Aug. 25, 1936. W. J. GRISSETT 2,052,462

PLUG VALVE OPERATOR

Original Filed April 5, 1935 2 Sheets-Sheet 1

Fig. 1.

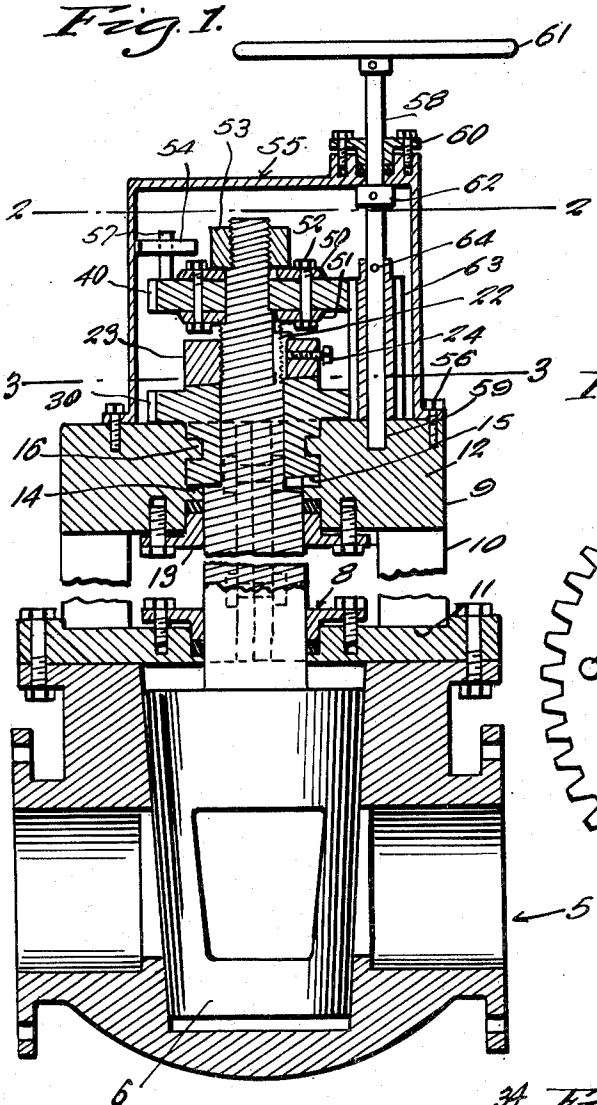


Fig. 9.

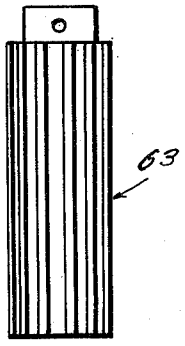


Fig. 4.

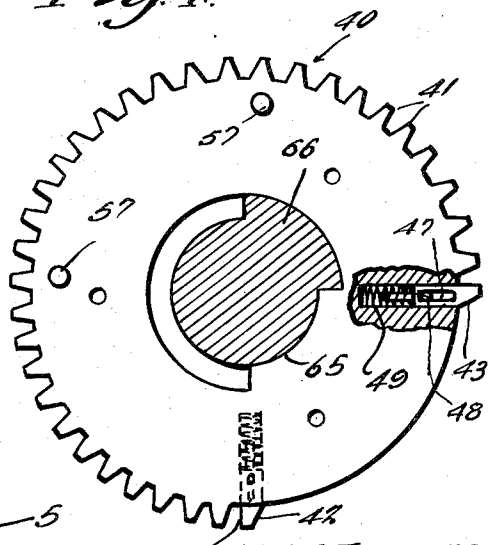


Fig. 10.

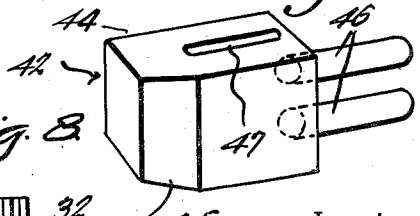
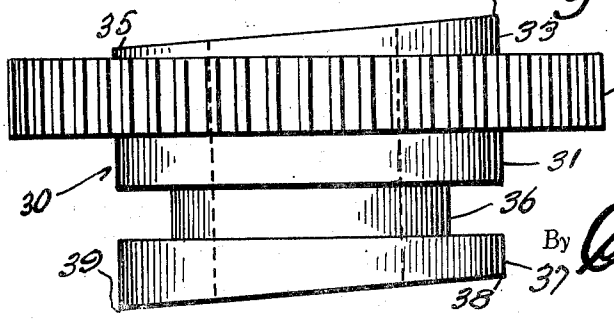


Fig. 8.



