

T. W. STONE.  
HIGH PRESSURE GATE VALVE.  
APPLICATION FILED JAN. 14, 1908.

970,764.

Patented Sept. 20, 1910.  
2 SHEETS—SHEET 1.

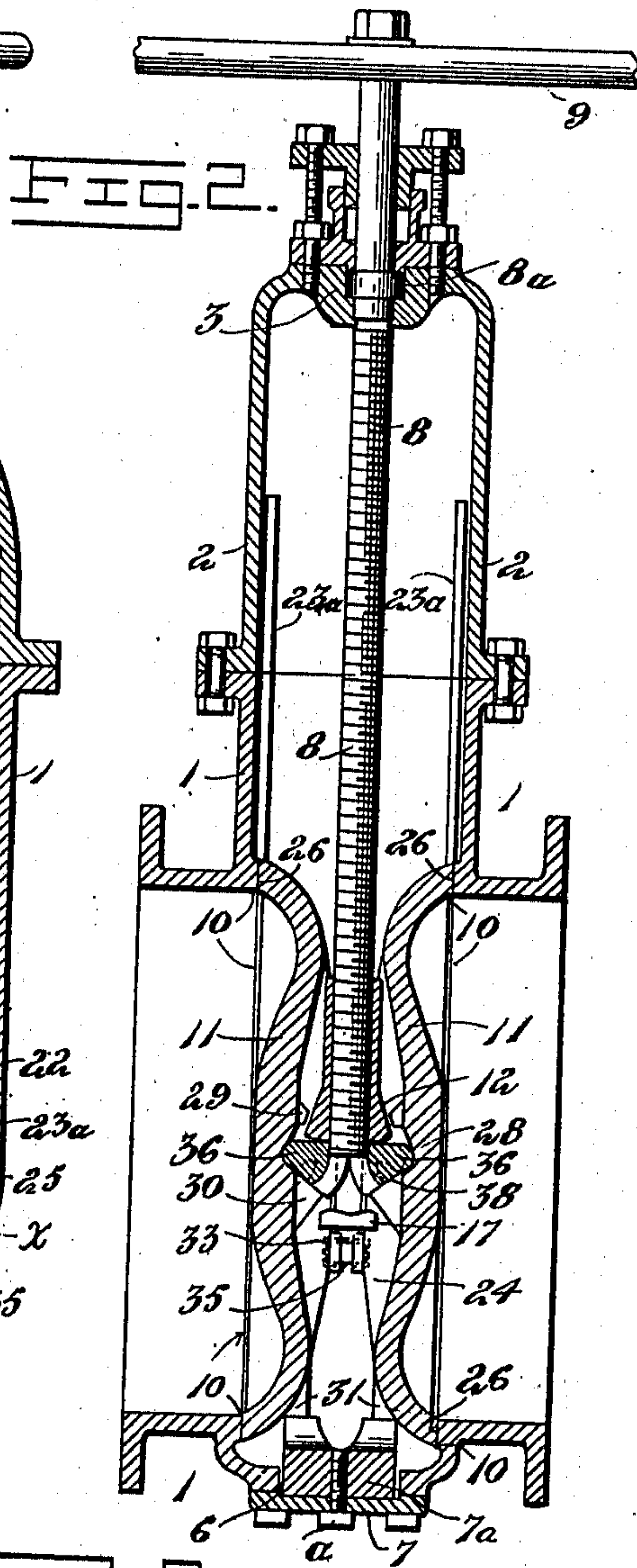
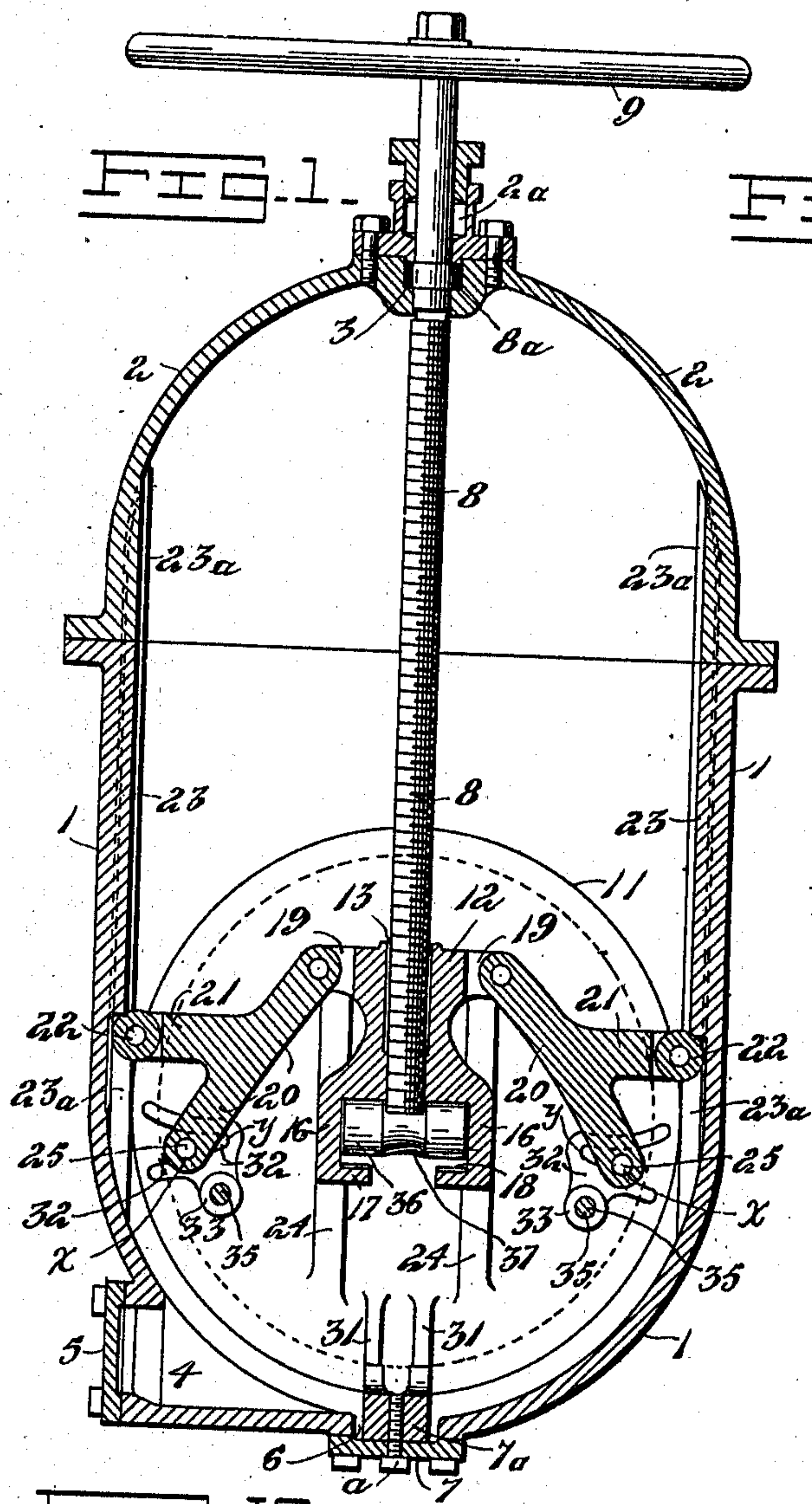
