Feb. 25, 1930. F. J. RODE 1,748,732

VALVE OPERATING MECHANISM

Filed July 25, 1927 4 Sheets-Sheet 1

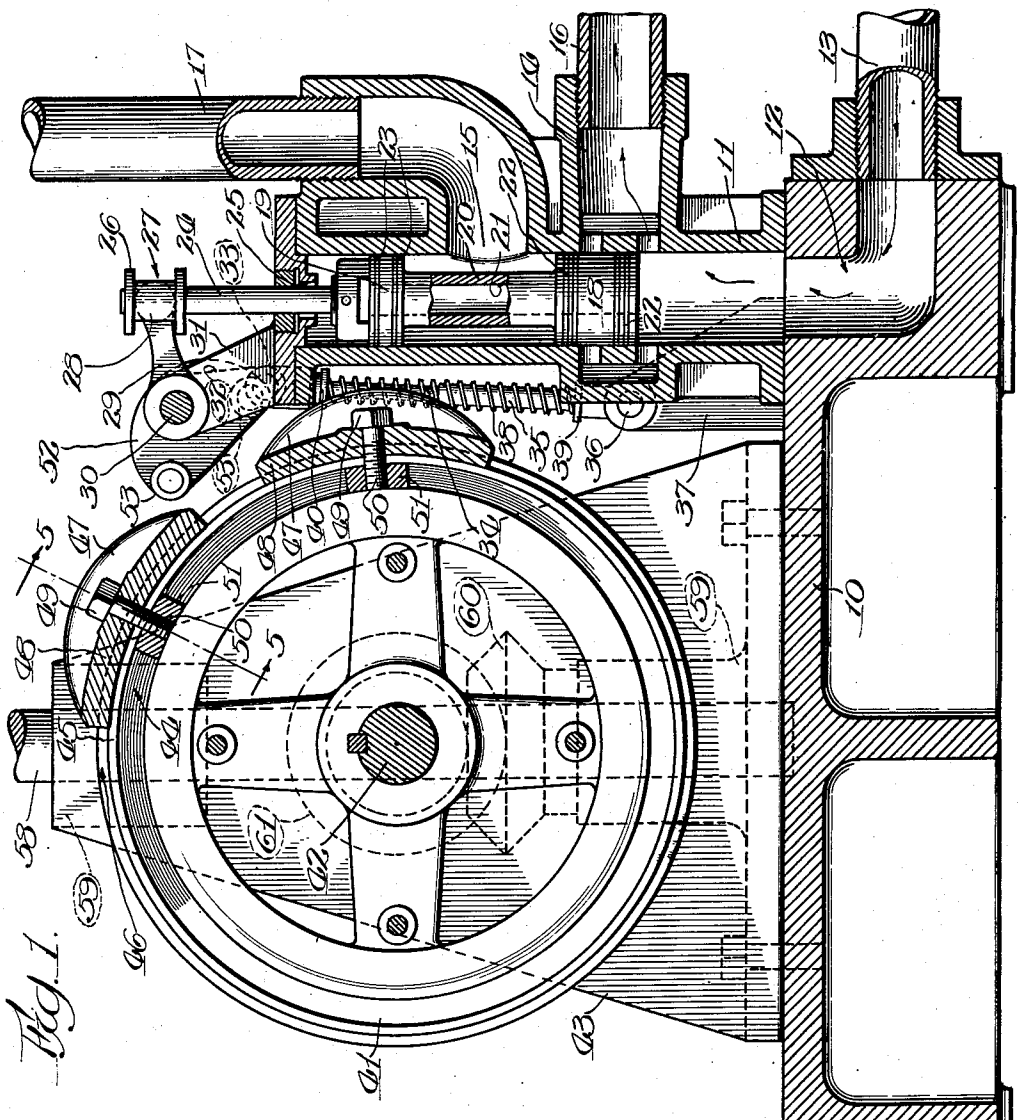


Fig. 1.