Inventor
William J. Grissett

By Clarence A. O'Brien
Attorney

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Fig. 5.

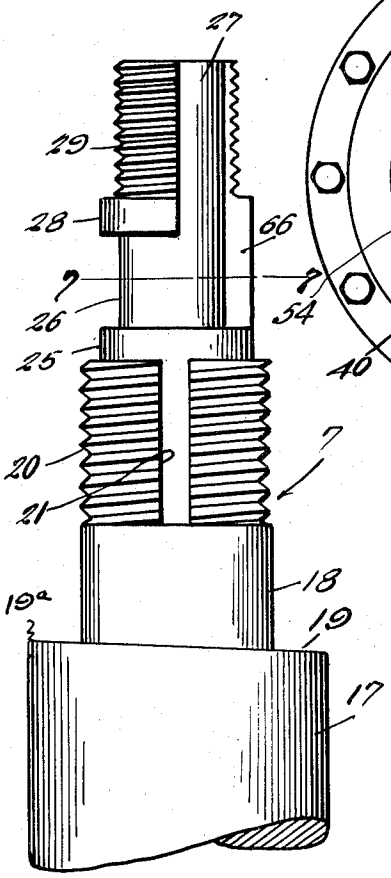


Fig. 2.

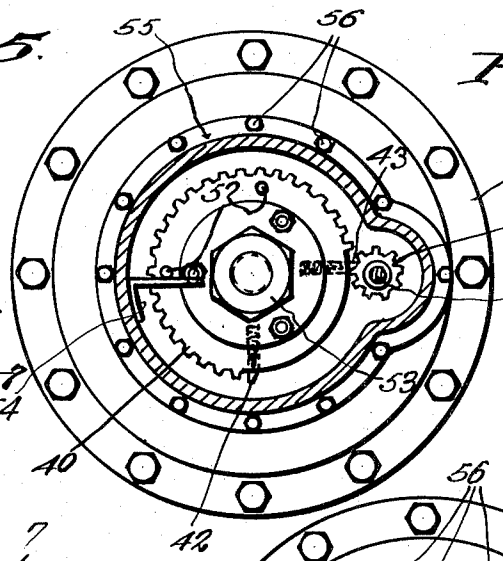


Fig. 3.

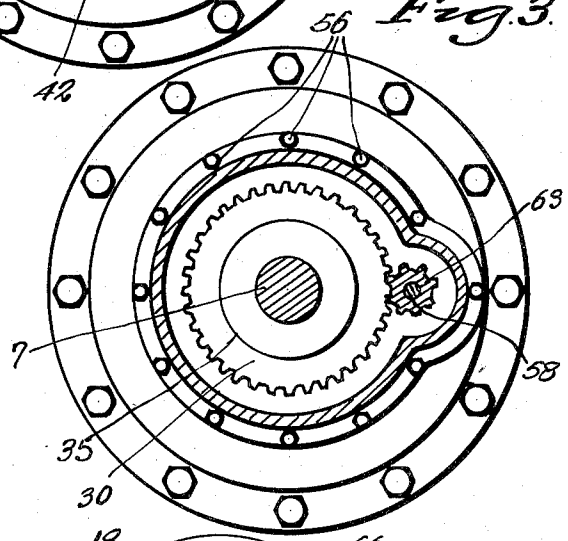


Fig. 6.

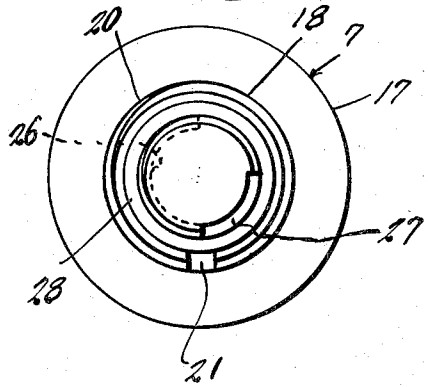
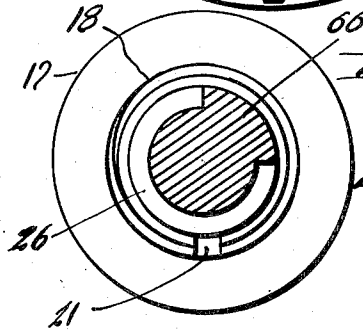


Fig. 7.



Inventor

William J. Grissett

By Clarence O'Brien

Attorney

Patented Aug. 25, 1936 2,052,462

UNITED STATES PATENT OFFICE

2,052,462

PLUG VALVE OPERATOR

William J. Grissett, Texon, Tex.