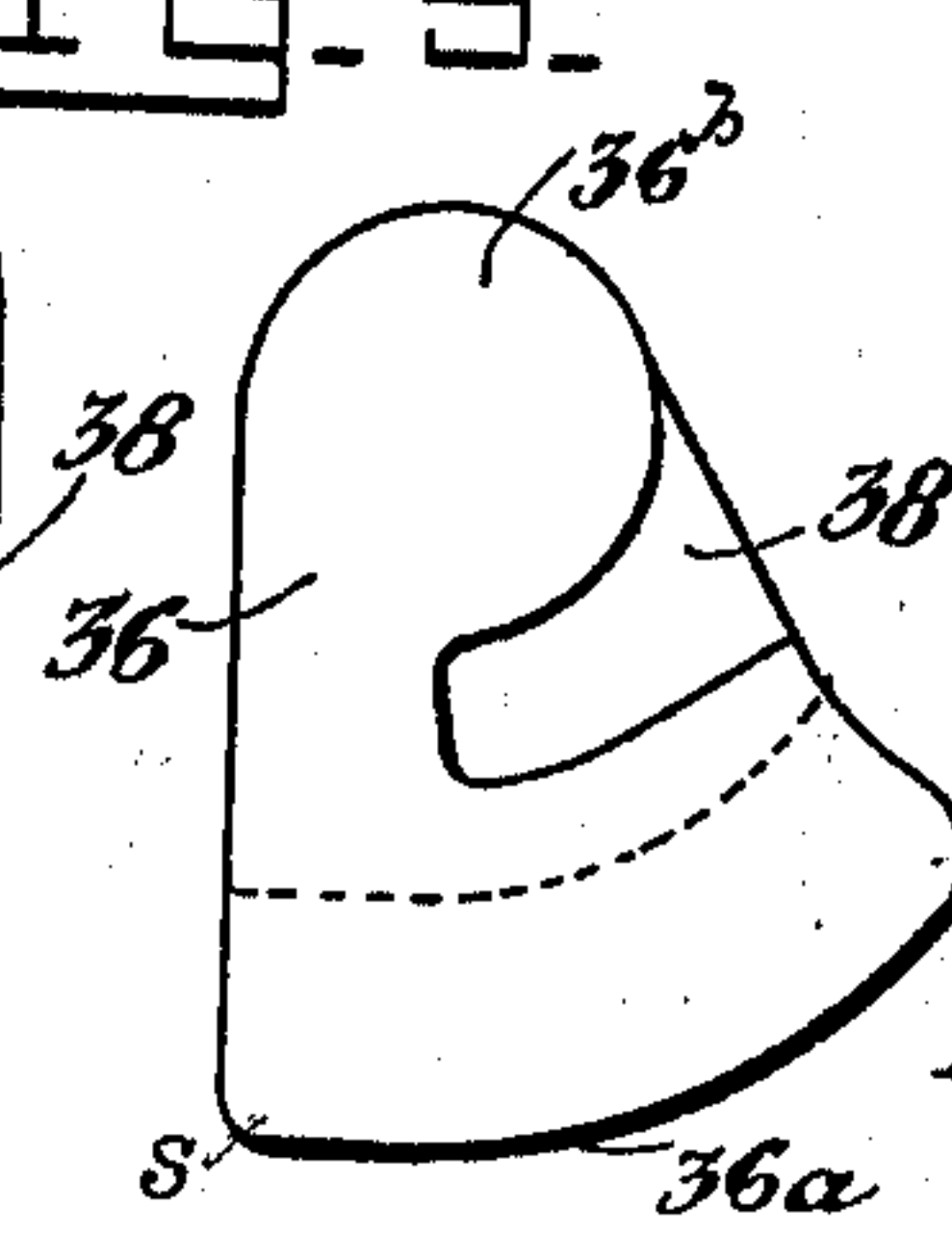
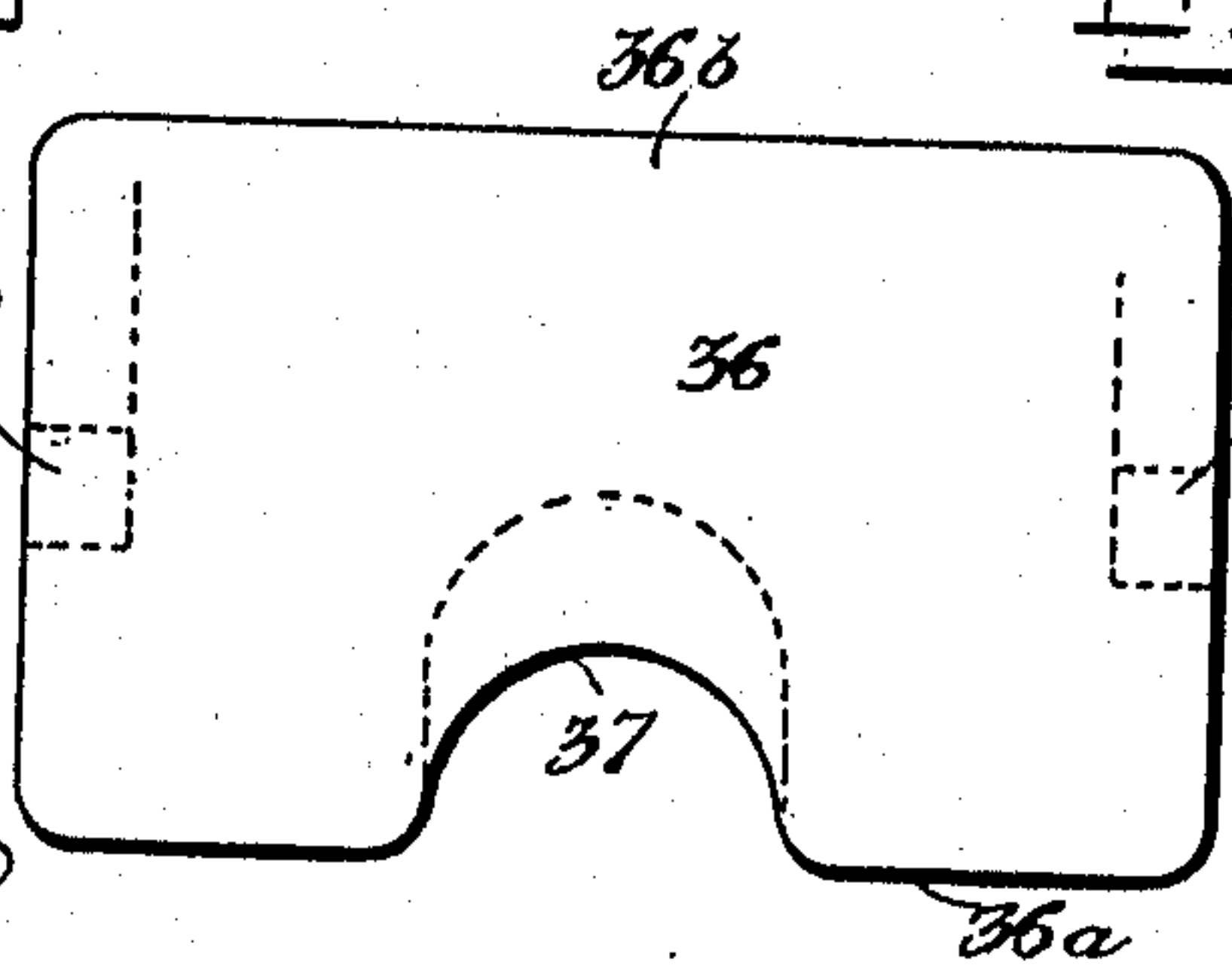


