Feb. 24, 1948. N. M. MARSILIUS 2,436,656

FLUID PRESSURE ENGAGED CLAMPING FIXTURE

Filed Dec. 6, 1944 3 Sheets-Sheet 1

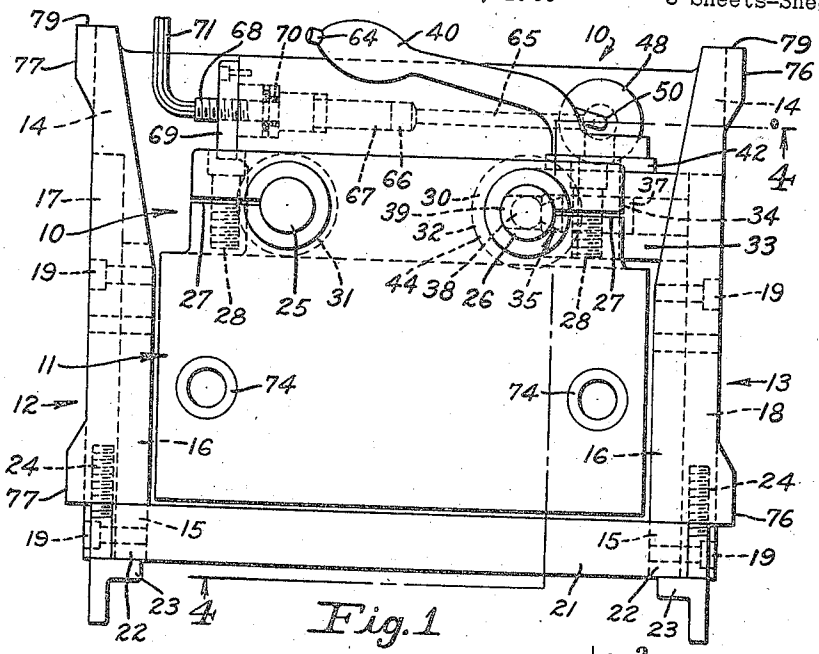


Fig. 1

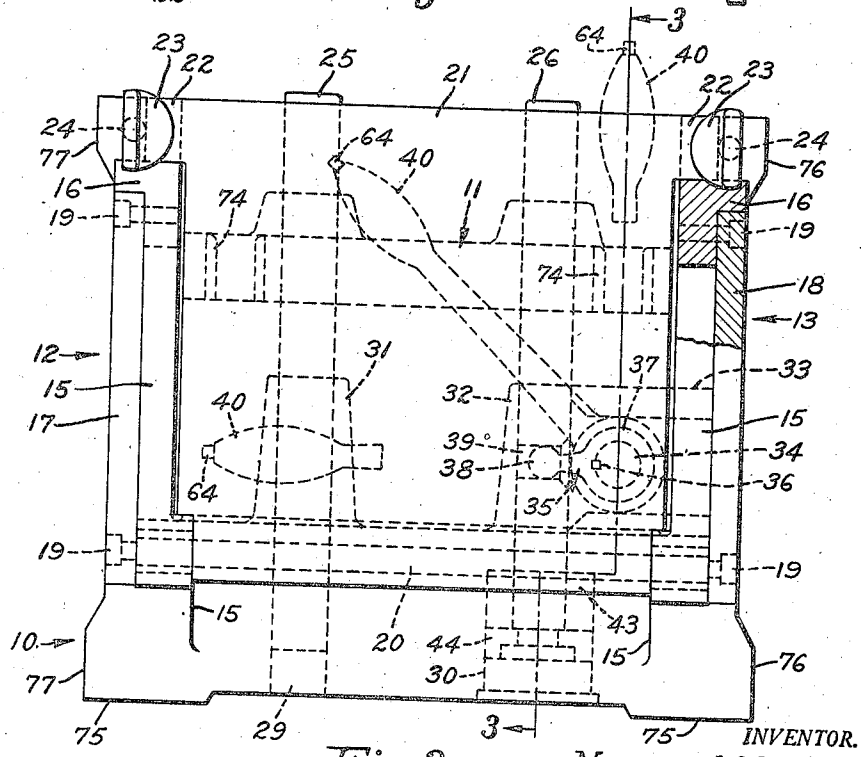


Fig. 2

INVENTOR.
Newman M. Marsilius
BY
John J. Hanrahan

Feb. 24, 1948. N. M. MARSILIUS 2,436,656

FLUID PRESSURE ENGAGED CLAMPING FIXTURE

Filed Dec. 6, 1944 3 Sheets-Sheet 2

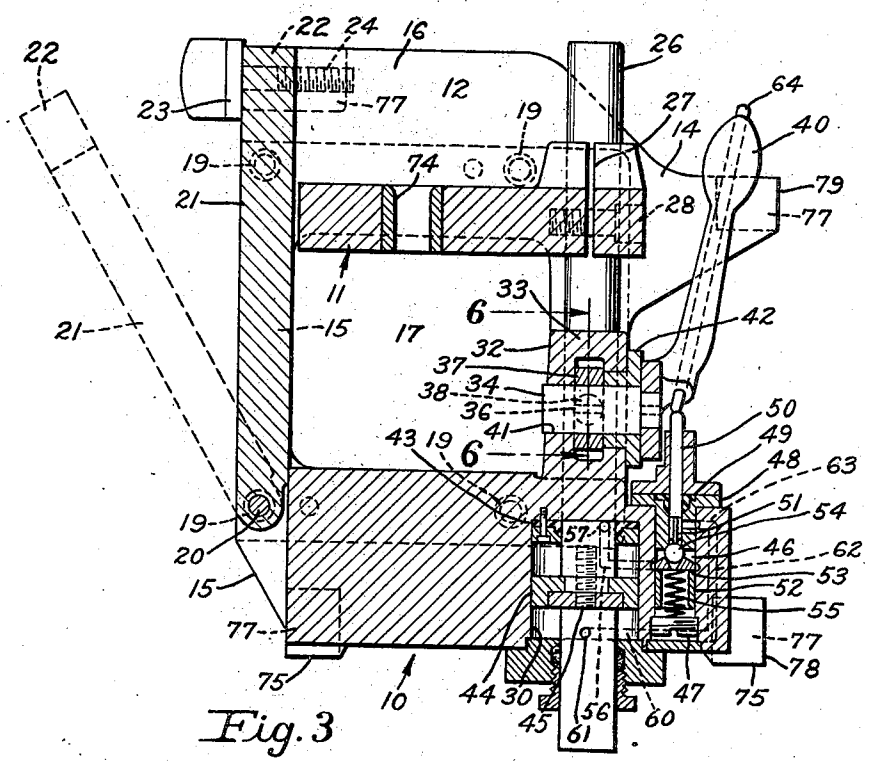


Fig. 3

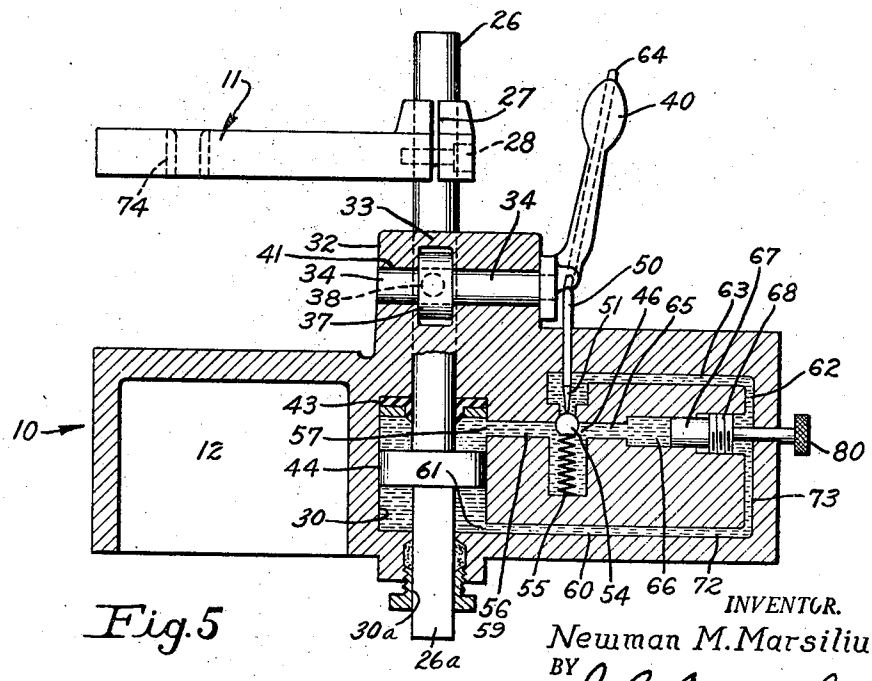


Fig. 5

INVENTOR.
Newman M. Marsilius
BY
John J. Hanrahan

Feb. 24, 1948. N. M. MARSILIUS 2,436,656

FLUID PRESSURE ENGAGED CLAMPING FIXTURE

Filed Dec. 6, 1944 3 Sheets-Sheet 3

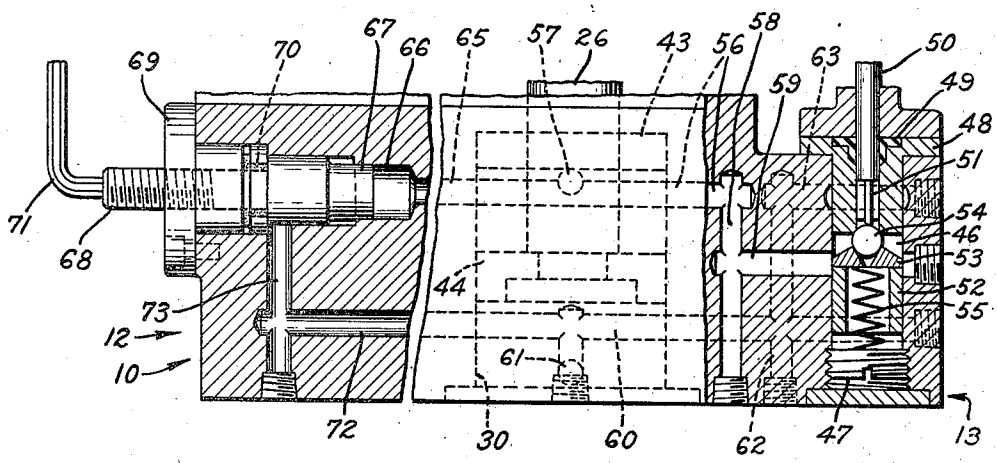


Fig. 4

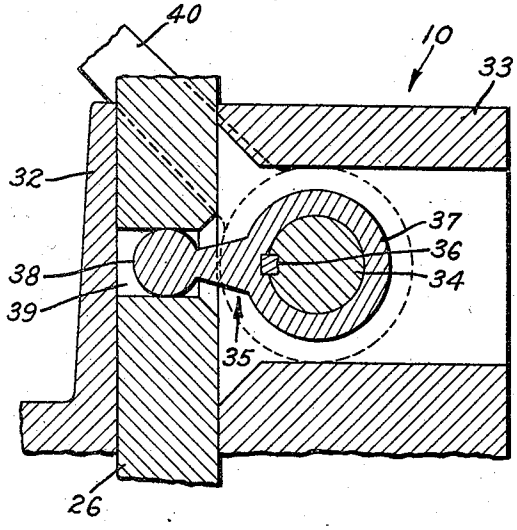


Fig. 6

INVENTOR.
Newman M. Marsilius
BY
John A. Hannahan

Patented Feb. 24, 1948 2,436,656

UNITED STATES PATENT OFFICE

2,436,656

FLUID PRESSURE ENGAGED CLAMPING FIXTURE