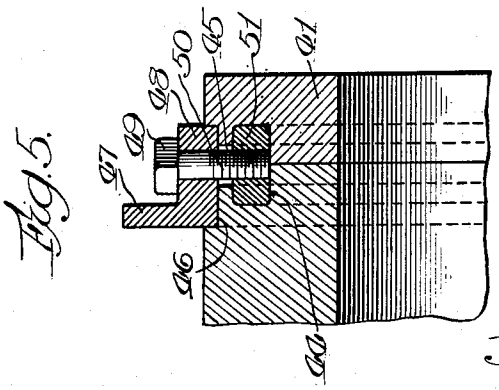


Fig. 5.

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VALVE OPERATING MECHANISM

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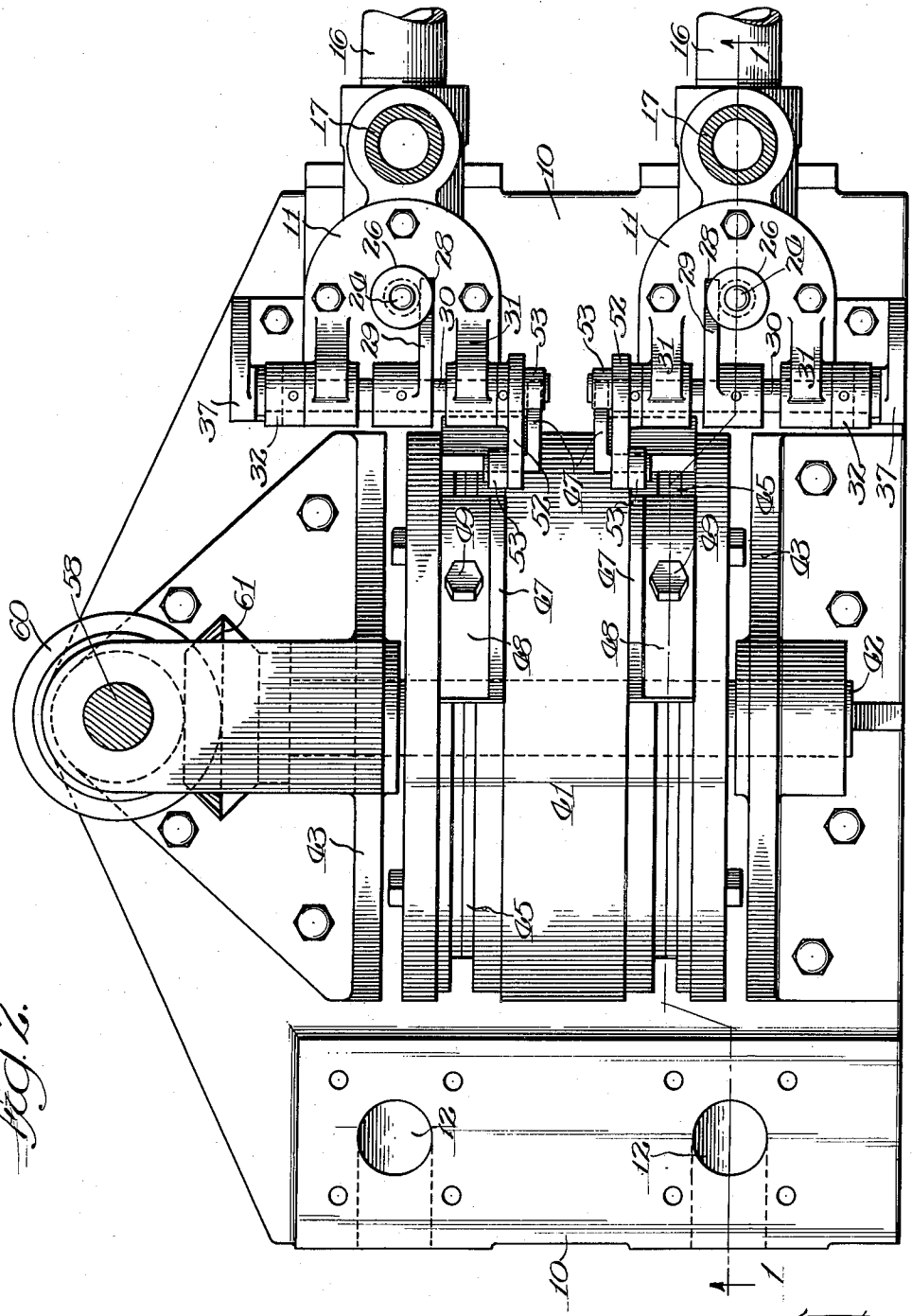


Fig. 2.

