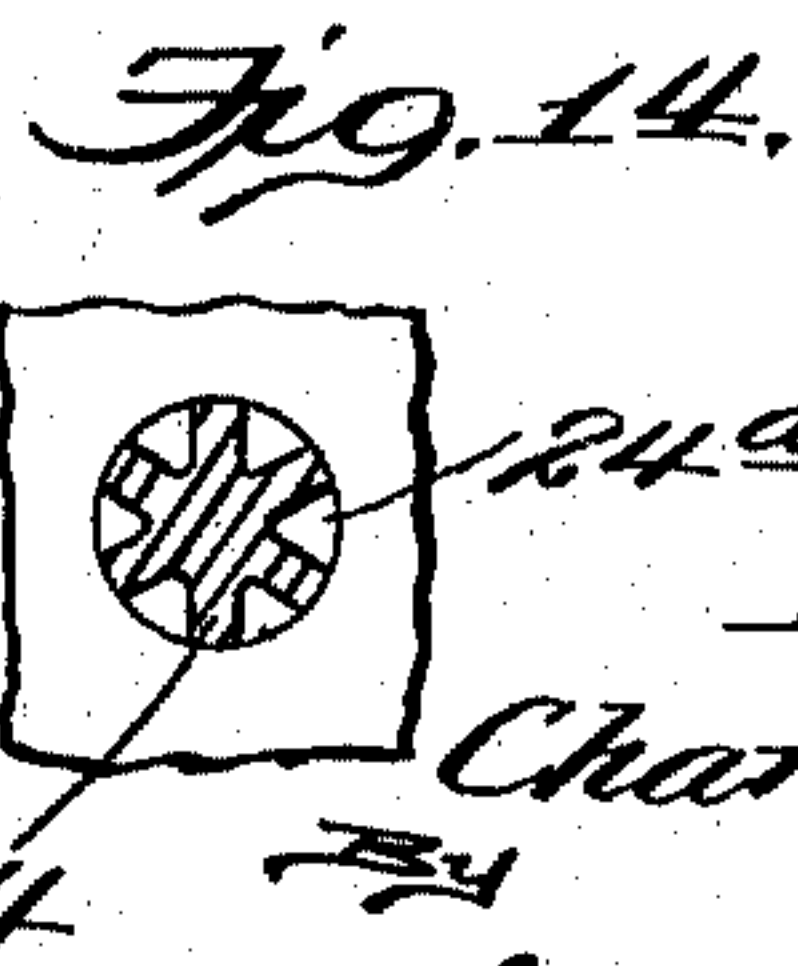
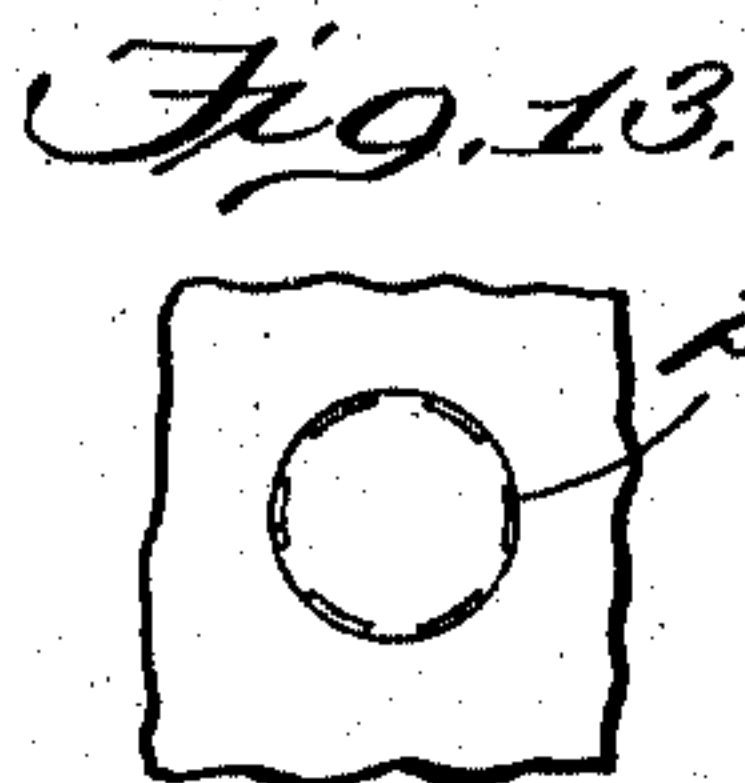