Application April 5, 1935, Serial No. 14,888
Renewed July 1, 1936

4 Claims. (Cl. 251—97)

My invention relates generally to means for operating valves, and particularly to means for opening and closing a plug valve, and an important object of my invention is to provide means of the character indicated which is simple and efficient and may be applied to different types of plug valves.

Another important object of my invention is to provide plug valve operating means of the character indicated above which is actuated simply by rotating handle means in one direction to open the valve and in the opposite direction to close the valve.

Other important objects of my invention will be apparent from a reading of the following description in connection with the drawings, wherein for purpose of illustration I have shown a preferred embodiment of my invention.

In the drawings:

Figure 1 is a transverse vertical sectional view taken through the embodiment approximately centrally.

Figure 2 is a horizontal sectional view taken approximately on the line 2—2 of Figure 1 and looking downwardly.

Figure 3 is a horizontal sectional view taken through Figure 1 approximately on the line 3—3 and looking downwardly.

Figure 4 is a horizontal sectional view taken through Figure 1 showing in top plan the rotating gear.

Figure 5 is a side elevational view of the stem.

Figure 6 is a top plan view of Figure 5.

Figure 7 is a horizontal sectional view taken approximately on the line 7—7 of Figure 5.

Figure 8 is a side elevational view of the lifting gear.

Figure 9 is a side elevational view of the driving gear.

Figure 10 is a perspective view of one of the spring pressed locking dogs.

Referring in detail to the drawings, the numeral 5 generally designates the housing of a plug valve having the vertically movable rotatable plug valve 6 which has operatively connected thereto the stem which is generally designated 7. A stuffing box generally designated 8 surrounds the stem and prevents leakage through the top of the housing 5.

Mounted on the housing and traversed by the stem 7 is the support which is generally designated 9. The support includes the legs 10 and the plate 11 which closes the top of the housing 5 and the block 12 which is supported by the legs 10.

The block 12 may be of suitable shape and has a generally circular opening receiving the intermediate part of the stem 7, the lower end of this opening being closed by a stuffing box 13 which prevents leakage from the opening around the stem.

The opening through the block 12 has a radially inwardly extending squared lower flange 14 against the right angular lower side of which the packing of the stuffing box 13 bears. Vertically spaced above the flange 14 is another radially inwardly directed squared flange 16 whose upper and lower surfaces are squared.

The main plain cylindrical part 17 of the stem rotatably works within the opening in the block 12 and in the opening in the stuffing box 13 and at an intermediate point the same has a reduced plain cylindrical part which is designated by the numeral 18 and which defines with the portion 17 the plain shoulder 19 which is angulated with respect to the axis of the stem and has the high point 19a. At a short distance above the shoulder 19 defined by the conjunction of the portions 17 and 18, the reduced portion 18 is exteriorly screw-threaded as indicated by the numeral 20 and the threads are traversed by a vertical slot 21 arranged to receive a key 22 which is mounted in a large nut 23 and locked in place in the nut by means of a set screw 24.

Above the upper end of the threaded portion 20 is a short plain further reduced cylindrical portion 25 and immediately above this there is a circumferential groove 26 which extends approximately three-quarters of the way around the stem, which groove has a vertical extension 27 which opens through the top of the stem and traverses the shoulder 28 which defines the upper wall of the groove 26 and the lower end of the reduced threaded part 29 thereabove.

Freely rotating on the plain cylindrical portion 18 and having its lower end arranged to rotatably engage the shoulder 19 is the lifting gear which is generally designated 30 and is shown in detail in Figure 8. The lifting gear comprises the body portion 31 from the upper part of which extends a lateral radial flange with teeth forming the gear 32. Above the gear 32 extends the plain cylindrical portion 33 which has its top angulated so as to present a high point 34 and a low point 35.

Below the gear 32 and spaced below the underside of the gear 32 is the squared groove 36 which defines the plain cylindrical portion 37 whose bottom is angulated so as to present in alignment with the high point 34 the low point 38, and in alignment with the low point 35 the high point 39.

The right angular groove 36 rotatably receives the flange 16 in the bore of the block 12 while

the angulated lower surface of the part 37 rides on the squared upper surface of the flange 14. In the initial position of the lifting gear 30 the angulated lower face of the part 37 has its high point 39 spaced from the low point of the shoulder 19 and its low point 38 resting on the high point 19a of the shoulder 19. The periphery of the body part 31 of the lifting gear rotatably engages the side of the bore in the block 12 above the flange 16.