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VALVE OPERATING MECHANISM

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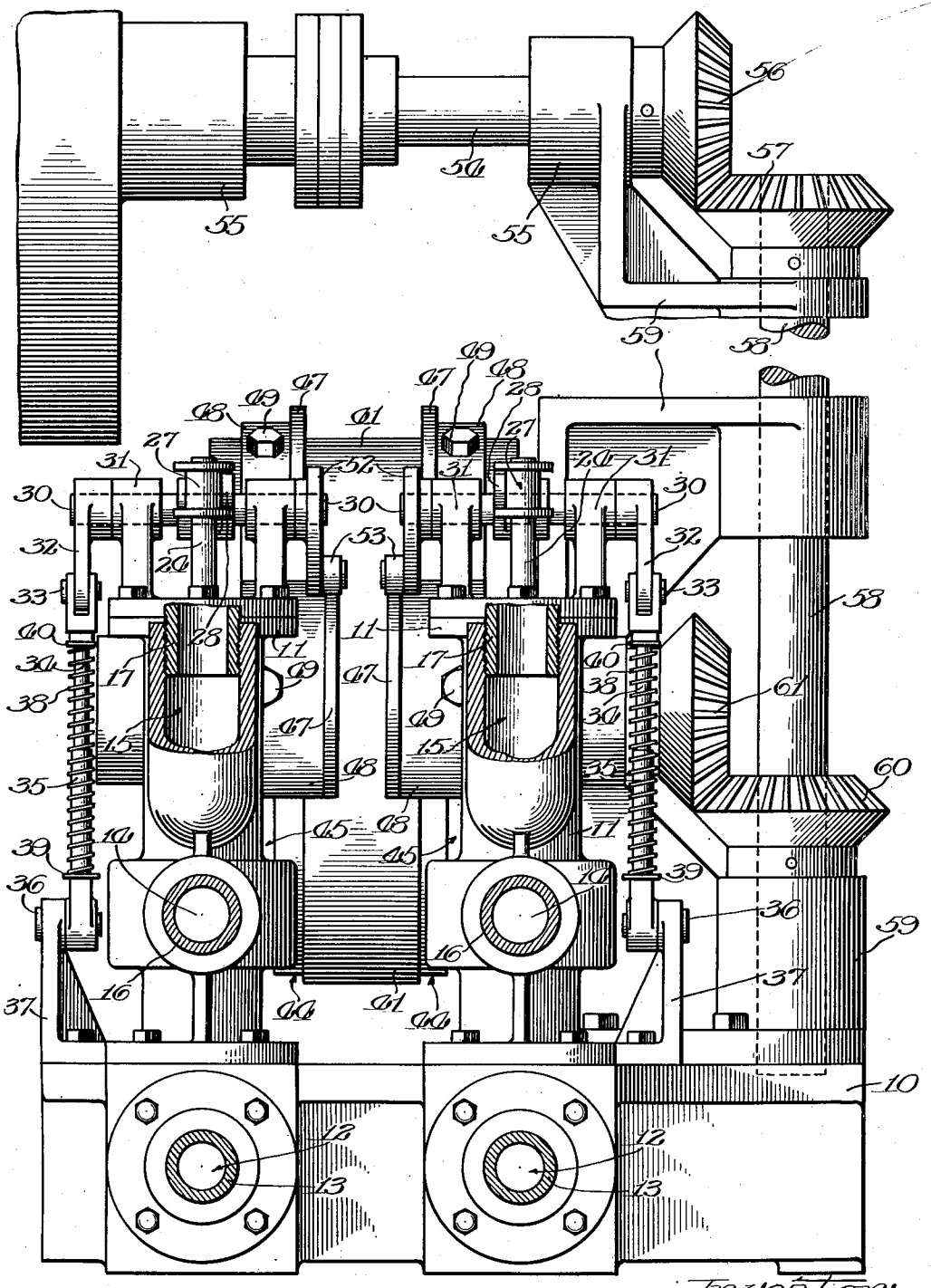


Fig. 3.