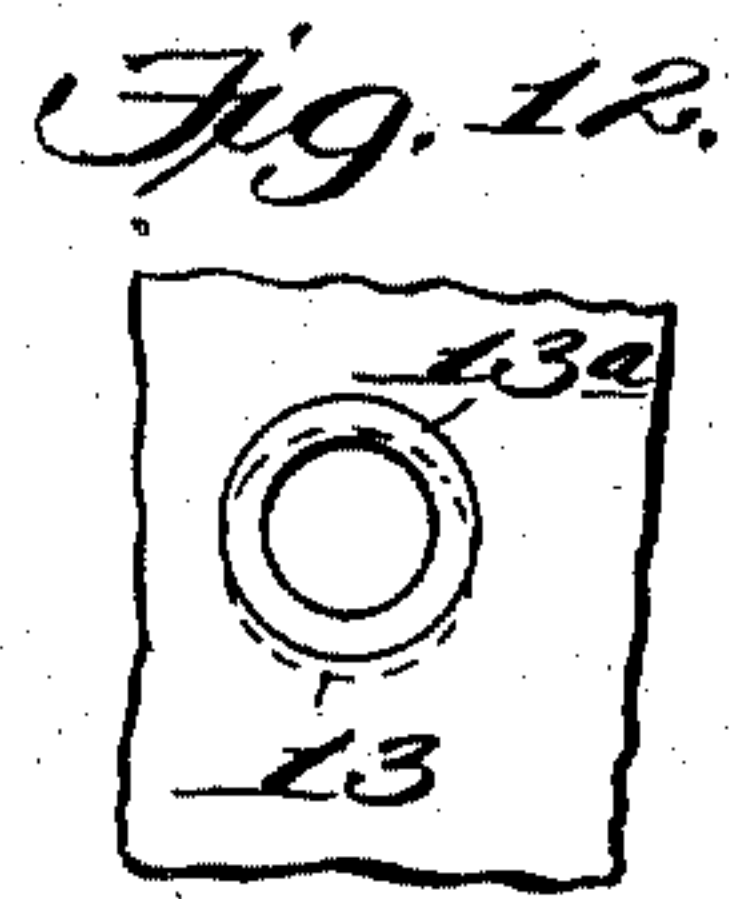
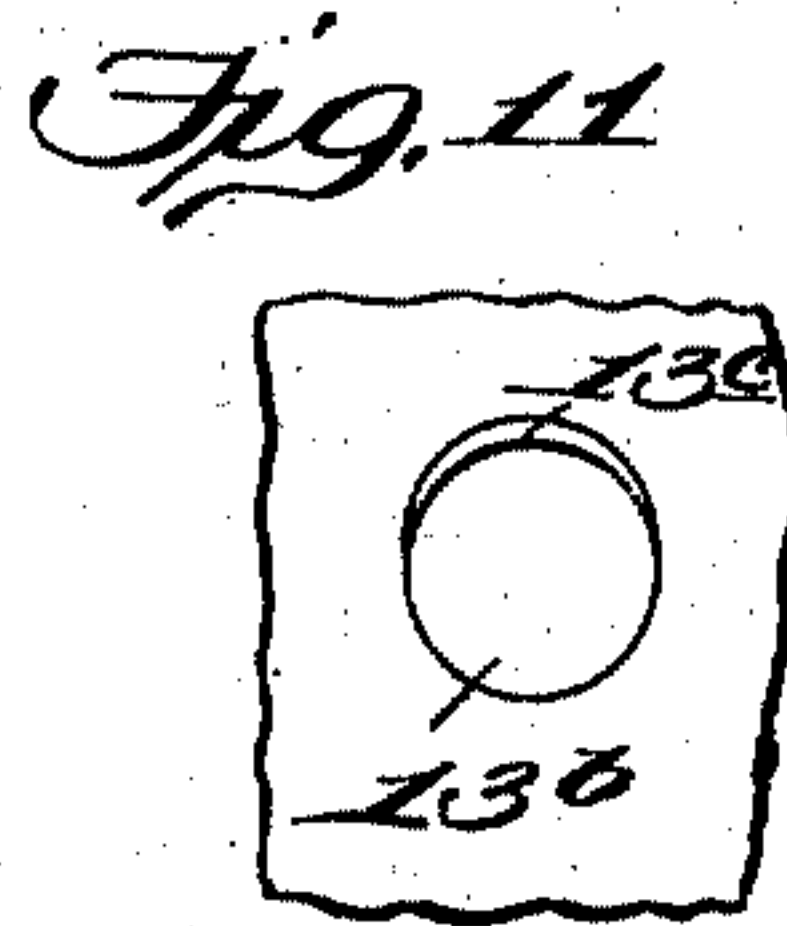