FIG. 10.

FIG. 9.

Witnesses  
L. C. Smith  
Alfred Scott



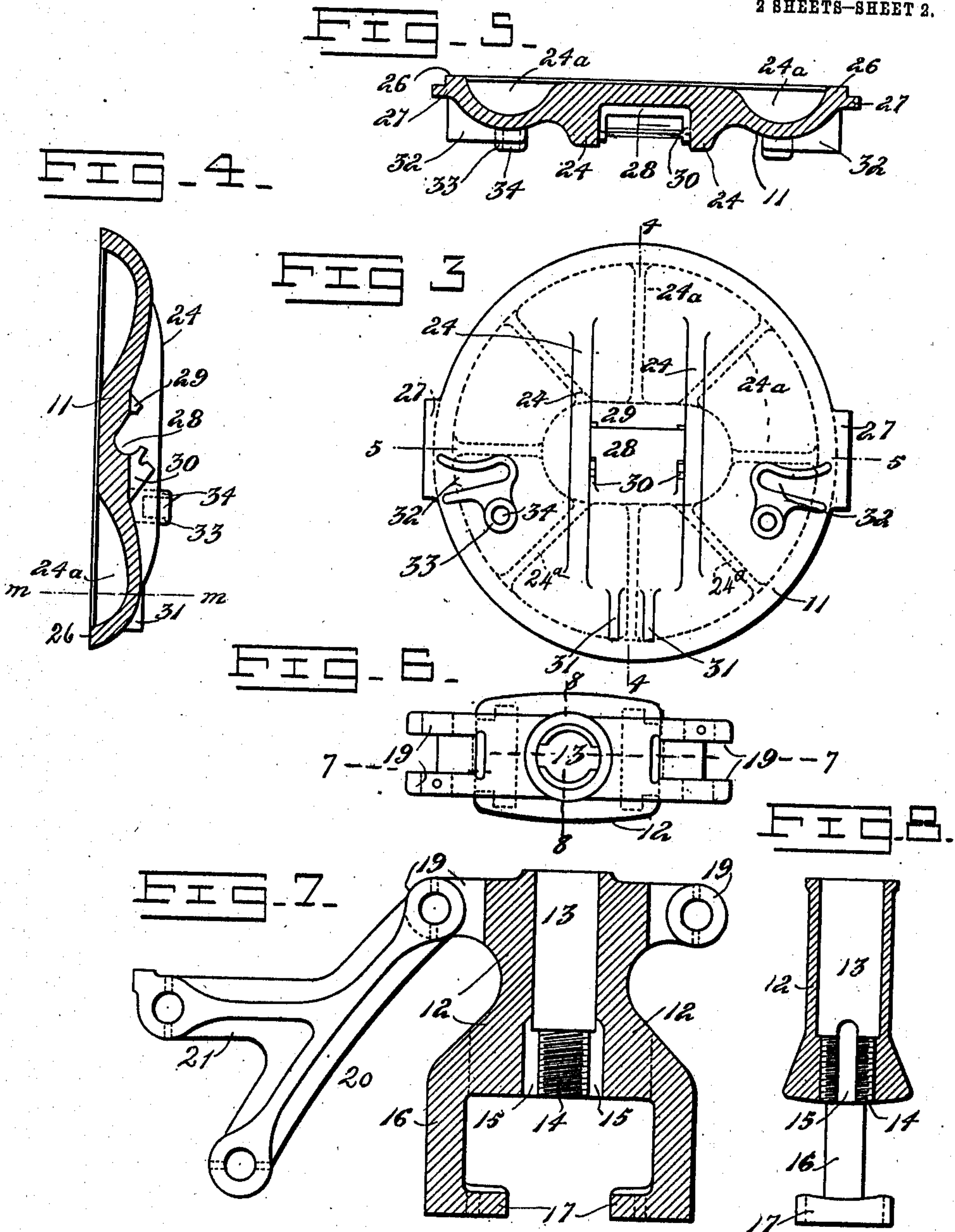
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Witnesses  
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# UNITED STATES PATENT OFFICE.