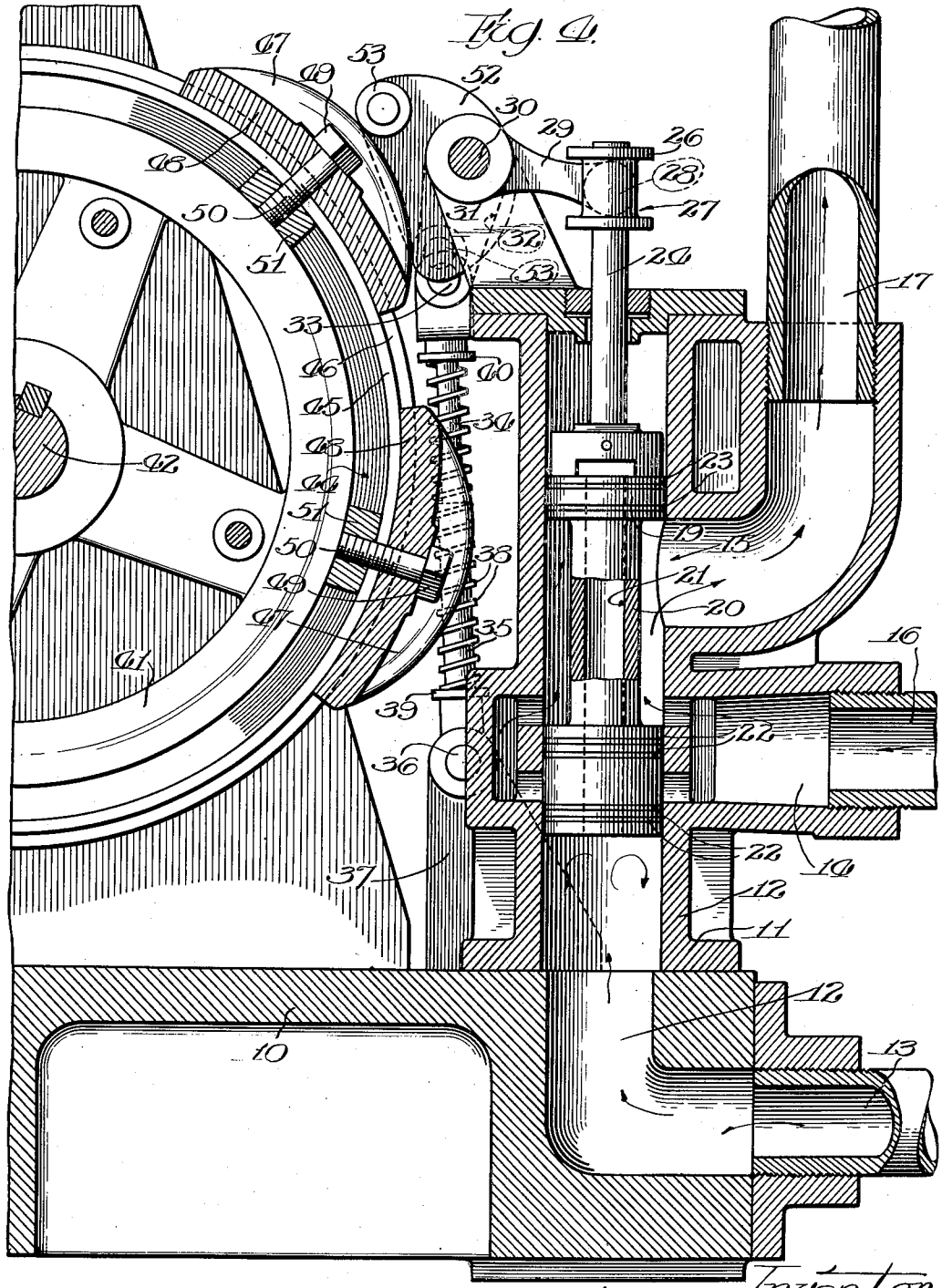
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VALVE OPERATING MECHANISM

Filed July 25, 1927 4 Sheets-Sheet 4

Fig. 4.