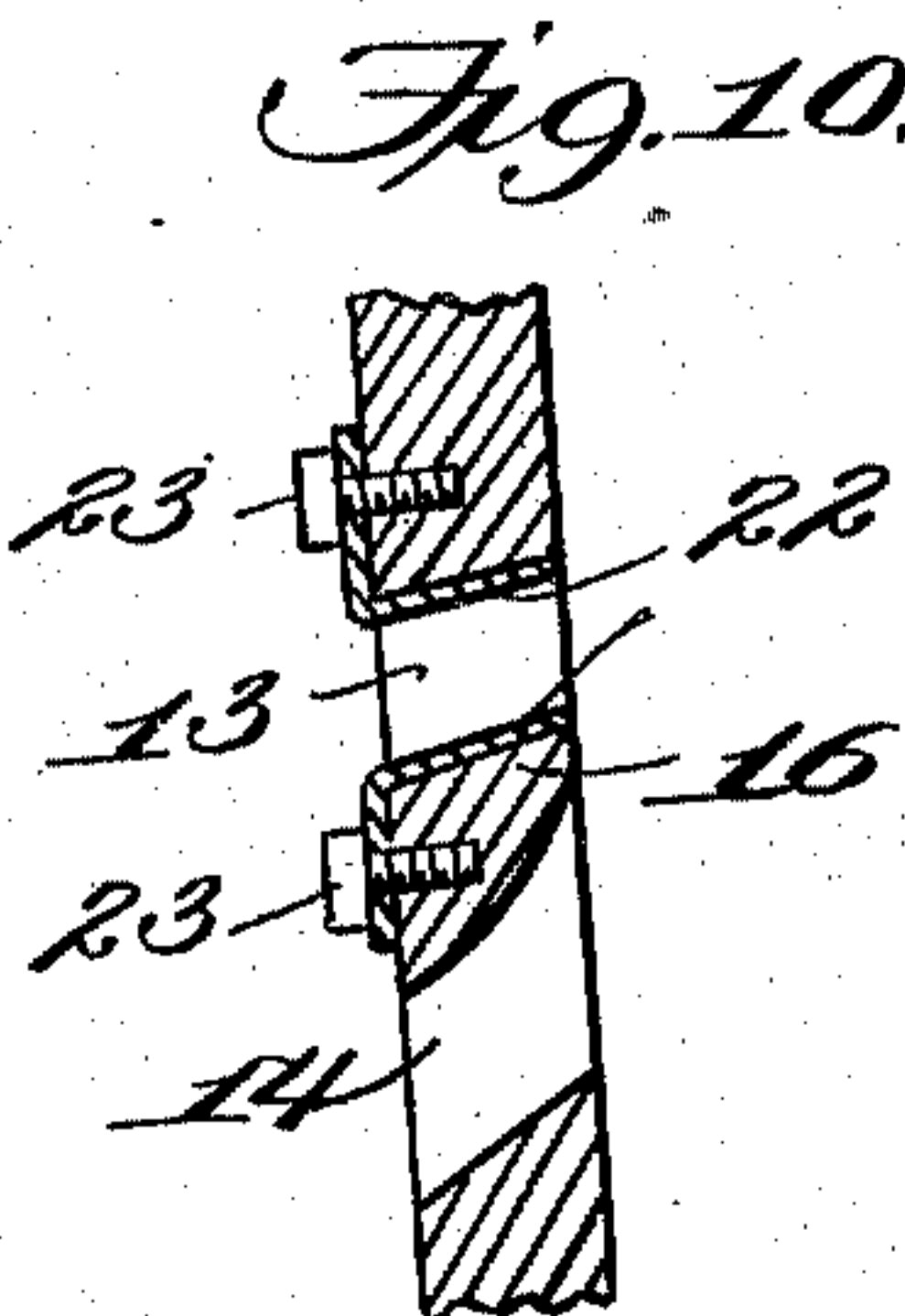
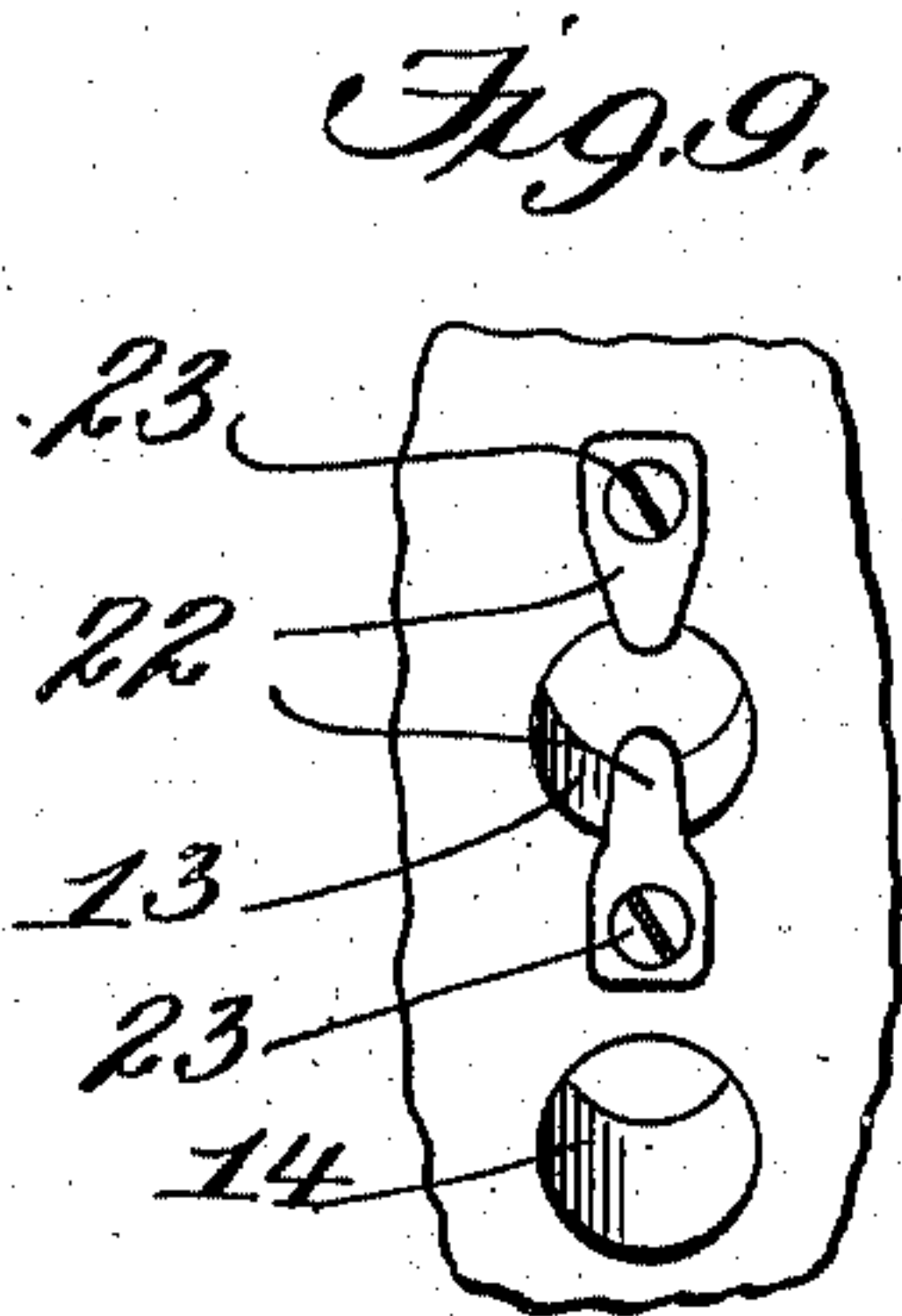
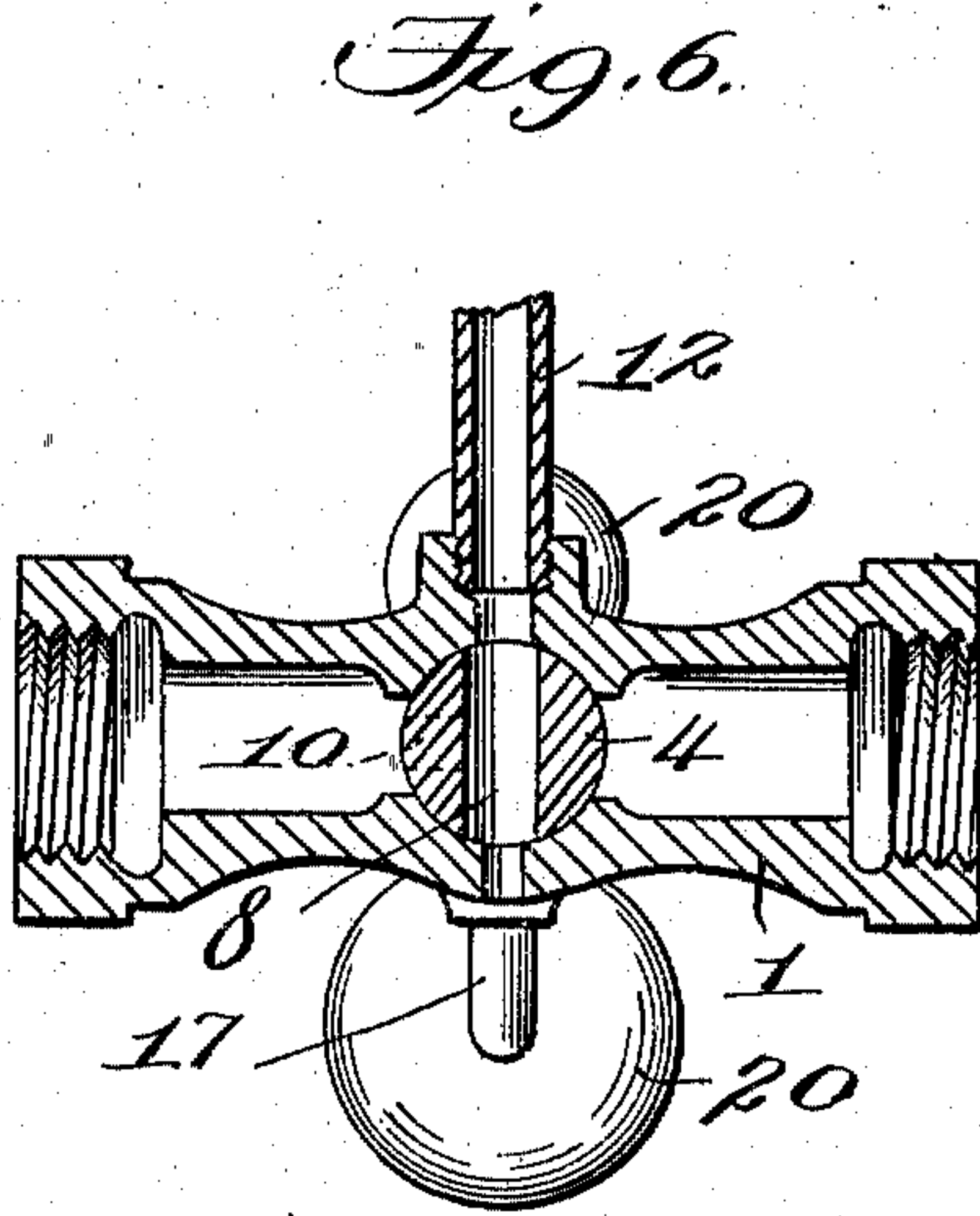