Newman M. Marsilius, Trumbull, Conn.

Application December 6, 1944, Serial No. 566,924

4 Claims. (Cl. 144—290)

1

This invention relates to new and useful improvements in work clamps and has particular relation to a clamping fixture including a fluid pressure means for causing a clamping block to hold a piece of work tightly against a base.

The objects and advantages of the invention will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawings wherein a satisfactory embodiment of the invention is shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawings—

Fig. 1 is a top plan view of the clamping fixture of the invention;

Fig. 2 is a front elevational view thereof;

Fig. 3 is a sectional view taken as along the line 3—3 of Fig. 2;

Fig. 4 is a view partly in elevation and partly in section and taken substantially as along the line 4—4 of Fig. 1;

Fig. 5 is a diagrammatic view illustrating the various passages of the hydraulic system employed in the present clamp; and

Fig. 6 is an enlarged detail sectional view taken as along the line 6—6 of Fig. 3.

Referring in detail to the drawings the clamping fixture of the invention comprises a base generally designated 10 and a clamping block 11 movable toward and from said base to clamp work thereagainst. Shown as integral with, although they may be separately formed and secured to, the base 10, are end walls 12 and 13, each comprising a frame portion including a rear post 14, a front post 15 and an outer or upper bar-like part 16 connecting the posts 14 and 15.

End plates 17 and 18 are secured to the frame portions of the end walls 12 and 13, respectively. Plates 17 and 18 are removably secured in place as by machine screws 19 whereby such plates may be changed. While these plates are shown blank in the drawings they may support drill bushings, or the like as will be set forth in connection with the clamping block 11.