THOMAS W. STONE, OF FORT WAYNE, INDIANA.

## HIGH-PRESSURE GATE-VALVE.

970,764.

Specification of Letters Patent. Patented Sept. 20, 1910.

Application filed January 14, 1908. Serial No. 410,849.

*To all whom it may concern:*

Be it known that I, THOMAS W. STONE, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in High-Pressure Gate-Valves, of which the following is a specification.

This invention relates to double disk gate-valves, and particularly to such kind of valve adapted to withstand a high pressure of fluid in a main or conduit.

The object of my invention is to provide a quick operating, reliable and effective gate-valve which will withstand a high pressure—such as one hundred pounds to the square inch, or such other pressure as may be required,—upon the disk or disks without permitting leakage of fluid into the valve body or casing.

A special object is to provide means for producing a powerful thrust or pressure upon the disks to force them upon, and hold them on, their seats or to readily release them therefrom when they are to be raised in the casing to open the pipe or conduit.

Another object is to provide means for better lifting the valve disks and guiding them as they are raised and lowered in the body or casing.

Another object is to provide valve disks which are comparatively light and yet possess great strength and rigidity so as to withstand great pressure without springing or yielding at their annular bearing edges or faces.

Another object is to provide improved mechanical details of construction by means of which a durable and smoothly operating high-pressure valve—not liable to get out of order—is produced.

The matter constituting my invention will be defined in the claims.

The details of construction of my high-pressure valve are illustrated in the accompanying drawings, in which—

Figure 1 represents a transverse section through the valve-casing and operating mechanism, showing the back face of one valve-disk. Fig. 2 represents a longitudinal section of the valve-casing, the view being at right-angles to that shown in Fig. 1. Fig. 3 represents a rear face view of one of the valve disks. Fig. 4 represents a vertical transverse section thereof on line

4—4, Fig. 3. Fig. 5 represents a horizontal central section thereof on line 5—5, Fig. 3. Fig. 6 represents a top plan view of the lifting yoke. Fig. 7 represents a vertical section thereof on line 7, Fig. 6. Fig. 8 represents a section on line 8, Fig. 6. Fig. 9 represents an end view of a locking cam. Fig. 10 represents a top plan view thereof.