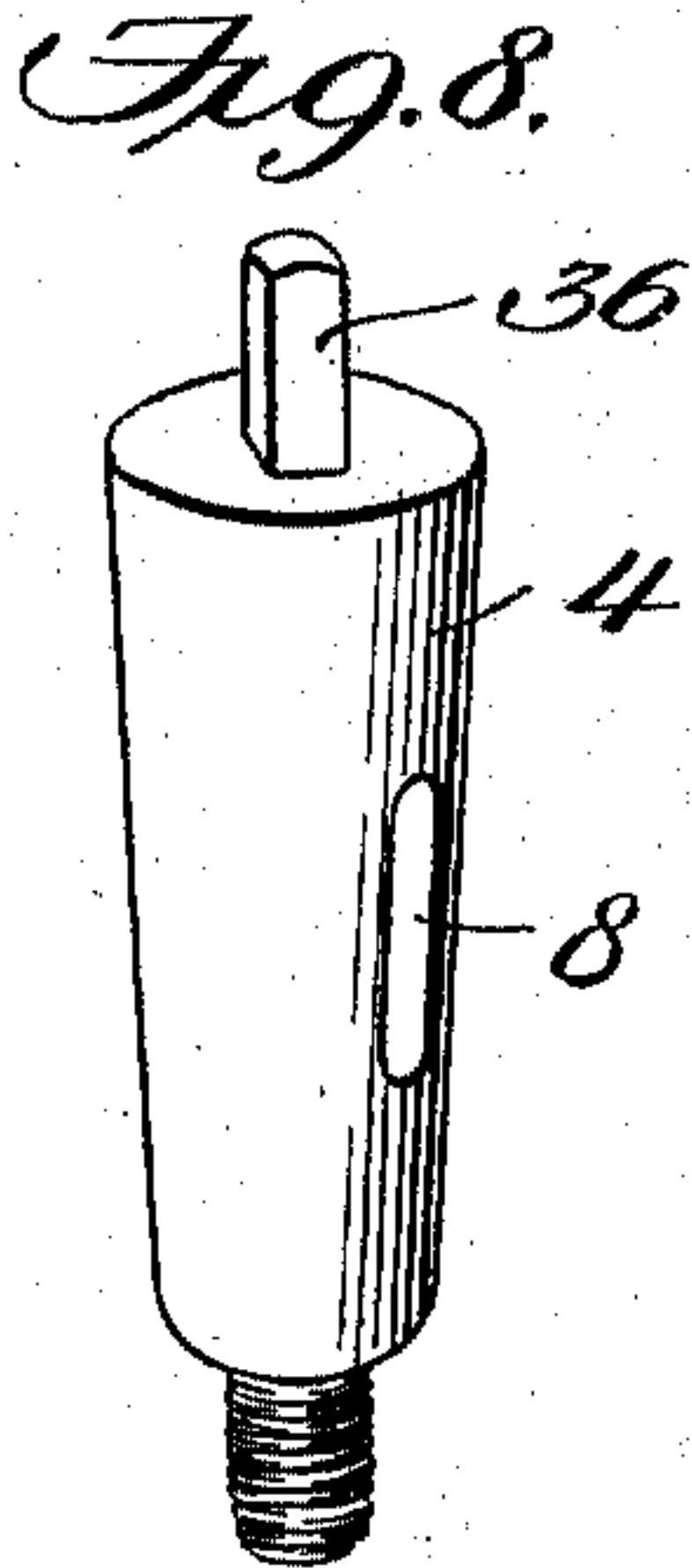
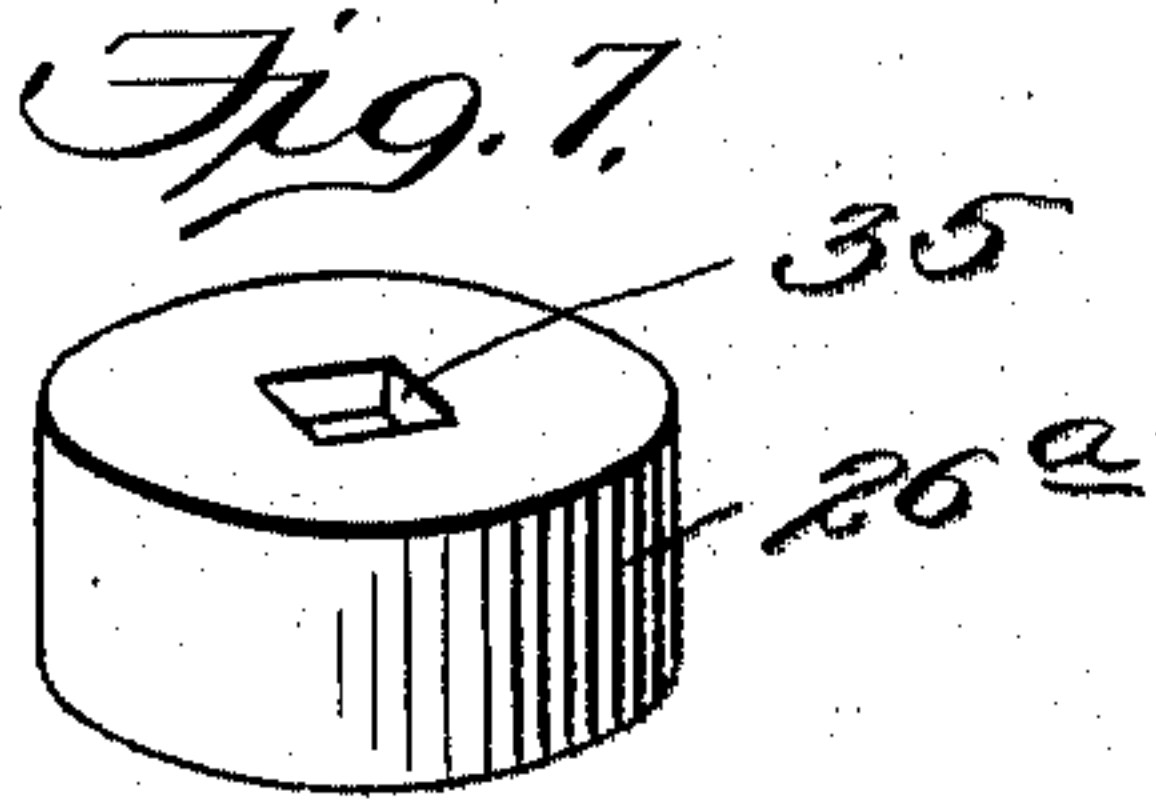
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Patented July 26, 1910.