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UNITED STATES PATENT OFFICE

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VALVE-OPERATING MECHANISM

Application filed July 25, 1927. Serial No. 208,223.

This invention relates to improvements in valve operating mechanism particularly adapted, though not necessarily limited in its use in connection with fluid pressure controlled die cushions, for controlling the direction of flow or pressure of fluids, and one of the objects of the invention is to provide improved mechanism of this character including means whereby the valve may be actuated at predetermined intervals in the cycle of operation of the machine or mechanism in connection with which the valve is used, and means whereby the time of operation of the valve with respect to the cycle of operation of the mechanism may be varied.

A further object is to provide an improved valve mechanism of this character in which the valve will be balanced, rendering it possible to shift the same with little effort and which may be readily moved at a high pressure.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention, and in which

Figure 1 is a view in vertical section taken on line 1—1, Figure 2, with parts omitted and with parts broken away, of a device of this character, constructed in accordance with the principles of this invention.

Figure 2 is a top plan view of Figure 3.

Figure 3 is a right hand end elevation of Figure 2 with parts omitted and parts broken away.

Figure 4 is an enlarged view of some of the parts shown in Figure 1, and with the parts in a different position.

Figure 5 is a detail sectional view taken on line 5—5, Figure 1.

The present invention is adapted for use in connection with a plurality of valves, and in the present exemplification of this invention two valves and operating mechanism therefor are illustrated, and as the operating mechanism for each of the valves and the valve structure are the same, the description of one will apply equally as well to them all.

Referring more particularly to the drawings the numeral 10 designates a suitable supporting base upon which is mounted a valve casing 11, preferably in the form of a cylinder arranged upright upon the base. The base 10 is provided with an opening 12 to which a pipe or conduit 13 leading from a suitable source of supply of fluid is connected. The opening 12 in the base has communication with the cylinder 11 at the bottom thereof and the cylinder is provided with openings 14 and 15.

Connected with the opening 14 is a pipe 16 which leads from the cylinder (not shown) and connected with the opening 15 is a pipe 17 which constitutes an exhaust.

The cylinder 11 is elongated and arranged and reciprocable therein is a valve embodying spaced pistons 18—19 connected by means of a stem 20, and an opening 21 passes through the valve and through the stem so as to permit the fluid entering the cylinder 11 through the supply 13 to pass on opposite sides of the valve to balance the same.

The piston 18 is preferably somewhat greater in length than the piston 19 and packing rings 22 are carried by the piston 18 and spaced from each other lengthwise of the piston, and similar packing rings 23 are carried by the piston 19 and spaced from each other so that the valve will be sealed on both sides of all of the ports when the ports are opened by the valve, thereby reducing leakage to a minimum.

The stem 20 of the valve is of an external diameter considerably smaller than the diameter of the pistons 18 and 19, so as to form a passage or connection between the respective

ports or passages in the valve casing when the valve is shifted.

Connected with the valve is a stem 24 which passes through a suitable packing 25 in the end of the cylinder. The valve stem 24 projects for a considerable distance beyond the end of the cylinder and carried by the stem is a collar 26 having a circumferential groove 27 in which groove one end 28 of a bell crank lever 29 projects. The lever 29 is pivotally mounted as at 30 upon a suitable support 31 and connected to the other arm 32 of the lever 29 by means of a pivot 33 is a rod 34. The other end of this rod telescopes with a rod 35 which is pivotally mounted as at 36 upon a suitable support 37. A resiliently yielding element 38 such as a coil spring encompasses the telescoping rods 34—35. One end of the spring engages a shoulder 39 connected with the rod 35 and the other end of the spring engages a shoulder 40 connected with the rod 34 and tends normally to separate the rods 34—35 to move the bell crank lever 29 in one direction or the other according to the position of the pivot 33 between the arm 32 of the bell crank lever and the rod 34, with relation to the pivot 30. When the pivot 33 is to one side of the center of the pivot 30 the spring 38 tends normally to move the valve in the casing 11 to the position shown in Figure 1.