The valve-casing or body 1 is cast in a well known manner and has secured to it a cap 2 provided at the top with a plate having a recess 3 for receiving the collar 8<sup>a</sup> of the valve-stem 8. The cap is also provided with the usual stuffing-box and gland for making a tight joint around the valve-stem. At the base the casing is provided with a lateral clean-out opening 4 closed by a tight-fitting plate 5; also with a bottom opening 6 which is closed by a cover-plate 7 secured by screws to the casing. To this cover-plate is secured, by screw *a*, the stop-block 7<sup>a</sup>, the purpose of which will be hereinafter described. The valve stem 8, as shown, is screw-threaded throughout its length below the collar 8<sup>a</sup> and has secured to its upper end a hand-wheel 9 and at its lower end engages with a screw-threaded opening in yoke 12 to which are attached devices for carrying the valve disks 11, but my invention is not confined to this particular style of screw-threaded stem. My yoke 12 and its attached devices may be connected to, and operated by, other well known kinds of stems, having various kinds of actuating mechanism. The pipe sections project slightly into the casing and are there made with ground faces forming annular seats 10 for the valve-disks 11.

The yoke 12, shown detached in Figs. 6, 7 and 8, is arranged to work between the webs 24 on the valve-disks, as shown in Figs. 1 and 2. This yoke is provided with a longitudinal bore 13 which is preferably made plain at its upper end and with a lower screw-threaded portion, as shown in Fig. 7. Adjacent to the screw-threaded portion I make two opposite vertical grooves 15 which act as dies for cleaning dirt from the screw-thread. As the stem is turned through the screw-threaded portion 14 the grooves 15 will clean off any adhering oil and dirt so as to prevent the possibility of the stem sticking in the yoke in case the valve has been left standing for a considerable length of time, and the dirt and oil having become



dry and hardened. The yoke is provided on opposite sides with lateral downward extensions 16, having at their lower ends the inwardly turned lifting fingers 17, which may also be termed carriage fingers, for raising the locking cams 36 as will be described in the operation. These extensions 16 and fingers 17 provide a space or opening for receiving the abutting faces of the locking cams. At the top the yoke is provided on opposite sides with slotted ears or lugs 19, Figs. 6 and 7, having transverse holes for pins used in connecting the forked lifting arms 20. These arms 20 are provided with inclined branches 21 having at their outer ends the rollers 22 working on suitable pins and adapted to bear on the central vertical guide-ribs 23 on opposite walls of the valve-casing. The valve-casing and cap are also provided in the four corners with guide-ribs 23<sup>a</sup> as bearings for flanges 27, Fig. 3, on the valve disks. The outer ends of the arms 20 are provided with laterally projected pins or studs 25 adapted to engage guide slots 32 on the valve disks, as shown in Fig. 1.

The valve-disks are of special construction, so that they shall be comparatively light and yet possess great strength and stiffness or rigidity in order to withstand the high pressure which is to be brought to bear upon them at the center and so that they shall not spring away from their seats or bearings at the periphery. The valve-disks 11 are made with a reverse curve construction, as shown in Figs. 4 and 5, and are provided with the exterior parallel webs 24 and the interior radial webs 24<sup>a</sup>, thereby providing the greatest depth through the disk at the section *m-m* near the edges where the disk bears upon its seat. This construction provides the greatest stiffness or rigidity at the annular bearing edge where such rigidity is most required. The annular bearing face 26 is ground to make a tight joint with the valve-seat. The disks are also provided with the lateral guiding flanges 27, Figs. 3 and 5, for bearing upon the corner ribs 23<sup>a</sup> in the casing. The valve-disk is provided centrally in its outer face with a pocket or recess 28, Figs. 4 and 5, to receive the small curved sides or faces of the locking cams, as shown in Fig. 2. Adjacent to this recess 28 and also next to the webs 24 are formed the upper stop projections 29 and the lower projections 30 for the locking cam. The projections 30 are also provided with stop-lugs below their outer ends, as shown in Fig. 4. At the lower edge the valve disk is provided with lugs 31 to bear upon the stop-block 7<sup>a</sup> as shown in Figs. 1 and 2. The outer faces of the valve-disks are also provided on opposite sides with the flaring guide-slots 32 adapted to be engaged by pins of the lifting arms for raising the disk. Adjacent to these guide-slots are pro-

vided the bosses 33 having holes or sockets 34 for receiving the loose dowel pins 35 which are inserted between the valve-disks to keep them in line with one another while moving up and down in the casing, as indicated in Fig. 2.