Pivotally mounted at the front of the base 10, as on a bar 20, is a front wall 21 which together with the end walls 12 and 13 and the base forms a box-jig. Front wall 21 is removable and may be provided with drill bushings or the like as will be described in connection with the clamping block 11. The front wall 21 is adapted to be swung on the pivot bar 20 to an out of the way position,

2

as suggested by the dotted lines in Fig. 3, whereby to permit of the placing of work on and the removing of work from the top or upper side of the base 10.

Wall 21 fits between the front frame posts 15 of the end walls when in closed position and at its upper end includes a pair of laterally extending lugs 22 adapted to be overlapped by the lateral flange portions 23 of screws 24. In this way the front wall is held in position against outward swinging movement but may be released by a turn of the screws or buttons 24. It is held against inward swinging movement by engagement with the front edge of base 10 (see Fig. 3) and by engagement of its lugs 22 with the front ends of the top or connecting bars 16 of the end frames.

Clamping block 11 is mounted on a pair of posts 25 and 26 reciprocable inwardly and outwardly with respect to the base 10. Posts 25 and 26 pass through the clamping block and the latter is split through to its edges as at 27 from its openings receiving the posts. Screws 28 passing through the split portions 27 of the block are adapted to be tightened to cause the block to bind to the posts.

From this it will be clear that on loosening of screws 28 the block may be adjusted inwardly or outwardly of or on the posts and that thereafter on tightening of the screws 28 the block is secured or fixed in adjusted position. Block 11 is positioned on the posts 25 and 26 according to the size of the work to be clamped, where a run of the same piece is to be handled, whereby a minimum movement of the block will bring it into clamping relation with a piece of work on the base.

Post 25 operates in an opening or socket 29 in the base while the inner end of post 26 operates in a cylinder 30 also in the base 10. The posts are guided and steadied by hollow bosses 31 and 32, respectively, formed with and extending outwardly from the base 10. Boss 32 includes a hollow lateral extension 33 through which extends a shaft 34 having a short lever or motivating link 35 keyed thereto as at 36. Lever 35 includes a hub portion 37 surrounding and keyed to the shaft and an arm portion extending radially of the shaft and having a ball-like portion 38 at its outer end received or located within an opening or socket 39 in the post 26.

To the outer end of shaft 34 is keyed or otherwise fixed a relatively long handle or lever 40. Clearly on movement of the hand lever 40 to turn the shaft 34 the lever or link 35 will be moved

up or down, depending on the direction in which the hand lever is moved. The post 26 will similarly be moved inwardly or outwardly with respect to the base 10 and will carry block 11 and post 25 with it, the latter being merely an additional guide.

As shown best in Fig. 3 the shaft 34 at its inner end has bearing in a wall of the extension 33 as at 41 and is supported in the other wall of such extension in a bearing or bushing 42. It is also clear from such figure that the hub portion 37 of the motivating link or lever 35 is located between the side walls of such extension. The length of the hand lever 40 as compared with the length of the motivating link or lever 35 determines the mechanical advantage obtained through the use of these elements.

As it enters the cylinder 30 the post 26 passes through a stuffing box structure 43 and toward its inner end the said post has a piston structure 44 fixed thereto as by a screw 45. Below the piston 44 is an extension 26a of the diameter of the post 26, said extension passing through a stuffing box 30a closing the lower end of the cylinder 30. Clearly as the post 26 is moved inwardly and outwardly the piston 44 is moved in the same manner and to the same extent in the cylinder 30. At this time displacement of fluid at each side of the piston is the same as the extension 26a is of the diameter of the post 26.

Within the base 10 adjacent the cylinder 30 is a passage 46 closed at its lower end by a screw plug 47 and at its upper end by a hollow plug 48 mounting a packing 49 through which passes a rod 50 having a reduced diameter inner end 51. In the lower portion of passage 46 is a sleeve 52 mounting an element 53 supporting a ball valve 54.

A coil spring 55 within the sleeve 52 and bearing at its respective ends against the plug 47 and the element 53 serves to normally maintain said element and thereby the valve 54 in an upper or outer position and with the ball seated or in closed position against the inner end of the hollow plug 48. When the rod 50 is pushed inwardly, the valve 54 is pushed inwardly and unseated. Inward movement of the valve involves inward movement of the element 53 and sleeve 52 and compression of the coil spring 55 and it will be understood that when the rod 50 is thereafter released the coil spring 55 will expand and return the parts to their normal positions.