When, however, the pivot 33 is to the other side of the center of the pivot 30 the spring 38 tends normally to move the valve in the casing 11 to the position shown in Figure 4.

The spring operates to impart a quick or snap action to the valve as the pivot 33 is passing to one side or the other side of the center of the pivot 30.

When the parts are in the position shown in Figure 1, the supply air inlet opening 12 which communicates with the cylinder 11, will have communication with the port or opening 14 so that the fluid passing into the cylinder 11 will flow through the pipe 16 in the direction indicated by the arrows in Figure 1. The port or opening 15 and consequently the pipe 17 will at this time be closed by the pistons 18 and 19 standing on opposite sides of the opening 15. The fluid entering the cylinder 11 through the opening 12, however, when the parts are in the position shown in Figure 1 will also serve to balance the valve in that a portion of the fluid will pass through the passage 21.

When the valve is in the position shown in Figure 4, the supply pipe 13 and port or passage 12 will be cut off from communication with the opening 14 and pipe 16, but communication will be established between the pipe 16, ports or openings 14 with the port or opening 15 and the pipe or conduit 17 so that the fluid will then flow in the directions indicated by the arrows in Figure 4.

Any suitable means may be provided for shifting the valve at predetermined times in the cycle of operation of the machine in connection with which the valve is employed so that the operation of the valve and the changing of the direction of flow of the current will be automatically controlled by the operation of a movable part of the machine.

To that end and in the preferred form of the invention, there is provided a drum like structure 41 which is connected to a shaft 42 and rotatably mounted upon a suitable support 43 mounted upon the base 10. The drum is provided with a circumferential groove 44 which communicates with a restricted opening 45, and this opening 45 has communication with a seat 46 adjacent an opening through the periphery of the drum. A cam device 47 having a base 48, preferably angular in cross section to conform to the shape of the groove or seat 46, is connected to the drum. The base 48 of the cam is seated in the groove 46 and conforming to the contour of the groove will be held against axial rotation. A fastening device 49 such as a bolt or the like is provided for securing the cam to the drum. This bolt passes through the base 48 of the cam with the head of the bolt resting thereupon. The bolt is provided with threads 50 adapted to be threaded into a member 51 which moves in the groove or channel 44. The member 51 is narrow so that it may be placed into the groove 44 by passing the same through the opening 45. By screwing the bolt 49 into the member 51 the cam 47 may be clamped to the periphery of the drum. By loosening the bolt the cam may be adjusted circumferentially about the drum to the desired position so as to vary the time of shifting of the valve with respect to the cycle of operation or rotation of the drum 41.

Connected with the pivot 30 of the bell crank lever 29 is a member 52 which moves therewith. This member 52 has mounted thereupon projections or anti-friction rollers 53 and these projections or rollers are adapted to be engaged by the cam device 47 so as to rock the member 42 and thereby shift the bell crank lever 29 to a position that the spring 38 will be rendered active to cause a sudden movement to be imparted to the valve after the valve has been started in its operative movement by the rocking of the member 52 by the cam 47.

Two of the cams 47 are employed with each of the members 52. The anti-friction rollers or projections 53 on the member 52 are arranged on opposite sides of the member. That is one of the projections 53 will project laterally from one side while the other will extend from the other side of the member 52.

The cams 47 are arranged out of alinement with each other, with the result that when the drum 41 is rotated one of the cams 47 will engage its respective projection of roller 53 to move the member 52 in one direction and the

other of the cams 47 will, at the proper time in the cycle of operation or rotation of the member 41, engage the other of the projections or rollers 53 to move the member 52 in the opposite direction.

It will therefore be obvious by adjusting the cams 47 with respect to the drum 41 and with respect to each other, the times in the cycle of operation or rotation of the member 41 at which the valve in the cylinder 11 is operated, may be varied at will.

Obviously any other fastening means may be employed for securing the cams to the drum 41.

