

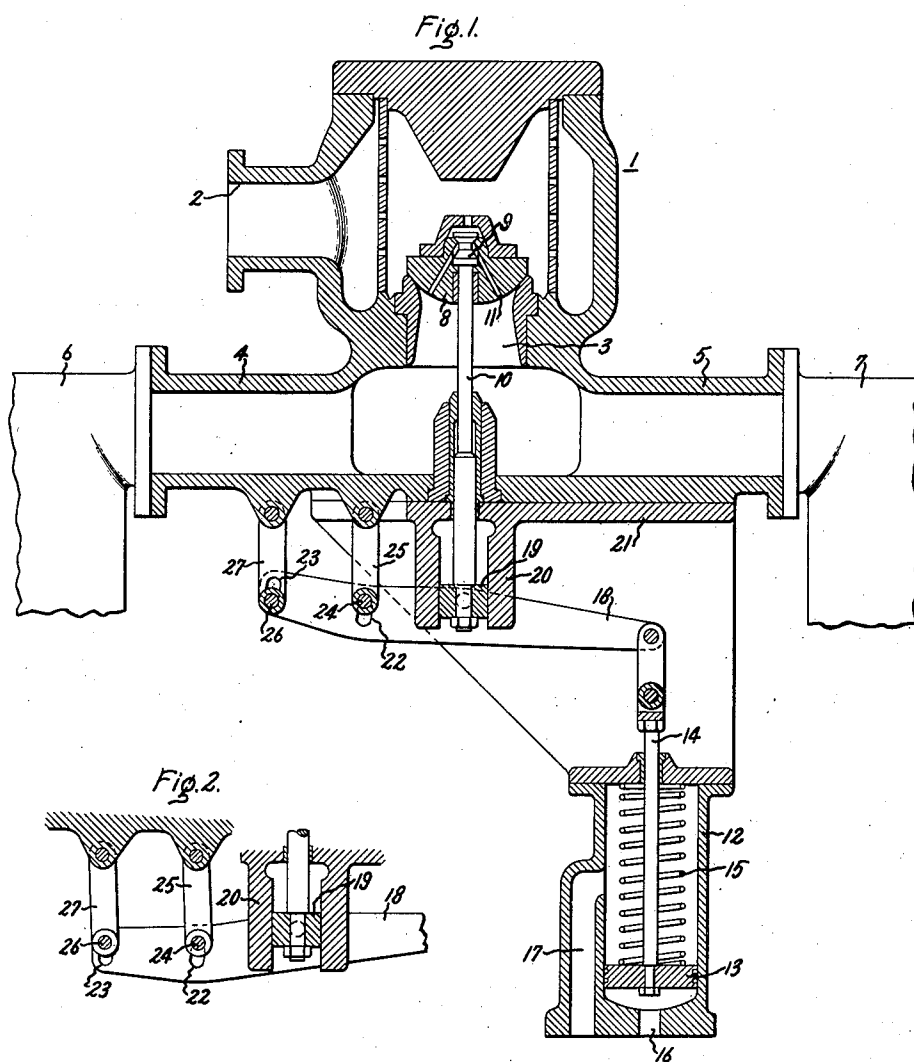
Dec. 6, 1949

L. W. SONGER

2,490,555

VALVE ACTUATING MECHANISM

Filed Oct. 28, 1944



Inventor:
Leo W. Songer,
by *Harry E. Dinkens*
His Attorney

UNITED STATES PATENT OFFICE

2,490,555

VALVE ACTUATING MECHANISM

Leo W. Songer, Scotia, N. Y., assignor to General Electric Company, a corporation of New York

Application October 28, 1944, Serial No. 560,814

5 Claims. (Cl. 74-516)

1

The present invention relates to valve actuating mechanisms including a hydraulic motor or power agency and a lever for positioning a valve. The invention is of particular interest in connection with unbalanced valves which have to be opened against the force of fluid pressure on one side thereof. In order to overcome the unbalanced force it has been customary heretofore to provide a valve with a main valve member and a pilot valve member, which latter is opened first to balance substantially the pressure across the valve. In some instances even the actuation of the pilot valve of this type requires a large hydraulic motor.