A passage 56 in the base 10 is in communication with the upper portion of the cylinder 30 as at 57 and passage portions 58 and 59 connect one end of passage 56 with the passage 46 and the valve chamber intermediate the ends of the latter. A somewhat similar passage 60 is connected at 61 with the inner portion of the cylinder 30 and through extensions 62 and 63 into the opening through the hollow plug 48 at the upper side of the valve 54. Rod 50 at its upper end is positioned to be engaged by a push rod 64 extending through the handle or hand lever 40.

A further extension 65 of the passage 56 communicates with the front end of a booster cylinder 66 in which is located a booster piston 67. Contacting the outer end of booster piston 67 is the inner end of a booster screw 68 passing through and in fact threaded in a bushing 69 at the inner side of which is a packing 70. Screw 68 is shown as receiving an Allen wrench 71 by means of which the screw may be threaded inwardly and outwardly. An extension 72 together with a branch 73 place passage 60 in communication with the outer side of the booster piston 67.

Clamp block 11 may be provided with drill bushings 74 as shown and the plates 17 and 18 may be likewise equipped. Front plate or wall 21 may be provided with drill bushings and this plate or wall as the plates 17 and 18 may be entirely removed to give access to work held against the base by the clamp block 11. In addition to being adjustable on the posts 25 and 26 the clamp block 11 may be removed from them and a clamp block of different construction may be mounted on the posts depending on the work to be performed on any piece held between the clamp block and the base 10.

Wall 21 is swung to an open position to permit of the placing of a piece of work on the base and thereafter the lever or handle 40 is operated to move the post 26, and thus the post 25 and the clamp block, inwardly to have the latter clamp the work against the base. The entire device may be positioned in several different ways to expose the work held for treatment by means entering from either end of the device or from the front thereof or from the top thereof. Thus in the drawings the present fixture is shown as resting on the feet 75. However it may be turned to rest on feet 76 on end 13 or on feet 77 of end 12 or on feet 78 and 79 when disposed on its back.

When using the present fixture after the work is in place on the base 10 the handle 40 is operated to move the post 26 inwardly and at the same time the push rod 64 is depressed to operate through the rod 50 and move the ball valve 54 off its seat against the inner end of hollow plug 48. Now as the post 26 and piston 44 are moved inwardly, the cylinders 30 and 66 and the various passages being full of fluid, as an oil, the fluid is displaced from below the piston 44 and then flows through opening 61, passages 60, 62 and 63 to the passage through the hollow plug 48 and then down past the valve 54 and through passages 59, 58 and 56 and into the upper portion of cylinder 30 through the port 57. The piston has the same active or operative surface area at each of its sides as the extension 26a is of the diameter of the post 26 and therefore the above operations are possible.

At the end of movement of the lever 40, this being when the clamp block 11 has been brought tight against a piece of work on the base 10, the push rod 64 is released and the valve 54 permitted to seat. The cylinder 30 is full of oil or the like at both sides of the piston 44 and the said oil or the like may not move from one side to the other of the piston and so the clamp block 11 is locked in clamping relation with the mentioned work on the base. The mechanical advantage obtained by the structure thus far has been pointed out above.

Now to further or tighter force the clamping block against the work and thereby insure that there will be no movement or slipping of the latter in the fixture the booster screw 68 is screwed inwardly by the Allen wrench 71 forcing the piston 67 inwardly of the booster cylinder 66 and thus applying pressure to the oil in the extension 65 of the passage 56 and through the port 57 applying further pressure to the fluid in the upper or outer portion of cylinder 30 and thus to the outer side of piston 44 so that the latter acts through post 26 to more tightly draw clamp block 11 against the work.

When the work is to be released and replaced

the booster screw 68 is backed off and the push rod 64 operated to unseat the valve 54. Thereupon as the hand lever 40 is moved in a reverse direction to raise the clamping block 11 the fluid is forced from the cylinder 30 above the piston out through the port 57, along through passages 56, 58 and 59, past the unseated valve 54 and through the hollow plug 48 into the passage 63 and from the latter through passages 62 and 60 and the port 61 into cylinder 30 at the lower or inner side of piston 44.

The mechanical advantage of the booster screw 68 and its operating means, namely the Allen wrench 71, depends on the threads of said screw and the length of the wrench lever or handle. Since the entire hydraulic system disclosed is filled with oil or the like and the latter is relatively incompressible it will be seen that the final pressure applied to the work through the clamping block 11 by turning of the screw 68 inwardly will be very large.