The large nut 23 which has the key 22 held in place by the set screw 24 is threaded on the threaded part 20 of the stem and has an angulated under face which is conformably engageable with the angulated upper face of the portion 33 of the lifting gear.

Mounted on the portion 26 of the stem 7 and rotatable thereon within a limit of 180 degrees in either direction is the rotating gear which is generally designated 40. Unlike the lifting gear 30 the teeth on the rotating gear 40 do not extend all the way around the periphery thereof, but the teeth on the rotating gear extend only about three quarters of the way around the rotating gear as indicated in Figure 4. At the opposite ends of the teeth 41 of the lifting gear 40 are spring-pressed dogs 42 and 43 which have the sides next to the adjacent tooth right angular as indicated at 44 instead of tapered as are the opposite sides of the dogs as indicated by the numeral 45.

One of the two similar dogs is shown clearly in Figure 10 and includes the two guide pins 46 and the guide slot 47. The dogs work in openings in the periphery of the plain untoothed portion of the rotating gear 40, being positioned by guide pins 48 and outwardly spring pressed by springs 49 which surround the guide pins 46 and engage the back end of the dog as shown in Figure 4.

Reinforcing plates 50 and 51 on the upper and lower sides of the rotating gear 40 are bolted thereto as indicated by the numeral 52 and have the major portion of their center openings engaged with the portions 28 and 25, respectively, of the stem, whereby to keep the gear 40 centered and supported relative to the stem. It is obvious that the gear 40 is engaged with the portion 26 of the stem.

A nut 53 screwed on the threaded portion 29 of the stem engages the top plate 50 to lock the rotating gear 40 in place on the stem.

A spring retaining finger 54 is attached to the vertical wall of one side of the housing 55. The housing is bolted as indicated at 56 on the top of the block 12 and encloses the mechanism described, so that the finger 54 is positioned in the path of upstanding lugs 57 which rise from the top of the operating gear 40 for a purpose to be described.

In a position diametrically opposite the finger 54 and on the opposite side of the rotating gear 40 is the actuating shaft 58 which has its lower end turning in a depression 59 in the top of the block 12 and its upper part rotatably traversing the top of the casing 55 the opening through which is packed by a suitable gland 60. The upper end of the shaft 58 is provided with a hand wheel 61 while a collar 62 is fixed thereon below the casing top to hold the shaft down in position. The lower part of the shaft has the vertically elongated drive gear 63 which is pinned thereto as indicated by the numeral 64 and whose long teeth are in mesh with the teeth both of the rotating gear 40 and of the lifting gear 30, so that rotation of the shaft 58 by turning the wheel 61 will simultaneously rotate both the lifting gear and the rotating gear by the same amount.

While the lifting gear 30 has teeth extending for 360 degrees on the circumference thereof, the rotating gear has teeth for only 270 degrees of the circumference thereof. The groove 26 extends for 270 degrees while the vertical groove 27 is 90 degrees wide. A tongue of 90 degrees which is generally designated 65 projects radially inwardly from the edge of the center opening of the rotating gear 40 to provide stops for engaging opposite sides of the portion 66 of the stem, which is defined by the opposite ends of the slot 26, in the opposite extreme positions of rotation of the gear 40. This arrangement permits the rotating gear 40 to "coast" for a distance of 180 degrees in opposite directions before operatively engaging the stem 7 and rotating the same. The object of having the gear "coast" is to enable the lifting gear to sufficiently lift the valve 6 from a seated position before the valve 6 is finally rotated into position either an open or a closed position. Continuous rotation of the hand wheel 61 in one direction will lift the valve from a seated position, turn the same to a completely open or completely closed position as the case may be, and then reseat the same in the new position. In the cases of some types of plug valves it would be practically impossible to rotate the plug while seated and the plug or stem are in all cases much more easily and effectively rotated to open and closed positions while the plug is lifted and in an unseated position.