The object of my invention is to provide an improved construction and arrangement of valve actuating mechanisms whereby the valve may be fully opened or closed by a comparatively small hydraulic motor. This is accomplished in accordance with my invention by the provision of a special lever mechanism between the hydraulic motor and the valve to be operated. Such lever mechanism in a preferred embodiment includes a lever which has portions connected to a hydraulic motor and a valve to be actuated and other spaced portions alternately supported on spaced fulcrums by slot and pin connections. A lever of this type provides for a large lever ratio to start opening or closing of the valve and a small lever ratio for subsequent movement of the valve.

For a better understanding of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawing.

In the drawing Fig. 1 illustrates a diagrammatic view of an arrangement embodying my invention; and Figs. 2 and 3 show parts of the arrangement of Fig. 1 in different operating positions.

The arrangement comprises a valve 1 having a casing with an inlet 2 for receiving fluid under pressure and an outlet 3 through which fluid is discharged. The outlet has two branches 4 and 5 connected to separate turbines or turbine parts 6 and 7 respectively. The flow from the inlet 2 to the outlet 3 is controlled by a movable valve member including a main valve member 8 and a pilot valve member 9. The pilot valve member is seated on the main valve member and the latter is seated on the casing. The valve members are connected to a stem 10. In the position shown both valve members are closed. Upon upward movement of the stem 10 the pilot valve

2

member is first opened, permitting the flow of operating fluid from the inlet 2 through channels 11 of the main valve member into the outlet 3, thus balancing at least partly the pressure across the main valve member. Upon further upward movement of the stem 10 the main valve member 8 is forced away from its seat. The initial opening movement, that is, the cracking open of the valve, requires a considerable force while only a smaller force is needed to force the valve member through the remaining part of the opening stroke. This also applies to the closing movement, especially with regard to stop valves of turbines which often are held fully open for a considerable period of time. During this long period the valve stem may stick to the casing due to deposits formed between them. This requires a considerable force to start closing movement of the valve and only a smaller force to complete the closing movement.

According to my invention, as pointed out above, this is accomplished by a special lever mechanism for connecting the valve to a power agency. The power agency is in the form of a hydraulic motor having a cylinder 12 and a piston 13 with a stem 14 slidably disposed in the cylinder. The piston 13 is biased downward by a compression spring 15. Fluid under pressure is supplied to the under side of the piston through an opening 16 in the casing and leakage fluid is drained from the upper side of the piston through a channel 17 in the casing. The stem 14 of the servomotor is connected to the right-hand end of a lever 18 which has an intermediate portion connected by a crosshead 19 to the lower end of the valve stem 10. The crosshead 19 in the present example is guided on projections 20 of a plate 21 secured to the valve casing.

The left-hand end of the lever according to my invention has spaced portions connected to fulcrums by means of pin and slot connections. More specifically, the left-hand end of the lever has spaced slots 22 and 23. The slot 22 is connected by a pin 24 to a link or fulcrum 25 and the slot 23 is connected by a pin or pivot 26 to another link or fulcrum 27. The links 25, 27 in the present example are pivotally supported on the valve casing.

During operation, oil or like operating medium under pressure is supplied to the pressure chamber below the piston 13 of the servomotor to effect upward movement of the latter in order to open the valve. During the first part of this upward movement the lever 18 pivots on the pin 24, thus providing for a relatively large lever

3

ratio, i. e. a large "mechanical advantage," and a considerable force on the valve stem. During this counter-clockwise turning movement of the lever about the pivot 24 the slot 23 moves gradually downward relative to the pivot 26. In a certain position (Fig. 2) of the lever the upper end of the slot 23 engages the pivot 26. From then on the pivot 26 becomes the fulcrum for the lever, that is, during the final opening stroke the lever turns about the pin 26 and the slot 22 moves upward relative to the pin 24 (Fig. 3) until the valve is fully open. During the first part of the closing movement of the valve the pin 24 acts as a fulcrum (Fig. 3), thus providing for a large mechanical advantage until the lower end of the slot 23 engages the pin 26 whereupon the latter acts as the fulcrum for the lever during the final closing movement of the valve.

If however stem 10 while in the open position is capable of moving freely in its bushing, during the first part of the closing movement lever 18 fulcrums first about pin 26 until the upper end of slot 22 engages pin 24 whereupon the latter acts as a fulcrum during the final closing movement of the valve.