2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

CHARLES WALKER, OF KNOXVILLE, TENNESSEE.

## DRAIN-VALVE.

965,772.

Specification of Letters Patent.

Patented July 26, 1910.

Application filed February 25, 1910. Serial No. 545,915.

*To all whom it may concern:*

Be it known that I, CHARLES WALKER, a citizen of the United States, residing at Knoxville, in the county of Knox and State of Tennessee, have invented new and useful Improvements in Drain-Valves, of which the following is a specification.

This invention relates to improvements in combined cut-off and drain valves which, as is well known, have for their general purpose to control the communication between the supply main and the service pipes of a building, and which are designed with reference to the combined and simultaneous operations of interrupting such communication and of draining the water from the service pipes, in order to prevent freezing.

The particular type of drain valve to which the present invention relates is one wherein an air vent means is provided, in order that the service pipes may be drained by a single operation of manipulating the drain valve and without the necessity of opening any of the service pipe valves for the purpose of admitting air to the system.

An objection to the use of the known constructions of drain valve resides in the fact that when the service pipe valves are closed, the draining operation is accomplished very slowly and frequently incompletely.

According to the present invention the draining of the system is accomplished quickly and absolutely in a certain and reliable manner. I have found that the force which retards the draining operation in the known constructions, is the surface tension of the water at the air vent in the valve casings.

The present invention proposes a novel means for overcoming or minimizing this surface tension to a negligible degree.

The invention also proposes a valve in which certain of the parts are constructed and related in a novel manner for the purpose of preventing the entrance of extraneous matter, such as would cause undue wear of the valve, between the latter and its casing.

Embodiments of the invention are illustrated by way of example, in the accompanying drawings, wherein—

Figure 1 is an elevation of one form of drain valve in accordance with the present invention; Fig. 2 is a vertical central sectional view of such drain valve; Fig. 3 is

a top plan view thereof; Fig. 4 is a bottom plan view of a valve cap or top plate employed in the construction of Fig. 1; Fig. 5 is a detail perspective view of the valve *per se*, employed in the construction of Fig. 1; Fig. 6 is a horizontal sectional view of the improved drain valve on the line 6—6 of Fig. 2; Fig. 7 is a detail perspective view of a modified form of valve cap or top plate; Fig. 8 is a similar view of a valve which is designed for use in connection with the form of cap or top plate shown in Fig. 7; Fig. 9 is a detail fragmentary front elevation showing one construction of air vent opening; Fig. 10 is a sectional view of the construction shown in Fig. 9; Fig. 11 is a detail fragmentary elevation of an alternative construction of air vent opening; Fig. 12 is a diagram showing the manner of producing the opening disclosed in Fig. 11; Fig. 13 is a detail elevation of another alternative construction of air vent opening; and Fig. 14 is a diagram showing the manner of producing the opening disclosed in Fig. 13.

Similar characters of reference designate corresponding parts throughout the several views.

In the example shown in Figs. 1 and 2, the valve casing is designated by the numeral 1 and has at one side thereof an inlet branch 2 for connection with the main supply pipe and at its opposite side, an outlet branch 3 for connection with the service pipe of the building. The valve herein disclosed is of the type generally known as turning-plugs, and includes a plug 4 of frusto-conical outline, and which has a conformable seating in the casing 1. To maintain this seating, the plug 4 has a depending threaded stem, as 5, upon which is provided a securing nut, as 6, the latter bearing against a washer, as 7, which is interposed between said nut and the underface of the casing 1. The plug 4 is provided with the usual slotted throughway opening, as 8, by means of which the communication of the branches 2 and 3 is established.