The drum 41 may be rotated in any desired or suitable manner, but preferably from a shaft 54 mounted in suitable bearings 55. Connected with the shaft 54 is a gear 56 preferably of the beveled type meshing with a gear 57 (preferably of the beveled type) that is connected with a shaft 58. The shaft 58 is journaled in suitable bearings 59 and has connected with it a gear 60, preferably of the beveled type, rotatable therewith. The gear 60 in turn meshes with a beveled gear 61 that is secured to the shaft 42 for rotation therewith.

Thus it will be seen that when the shaft 54 is rotated the drum 41 will be rotated and the valve in the cylinder 11 will be shifted at predetermined times in the cycle of rotation of the drum 41 according to the positions at which the respective cams 47 are secured upon the periphery of the drum 41.

Obviously when a plurality of valves are employed the respective cams 47 may be adjusted with relation to the respective drums 41 so that the valve may be operated at any predetermined time with respect to the operation of each other.

While the preferred form of the invention has been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:—

1. A reciprocable valve, a casing in which the valve operates, a valve stem, a lever pivotally mounted intermediate its ends, one end of the lever operating upon the valve stem to positively move the valve in both directions in the casing, a rotatable cam device co-operating with said lever to rock it alternately clockwise and anti-clockwise at timed intervals in the cycle of operation, and resilient means acting on said lever in such a manner as to force the valve to the remote end of its stroke when the lever is so rocked.

2. A reciprocable valve, a casing in which the valve operates, a valve stem projecting beyond the valve casing, a lever, one end of the lever operating upon the valve stem shifting the valve in both directions, a rotary element, cam devices carried by said element and co-operating with said lever to rock it alternately clockwise and anti-clockwise at timed intervals in the cycle of operation, resilient means acting on said lever in such a manner as to force the valve to the remote end of its stroke when the lever is so rocked, and means for securing said cam devices to said rotary element for adjustment with respect thereto to regulate the timing of the rocking movements of the lever.

3. A reciprocable valve, a casing in which the valve operates, a stem on the valve projecting beyond the casing, a bell crank lever, one arm of the lever operating upon the said stem to shift the valve in both directions, a resiliently yielding lever operating upon the other arm of the bell crank lever for shifting the valve after an initial movement has been imparted to the lever, a member connected with the pivot on which the lever fulcrums, spaced tappets carried by the said member, a rotatable drum like device, projections carried by the periphery of the drum for alternately engaging the tappets to rock the tappet carrying member clockwise and anti-clockwise in the cycle of operation, and means for rotating said drum.

4. A reciprocable valve, a casing in which the valve operates, a stem on the valve projecting beyond the casing, a bell crank lever, one arm of the lever operating upon the said stem to shift the valve in both directions, a resiliently yielding lever operating upon the other arm of the bell crank lever for shifting the valve after an initial movement has been imparted to the lever, a member connected with the pivot on which the lever fulcrums, spaced tappets carried by the said member, said tappets being arranged out of alinement, a rotatable drum like device, projections individual to the tappets and carried by the periphery of the drum for alternately engaging the tappets to rock the tappet carrying member clockwise and anti-clockwise in the cycle of operation, and means for rotating said drum, said projections being adjustably secured to said drum to regulate the timing of the rocking movement of the lever.

5. A reciprocable valve, a casing in which the valve operates, a stem on the valve projecting beyond the casing, a bell crank lever, one arm of the lever operating on the valve stem to shift the valve, telescoping rods, the free end of one of the rods being pivotally connected to the other arm of the bell crank lever, a pivoted guide for the free end of the other rod, resiliently yielding means encompassing the rods and operating upon the said lever to move the same about its pivot after an initial movement has been imparted to the lever, spaced tappets connected with the pivot of the lever and arranged out of alinement with each other, a rotatable drum, projections secured to the periphery of the

drum, for engaging the tappets to rock the said lever clockwise and anti-clockwise in the cycle of operation, means securing the projections to the drum for adjustment thereabout to regulate the timing of the rocking of said lever, and means for rotating the drum.

In testimony whereof I have signed my name to this specification, on this 6th day of July, A. D. 1927.

FREDRICH J. RODE.