Having described the method of operation of my invention, together with the apparatus which I now believe to represent the best embodiment thereof, I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination with a first movable member adapted to be actuated in substantially linear translational movement, actuating means for said member comprising a motor having a second actuating member adapted to produce linear reciprocating motion in a direction substantially parallel to the path of the first member and linkage means connecting said second member to said first member, said linkage including lever means having a first end portion connected to the second member and an intermediate portion connected to the first member and two spaced fulcrum means each connected to the lever on the same side of the first member and remote from said first lever end portion, said fulcrum means engaging the lever through lost motion connections so arranged that initial movement of said second actuating member in either direction produces a force on the first member with a large mechanical advantage while subsequent movement of the actuating member in the same direction produces movement of the first member with a smaller mechanical advantage.

2. The combination of a first movable member to be actuated, actuating means for said member comprising a motor having a second actuating member adapted to produce substantially linear reciprocating motion and linkage means connecting said second member to said first member, said linkage including lever means having an intermediate portion connected to the first member and a first end portion connected to said second member and a second end portion having cooperatively associated therewith variable fulcrum means including a first fulcrum connected to said third end portion of the lever by a first lost motion connection and a second fulcrum connected to the lever by a second lost motion connection at a point intermediate said first connection and the connection with said first member.

3. The combination of a first movable member

4

to be actuated, actuating means for said member comprising a motor having a second actuating member adapted to produce substantially linear reciprocating motion and linkage means connecting said second member to said first member, said linkage including lever means having an intermediate portion connected to the first member and a first end portion connected to said second member and a second end portion having cooperatively associated therewith variable fulcrum means including a first fulcrum connected to said second end portion of the lever by a first lost motion connection and a second fulcrum connected to the lever by a second lost motion connection at a point intermediate said first connection and the connection with said first member, said lost motion connections being constructed and arranged so that initial movement of the second member in either direction produces a force on said first member with a large mechanical advantage while subsequent motion of the second member in the same direction produces a force on the first member with a smaller mechanical advantage.

4. The combination of a first movable member to be actuated, actuating means for said member comprising a motor having a second actuating member adapted to produce substantially linear reciprocating motion and linkage means connecting the second member to the first member including a lever having first and second spaced portions connected to the first member and the second member respectively, and variable fulcrum means associated with a third portion of the lever on the side of the first lever portion remote from the second portion, said variable fulcrum including a first link connected by a lost motion connection to the third lever portion at a point remote from the connections with the first and second members and a second pivoted link connected by a second lost motion connection to the lever at a point between the first lost motion connection and said connection with the first member.

5. The combination of a first movable member to be actuated, actuating means for said member comprising a motor having a second actuating member adapted to produce substantially linear reciprocating motion and linkage means connecting the second member to the first member including a lever having first and second spaced portions connected to the first member and the second member respectively, and variable fulcrum means associated with a third portion of the lever on the side of the first lever portion remote from the second portion, said variable fulcrum including a first link connected by a lost motion connection to the third lever portion at a point remote from the connections with the first and second members and a second pivoted link connected by a second lost motion connection to the lever at a point between the first lost motion connection and said connection with the first member, said lost motion connections being constructed and arranged so that initial movement of the second member in either direction causes the lever to fulcrum on the second lost motion connection while subsequent movement of said second member in the same direction causes the lever to fulcrum on the first lost motion connection.

LEO W. SONGER.

(References on following page)

5

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
368,347	Massey -----	Aug. 16, 1887
374,786	Everitt et al. -----	Dec. 13, 1887
518,700	Reynolds -----	Apr. 24, 1894
1,000,489	Buck -----	Aug. 15, 1911
1,382,020	Scoville -----	June 21, 1921
1,547,133	Strickland -----	July 21, 1925

5

10

Number
1,832,952
1,847,031
1,959,071
2,184,294
2,258,224
2,276,702
2,338,379

Number
674,382

6

Name	Date
Kieser -----	Dec. 8, 1931
Wiberg -----	Feb. 23, 1932
Van Patter -----	May 15, 1934
Ferguson -----	Dec. 26, 1939
Sheppard -----	Oct. 7, 1941
Riparbelli et al. -----	Mar. 17, 1942
Henke -----	Jan. 4, 1944

FOREIGN PATENTS

Country	Date
Germany -----	Apr. 13, 1939