Those features of construction by which the draining of the system is provided for, will now be described. The plug 4 is provided with upper and lower openings, as 9 and 10, which project laterally and at right angles from the slot 8 and are disposed adjacent the respective upper and lower ends of said slot and at the same side thereof.



The portion of the plug at the opposite side of the slot, is solid. The casing 1 is provided at one side thereof and intermediate the branches 2 and 3, with an opening, as 11, adjacent which is an interiorly threaded boss to receive a pipe, as 12, which is joined to the trap pipes of the system. The casing 1 is provided at the opposite side thereof with air vent openings and with a drainage opening. The air vent openings are designated by the numerals 13 and 14 and the drainage opening is designated by the numeral 15. The opening 13 is disposed above the opening 14 and the latter is disposed above the opening 15, all of the openings being arranged in vertical alinement. The openings 13 and 14 are separated by a web, as 16, the upper and lower faces of which are inclined inwardly and upwardly and in convergent relation, and meet in a comparatively sharp edge coincident with the inner face of the casing 1.

The general operation of the valve is as follows. Normally the plug 4 is in a position to establish communication between the branches 2 and 3. When, however, it is desired to disestablish such communication, the plug is turned through an angle of ninety degrees, bringing its openings 9 and 10 in communication with the branch 3 and the service pipe leading therefrom, bringing its solid portion on the side opposite the said openings across the mouth of the branch 2, and bringing its slot 8 into communication with the opening 11 at one side of the casing and with the openings 13, 14 and 15 on the other side of the casing. It will be borne in mind that the service pipe valves are closed and that, therefore, the air necessary to a complete drainage of the system, is admitted through the openings 13 and 14 and flows into the slot 8, passing from thence through the opening 9 into the service pipe connected to the branch 3. At the same time, water flows from said service pipe and from the pipe 12 through the slot 8, draining through the opening 15. It will thus be seen that the valve provides for the movement of a column of water in one direction and the movement of air in an opposite direction and above the out-flowing column of water.

In order that the operation generally set forth in the preceding paragraph may be rendered practically possible, it is essential to prevent the maintenance of a film at the air vent, since a film, due to surface tension, would prevent the entrance of air and consequently the complete drainage of the system, assuming that the service pipe valves are not opened. One means for preventing such a film, (and which is not claimed in this application) comprises a tube, as 17, which is connected to the casing 1 adjacent the opening 15, and depends from said cas-

ing for a suitable distance, the said tube having a water-sealed discharge end which preferably includes an angular leg, as 18, having an upward extension, as 19. The tube may also be provided with one or more bulbs, as 20, and with a check valve, as 21, which closes against upward pressure. According to this arrangement, the weight of the column of water in the tube 17 is sufficient to overcome atmospheric pressure which tends to resist the backward flow of water through the pipes of the system, and the valve 21 tends to prevent the contents of the trap portion of the tube from being forced backwardly by air pressure at the discharge end of the tube, while the bulbs 20, by virtue of their increased capacity, prevent the water from being forced back to any material degree before the valve 21 closes.

According to the present invention, the surface tension is overcome by a means which is independent of the means just described, and may be employed, *per se*, or in connection with the tube 17 and its adjuncts. The present invention is based upon the facts that the degree of surface tension depends upon (1) the outline of the vent opening and (2) the material in which the opening is formed. From the statement of these facts it follows that if the opening is of the same size throughout its extent and the material is of the same nature throughout the extent of the opening, the degree of attraction between the water and the material forming the face of the opening is always the same at a given temperature. If, however, the vent opening is of irregular outline and the material surrounding the opening is different at different points, the forces which act upon the particles of water within the sphere of attraction are unequal and unequally distributed. As a result of these unequal and opposing attractions, the surface tension of the film is more readily overcome by the pressure of the atmosphere.

The unequal distribution of the forces is due to the irregular outline of the opening 13, as will appear later, and to differences of adhesion between the film and different parts of the surrounding wall of the opening, the latter being faced with more than one material. This may be done in a number of ways. For instance, in Figs. 1, 2, 9 and 10, small plates of metal, as 22, of different material than the material of the casing, are arranged at opposite sides of the opening 13, being secured by screws 23. Or it may be accomplished, as shown in Figs. 11 and 12, wherein a hole 13<sup>a</sup> is drilled in the casing and filled with any desired material, and a hole 13 is subsequently drilled eccentrically to the hole 13<sup>a</sup>, the resultant opening being of oval form, as shown at 13<sup>b</sup> in



Fig. 11 and having a crescent-shaped facing, as 13<sup>c</sup> composed of the material which was originally placed in the hole 13<sup>a</sup> and the greater portion of which was removed in the operation of drilling the hole 13. Or the facing of the hole 13 may be accomplished as shown in Figs. 13 and 14 wherein the hole 13 is first drilled and a ribbed core rod, as 24, is inserted therein, the clear spaces 24<sup>a</sup> between the ribs of such core rod providing for electroplating the hole 13 at intervals, the facing material being shown in Fig. 13 at 25, and conforming in relation to the relation of the ribs of the core rod 24 which, after the electroplating operation, is withdrawn. Thus the hole 13 consists of alternately disposed plain and plated faces. Another method consists in first forming the hole 13, then electroplating the same as an entirety with some desired material and then tapping the same with a milled die so as to provide for spiral electroplated ridges and intervening plain-faced grooves. Or instead of tapping the hole, portions of the electroplated surface may be filed away at desired intervals.