A pair of locking cams 36 is used for thrusting or forcing the valve-disks against their seats, such cams being arranged to bear at their inner faces in a recess or chamber at the lower end of the yoke 12, as shown in Figs. 1 and 2. Each locking cam, Figs. 9 and 10, is made with a large eccentric curved inner side or face 36<sup>a</sup> and with an opposite smaller curved side or face 36<sup>b</sup> which is adapted to fit in the pocket 28 in the valve-disk. The inner curved face is provided with a central transverse groove 37 for passage of the valve-stem 8, as indicated in Fig. 2, and at each end is cut or forged a curved slot 38 adapted to be engaged by the projections 30 near the center of the valve-disk, as shown in Figs. 3 and 5. It will thus be seen that each cam is supported at its smaller curved face 36<sup>b</sup> in pocket 28 and by the projections 30 fitting into the curved slots 38. These locking cams are otherwise loose and free to be moved up and down, at their abutting faces, by the yoke 12. The locking cam is of peculiar shape, being so constructed that the distance from the corner of point *t* to the smaller curved side 36<sup>b</sup>, is considerably less than the distance from the corner or point *s* to the same curved side 36<sup>b</sup>. This is due to the fact that the center of the arc describing the larger face 36<sup>a</sup> is spaced one-eighth inch above the center of the circle describing the curved face 36<sup>b</sup>. By this construction a toggle joint is formed by means of two cams, the center joint of which is continually one eighth inch above the center line of the point at which the thrust is being applied at the same time that the cams move, and in this manner the angle of the toggle arm is maintained while the arm itself is increasing in length. By this construction there is produced the tremendous pressure delivered by a toggle construction just before it passes the center, causing considerable travel of the disks between their seats so that they will take up the spring in all parts and there may still be applied the crucial pressure of the toggle joint.

The valve disks and their operating mechanism having been assembled and in the close or tight position, as shown in Figs. 1 and 2, may be readily and quickly operated by an unskilled attendant, as follows:—The disks being in position on their seats, the cams 36 will be in contact at the top, at or about their opposite points *s*, thereby exerting a powerful toggle joint pressure upon the centers of the valve-disks. It being desired to open the disks, the valve-stem is turned to the left and in its first movement causes the disks



to be released from pressure and permitted to move slightly bakward from their seats. The screw stem being further turned to the left thereby raising the yoke and causing the  
 5 lifting fingers 17 to engage with and raise the locking cams 36, taking pressure off from the valve-disks, the continued turning of the valve-stem causes the yoke to be traversed upward upon the same and the disks  
 10 to be raised into the casing and cap so as to fully open the main or conduit.

When the valve is to be closed the screw stem is turned to the right, thereby causing the yoke to travel downward and carry the  
 15 disks into position adjacent to their seats. At the lower end of their downward movement the lugs 31 will bear upon the stop-block 7<sup>a</sup>, thereby arresting the disks in proper position with their bearing faces 26  
 20 adjacent to the seats 10. The continued turning of the screw-stem now causes the yoke to bear upon the upper face of the locking cams thereby forcing their outer curved portions downward and to roll against one  
 25 another to the points or angles *s*, so as to thrust the disks upon and against their seats.

When the disks are being raised the lifting arms 20 will engage by their pins 25 in the guide-slots 32 and as the yoke begins to  
 30 move upward the pins 25 will slide from the positions *x* to the positions *y* in said guide-slots. This movement takes place while the locking cams are being opened and the pressure on the disks being released. As soon  
 35 as the pins reach the positions *y* the disks will be carried up by the yoke and lifting arms and at the same time the rolls 22 on the branches 21 will be swung inward far enough to allow them to just fit on and between the  
 40 opposite guide ribs 23. In this way the disks are carried to the upper limit of their travel. In closing the valve the rollers 22, running down along the guide ribs 23 always in advance of the pin joint in the ears 19,  
 45 cannot swing away from the center and therefore the pins 25 at the lower ends of the lifting arms cannot move from the positions *y*. In this way it is possible to cause the disks to be forced toward the closed position in case there should be a tendency to stick.

As soon as the lugs 31 on the disks come into contact with the stop block 7<sup>a</sup> the rollers 22 pass below the ends of the guide ribs 23  
 55 and the pins 25 pass from the positions *y* to the positions *x* while the cams are bringing pressure to bear upon the disks and thereby forcing them to their seats 10. The action and operation of the valve is very simple and is performed without hitch or friction, and has given satisfactory results in practical use.

Having described my invention, what I claim, and desire to secure by Letters Patent, is,—  
 65

1. The combination with a pair of valve-disks, of a pair of central locking cams having eccentric faces arranged to bear thereon and to meet centrally at their eccentric faces, a valve-stem, and means connecting there-  
 70 with for operating said cams, substantially as described.