The stop lugs 57 are two in number and are positioned on the top of the rotating gear 40 diametrically opposite to corresponding ones of the stop dogs 42 and 43, so that the spring 54 acts in conjunction with the corresponding dog so as to help engagement of the drive gear 63 with the corresponding dog so as to start full operative engagement of the drive gear 63 with the rotating gear 40. The underface of the toothed flange 32 of the lifting gear 30 preferably clears the top of the block 12. Turning drive gear 63 to the left causes the gear 40 to turn to the right, so that 65 (Fig. 4) leaves 66 allowing gear 40 to "coast" or "idle" 180 degrees until it 65 contacts the opposite side of 66. In the meantime, lifting gear 30 will have raised or unseated the plug. The two gears turn together, gear 30 riding on the flange 16 with the high point 34 in contact with the high point on the nut 23 so as to carry and hold the valve stem and valve 6 suspended or raised, while 40 rotates them 90 degrees or until the dog 42 comes into contact with the driving gear 63, thereby allowing 40 to stop rotating. At this point the valve 6 is still suspended. Continuing the rotation of 63 rotates the gear 30, while the gear 40 and the valve stem fail to rotate. The high point 39 travelling toward the high point 19a (Fig. 5) depress the valve stem so as to reseat said core in valve closing position. To open the valve the gear 63 is turned toward the right so that 65 leaves 66 and permits 40 to coast through 180 degrees, while 30 is lifting the valve core. Then 65 contacts the opposite end of 66 and turns 40 through 90 degrees when the dog 43 arrives in position and the gear 40—stem and plug 6 stop rotating although 30 continues to rotate until the plug is seated with valve opened.

It is to be noted that the contacting of jaw clutch 65 and 66 arrests the coasting action of the gear 40 but not the rotation thereof. The

dogs 42 and 43 stop rotation of the gear 40 only together with 6 and 7.

The closed position of the plug is 90 degrees away from the open position.

Although I have shown and described herein a preferred embodiment of my invention, it is to be definitely understood that I do not desire to limit the application of the invention thereto, and any change or changes may be made in the materials, and in the structure and arrangement of the parts, within the spirit of the invention and the scope of the subjoined claims.

What is claimed is:—

1. An operating device for a valve member, said member having a housing and a stem connected with the valve member, cam parts carried by the stem, a gear rotatably mounted on the stem and having cam parts engaging the cam parts of the stem, means for rotatably supporting the gear, a second gear cooperating means on the second gear and the stem for permitting the gear to rotate on the stem for a part of a revolution, after which the stem is caused to rotate with the second gear, a pinion engaging both gears, said pinion rotating the first gear to cause the cam parts to move the valve member off its seat while the second gear is rotating on the stem, said cooperating means then causing the stem to rotate with the second gear to rotate the valve member.

2. An operating device for a plug valve, said valve having a stem and a housing receiving the valve, said stem having cam parts thereon, a lifting gear having cam parts, supported for rotary movement on the stem, a support for the gear, a segmental gear on the stem, projections on the stem and second gear whereby the second gear will rotate freely on the stem until its projection engages the projection on the stem when the stem will be rotated by the second gear, a pinion member engaging both gears, said pinion rotating the first gear to cause the cam parts to move the plug off its seat, while the second gear is rotating on the stem, the projection on the second gear then engaging the projection on the stem to rotate the stem and plug until the pinion member leaves the teeth of the second or segmental gear, the pinion then continuing rotation of the first gear to cause the cam parts to move the plug back upon its seat.

3. An operating device for a plug valve, said valve having a stem and a housing receiving the valve, said stem having cam parts thereon, a lifting gear having cam parts supported for rotary movement on the stem, a support for the gear, a segmental gear on the stem, projections on the stem and second gear whereby the second gear will rotate freely on the stem until its projection engages the projection on the stem when the stem will be rotated by the second gear, a pinion member engaging both gears, said pinion rotating the first gear to cause the cam parts to move the plug off its seat, while the second gear is rotating on the stem, the projection on the second gear then engaging the projection on the stem to rotate the stem and plug until the pinion member leaves the teeth of the second or segmental gear the pinion then continuing rotation of the first gear to cause the cam parts to move the plug back upon its seat, a pair of dogs carried by the segmental gear, adjacent the first and last teeth of the gear, spring means for pressing the dogs outwardly, the inner side edge of each dog being straight and its opposite side edge beveled, said dogs acting with the pinion as one-way clutches.

4. An operating device for a plug valve, said valve having a stem and a housing receiving the valve, said stem having cam parts thereon, a lifting gear having cam parts, supported for rotary movement on the stem, a support for the gear, a segmental gear on the stem, projections on the stem and second gear whereby the second gear will rotate freely on the stem until its projection engages the projection on the stem when the stem will be rotated by the second gear, a pinion member engaging both gears, said pinion rotating the first gear to cause the cam parts to move the plug off its seat, while the second gear is rotating on the stem, the projection on the second gear then engaging the projection on the stem to rotate the stem and plug until the pinion member leaves the teeth of the second or segmental gear the pinion then continuing rotation of the first gear to cause the cam parts to move the plug back on its seat, spring pressed members carried by the segmental gear adjacent the first and last teeth thereof, and acting with the pinion as one-way clutches, a pair of projections on the segmental gear and a spring stop for engaging said projections at the limits of movement of the segmental gear.

WILLIAM J. GRISSETT.