The efficacy of the foregoing constructions depends upon the fact that the force of adhesion between the water and a given metal is a definite amount and is different for different metals. With this unequal force of adhesion between water and the different metals the film is more easily broken and hence air more readily enters the valve and the pipes.

The novel features of organization of the valve will now be described. That portion of the valve casing in which the plug 4 has its seating is open ended, its lower end being closed by the washer 7, previously referred to, and its upper end being closed by a cap, as 26. The plug 4 has in its upper end a flat-sided axial recess, as 27, and the cap 26 has a central depression, as 28, which fits conformably in the recess 27, and is in turn formed with a flat-sided recess, as 29, to receive the tang 30 of the operating handle 31. The cap 26 rotatably surrounds the annular upper end portion of the casing 1 and is turned with the handle 31. For the purpose of limiting the turning movement of said handle and consequently of the valve, the casing 1 has at a suitable point on its upper edge, a projecting lug, as 32, and the cap 26 has on its underface two oppositely disposed lugs, as 33 and 34. The lugs 33 and 34 are of suitable dimensions and the one limits the movement of the valve in one direction while the other limits the movement of the valve in the other direction. By virtue of this arrangement the parts may be set for clockwise or counter-clockwise rotation. Referring to Figs. 1 and 2, wherein the plug is shown in position to interrupt the communication of the branches 2 and 3,

if it be assumed that the lug 33 is as shown at the left hand side of the lug 32, bearing thereagainst and the lug 34 is at the right hand side of and distant from said lug, the movement of the valve to establish communication will be clockwise and the movement of the valve to shut off communication will be counter-clockwise. If, however, the cap 26 is so positioned that (with the plug in the relation shown in Figs. 1 and 2) the lug 33 is at the right hand side of the lug 32, bearing thereagainst and the lug 34 is at the left hand side of and distant from said lug, the opening movement of the valve will be counter-clockwise and the closing movement of the valve will be clockwise. In the construction shown in Figs. 7 and 8, the valve cap or top plate designated by the numeral 26<sup>a</sup>, has a central flat-sided hole, as 35, and the plug 4 has an axial projecting tang, as 36, which passes through the hole and is of conformable flat-sided formation. The cap 26<sup>a</sup> is otherwise similar to the cap 26 and fits over the casing in the same manner. The tang 36 fits conformably in a socket in the end of the handle, as will be readily understood.

The construction and relation of the cap 26 is of advantage in that it provides against the passage of extraneous matter between the valve and its casing through the upper end of the latter, and in that it provides for either a clockwise or counter-clockwise movement of the valve in a particular operation, as may be required by circumstances.

It will be understood that no specific description herein contained is intended to put any limitation on the claims not inherent in the language thereof.

Having fully described my invention, I claim:

1. The combination with a drain valve and a service pipe, of a valve casing having an air vent opening faced with different kinds of material, the valve in its closed position putting the vent opening in communication with the service pipe and draining water from the service pipe.

2. The combination with a drain valve and a service pipe, of a valve casing having an air vent opening, the surrounding surface of which is partially electroplated with suitable metal, the valve in its closed position putting the vent opening in communication with the service pipe and draining water from the service pipe.

3. The combination with a turning plug and a service pipe, of a casing for the turning plug, the latter having a through-way slot and having upper and lower openings at one side of the slot, and the casing having an air vent opening faced with different kinds of material, the valve in its closed position putting the slot in communication with the air vent opening, putting the upper



and lower openings in communication with the service pipe, and draining water from the service pipe.

4. The combination with a drain valve  
5 and a service pipe, of a valve casing having two air vent openings, the wall between which has inwardly converging faces meeting in an edge, one of the openings being faced with different kinds of material, the  
10 valve in its closed position putting the vent openings in communication with the service pipe and draining water from the service pipe.

5. The combination with a drain valve  
15 and a service pipe, of a valve casing having an air vent opening faced with different kinds of material, the valve in its closed position putting the vent opening in communication with the service pipe and draining  
20 ing water from the service pipe, and a tube depending from the casing and through which the water drained from the service pipe flows.

6. A valve consisting of a casing, a valve  
25 body rotatable therein and having at its upper end an axial non-circular recess, a cap

rotatably fitted upon the upper end of the casing and having an axial central depression which fits conformably in said recess and is also provided with a non-circular recess, and a handle having a tang for conformable engagement in the recess of the cap.

7. A valve consisting of a casing, a valve body rotatable therein, the casing having a lug at its upper end, the valve body having a recess at its upper end, a cap rotatably fitted on the upper end of the casing and having a projection to engage in the recess and to produce thereby a rotation of the valve body with the cap, the cap also having oppositely located lugs to engage said first-named lug as a stop, and a handle for turning the cap.

In testimony whereof I have hereunto set  
my hand in presence of two subscribing witnesses.

CHARLES WALKER.

Witnesses:

H. G. MOODY,

PARIS A. HAYNES.