2. The combination with a pair of valve-disks, having central recesses in their back faces, of a pair of locking cams having  
 75 curved sides fitting in said recesses and eccentric faces adapted to meet and bear centrally one upon the other, a valve-stem and means connecting therewith adapted to bear upon the cams near their eccentric faces for  
 80 thrusting the disks to their seats or releasing them therefrom, substantially as described.

3. The combination with a pair of valve-disks, of a pair of central locking cams arranged to bear thereon, a connecting yoke  
 85 bearing on and operating the cams, a screw threaded valve stem working through said yoke and means connecting said yoke with the disks for raising and lowering the disks  
 90 in the casing, substantially as described.

4. The combination with a pair of valve-disks, of a connecting yoke, means engaging therewith for thrusting the disks against  
 95 their seats, a screw threaded valve stem engaging with said yoke, and lifting arms pivotally connecting with the yoke and loosely engaging the disks for raising and lowering the disks in the casing, substantially as described.  
 100

5. The combination with a pair of valve-disks, of a yoke, means interposed between the yoke and the disks for thrusting the disks against their seats, a screw threaded  
 105 valve stem passing through a screw threaded opening in the yoke, a pair of lifting arms pivotally connecting with the yoke and loosely engaging with the outer edges of the disks for raising and lowering them in the casing, and guide rollers on the outer  
 110 ends of said arms for bearing on the casing, substantially as described.

6. The combination with a pair of valve-disks, of a connecting yoke, means engaging therewith for thrusting the disks against  
 115 their seats, a screw threaded valve stem engaging with said yoke, guide-slots on the disks and lifting arms connecting with the yoke and said slots on the disks, guide ways in the casing and means connecting with the  
 120 arms for bearing upon said guide-ways, substantially as described.

7. The combination with a pair of valve-disks having central bearing recesses and guide-slots near their opposite edges, of  
 125 locking cams adapted to bear upon the disks in said recesses, a valve-stem, a yoke connecting therewith and adapted to operate said cams, and lifting arms connecting with the yoke and engaging with said slots on  
 130



the disks and having means for bearing upon opposite vertical guide ribs in the casing, substantially as described.

8. The combination with a pair of valve-disks having central bearing recesses, guide-slots near their opposite edges and bearing lugs at their lower edges, of a connecting yoke, means in the recesses operated by the yoke for thrusting outward the disks, a screw threaded valve stem engaging with said yoke, lifting arms connecting the yoke with said guide-slots, and a stop block at the bottom of the casing, in position to be borne upon by said lugs on the valve-disks, substantially as described.

9. The combination with a pair of valve-disks, of a pair of central locking cams having eccentric faces adapted to bear thereon and on each other at their eccentric faces, a yoke adapted to receive the inner eccentric faced ends of the cams and having inwardly turned fingers for operating the cams, a screw threaded valve stem engaging with said yoke, and lifting arms connecting with the yoke and disks, substantially as described.

10. A valve disk constructed with reverse curves and having a pair of exterior parallel strengthening webs and interior radial webs, the latter extending across the curved portion and being of the greatest depth or thickness near the edges of the disk, and said disk having means for connecting it with a yoke, substantially as described.

11. A valve-disk constructed with reverse curves and a central recess and having at its inner face radial strengthening webs extending across the curved portion, for pre-

venting the annular bearing edge or face from springing or yielding under pressure, also having parallel webs on its back or outer face, and guide slots for connecting it with a yoke in a valve casing, substantially as described.

12. The combination with a pair of valve-disks, having recesses or pockets in their back faces, and supporting projections adjacent to said recesses, of locking cams having curved sides adapted to fit in said recesses, and end slots adapted to be engaged by said projections for holding the cams in place, a valve-stem, and means connecting therewith adapted to bear upon the cams for turning them in their recesses, substantially as described.

13. The combination with a pair of valve-disks, having recesses in their back faces, and supporting projections adjacent to said recesses for supporting the cams, of locking cams having curved sides adapted to fit in said recesses, and having opposite eccentric faces, each provided with a transverse groove, a valve-stem and a yoke, said stem passing through the yoke and said grooves in the cam-faces, and the yoke being adapted to operate the cams for thrusting the disks to their seats or releasing them therefrom, substantially as described.

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

THOMAS W. STONE.

Witnesses:

WALTER J. WELCH,  
ROBERT J. CORK.