In Fig. 3 the passages 56, 58 and 59 are rather diagrammatically shown and the same is true with respect to the passages 63, 62 and 60. In Fig. 5 which diagrammatically and at a glance shows the hydraulic circuit the passages 61 and 73 are combined but it will be understood that this is only for the purpose of making the diagram easy to read. In this figure a knurled head 80 has been substituted for the Allen wrench. However from this figure it will be clear that when the valve 54 is closed and the booster piston is fed inwardly there is no escape for the liquid and a great pressure is built up in the upper end portion of the cylinder 30 so that any work on the base 10 is very effectively clamped in place.

Having thus set forth the nature of my invention, what I claim is:

1. In a clamping fixture, a base, a post movable inwardly and outwardly with respect to said base, a clamping block on said post, a cylinder in said base, a piston on said post and operating in said cylinder, a lever mechanically connected to said post and manually operable to move the same inwardly and outwardly with respect to said base, said base having passages therein providing for the movement of fluid between the inner and outer sides of said piston as the latter and post are moved, a valve controlling such movement of fluid in said passages, means operable from said lever for unseating said valve, and a separate manually operable booster means for increasing the pressure of the fluid at the outer side of said piston when the valve is seated.

2. In a clamping fixture, a base, a post movable inwardly and outwardly with respect to said base, a clamping block on said post, a cylinder and piston construction of which the piston is connected to move with said post, manually operable means for moving said post inwardly and outwardly with respect to said base, means providing passages for the movement of fluid to and from the inner and outer sides of said piston as said port and piston are moved, and a separate manually operable booster means for increasing the pressure of the fluid at the outer side of said piston when the post is in an inner position with said clamping block against a piece of work.

3. In a clamping fixture, a base, a post movable inwardly and outwardly of said base and in all positions extending into the latter, a cylinder in said base and into which said post extends, a piston on said post within said cylinder, a normally seated valve, said base having a passage

therein from the outer portion of said cylinder to said valve and a passage from the inner portion of said cylinder to said valve whereby when the latter is unseated the inner and outer portions of the cylinder are in communication, manually controlled means for unseating said valve, a lever connected to move said post and thereby said piston when the valve is unseated and thereby force fluid through said passages from one side to the other of the piston, a booster cylinder in said base, said base having a passage therein connecting the inner end of said booster cylinder with the outer end portion of the first cylinder, said base having a passage therein connecting the outer end of the booster cylinder with the inner end portion of the first cylinder, a booster piston in said booster cylinder, and manually operable means for moving said booster piston inwardly in said booster cylinder to increase the pressure of the fluid in the outer end portion of the first cylinder when said post has been moved inwardly and said valve is seated.

4. In a clamping fixture, a base, a post movable inwardly and outwardly of said base and in all positions extending into the latter, a cylinder in said base and into which said post extends, a piston on said post within said cylinder, a normally seated valve, said base having a passage therein from the outer portion of said cylinder to said valve and a passage from the inner portion of said cylinder to said valve whereby when the latter is unseated the inner and outer portions of the cylinder are in communication, manually controlled means for unseating said valve, a lever connected to move said post and thereby said piston when the valve is unseated and thereby force fluid through said passages from one side to the other of the piston, a booster cylinder in said base, said base having a passage therein connecting the inner end of said booster cylinder with the outer end portion of the first cylinder, said base having a passage therein connecting the outer end of the booster cylinder with the inner end portion of the first cylinder, a booster piston in said booster cylinder, a screw for moving said booster piston in said booster cylinder, a manually operable means providing a mechanical advantage for turning said screw, and said screw adapted when turned in one direction to feed said booster piston inwardly in said booster cylinder to increase the pressure of the fluid in the outer portion of the first cylinder when said post has been moved inwardly and said valve is seated.

NEWMAN M. MARSILIUS.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
198,176	Alexander	Dec. 18, 1877
381,263	Liddell	Apr. 17, 1888
705,097	Koken	July 22, 1902
775,853	Philipp	Nov. 22, 1904
1,142,704	Haugh	June 8, 1917
1,250,558	Burns	Dec. 18, 1917
1,575,039	Cooper	Mar. 2, 1926
1,643,591	Smith	Sept. 27, 1927
1,659,157	Prouty	Feb. 14, 1928
1,827,258	Payzant	Oct. 31, 1931
2,061,369	Prendergast et al.	Nov. 17, 1936
2,107,970	Wells	Feb. 8, 1938
2,396,539	Smith	Mar. 12, 1946