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M. M. KINLEY

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FLOW BUTTON FOR WELL PIPES

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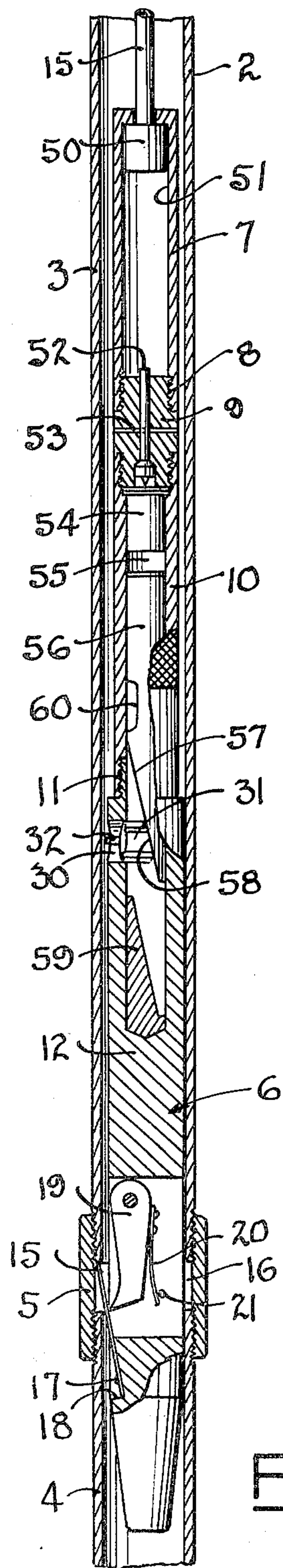


Fig. 1.

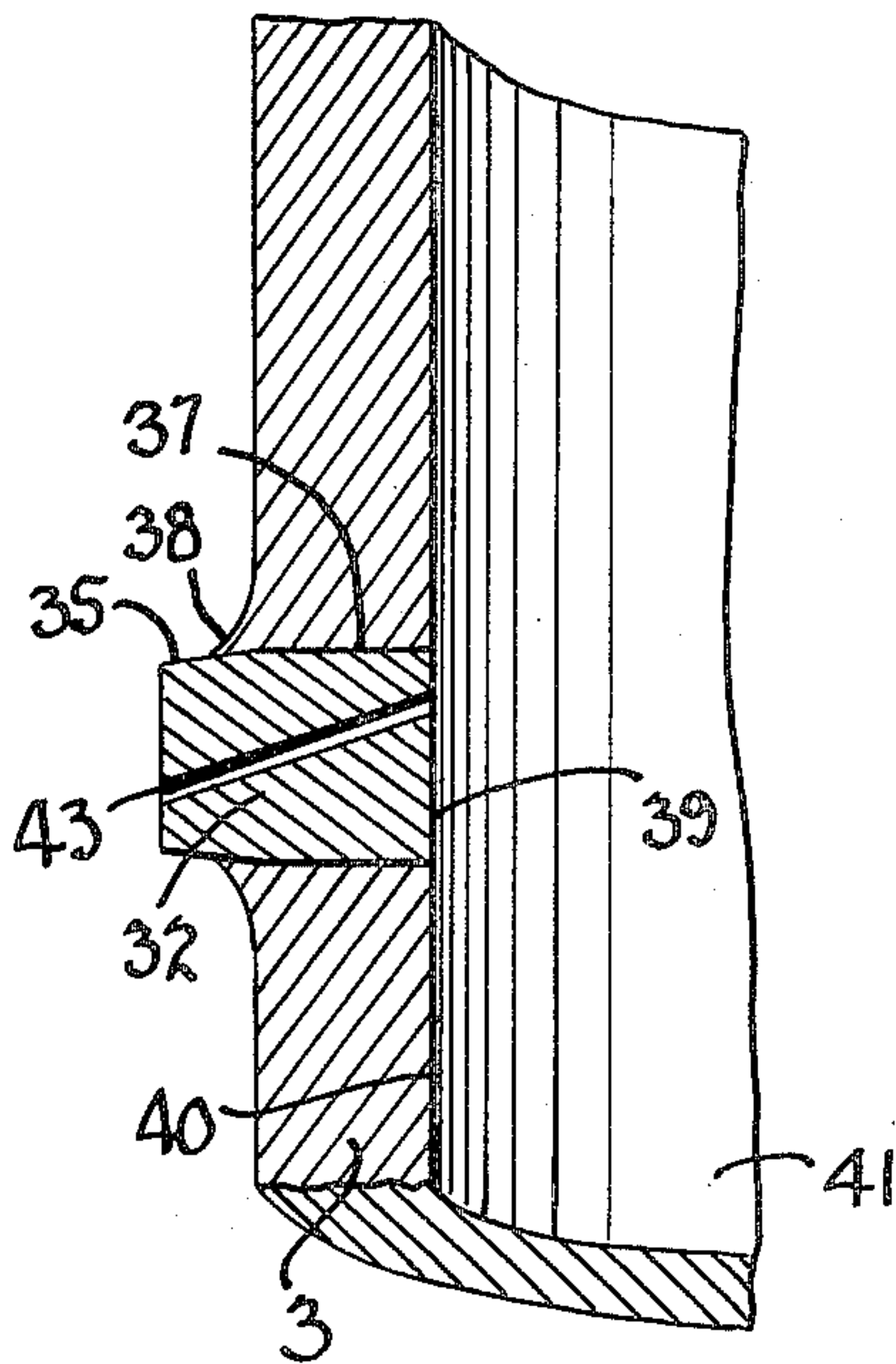


Fig. 3.

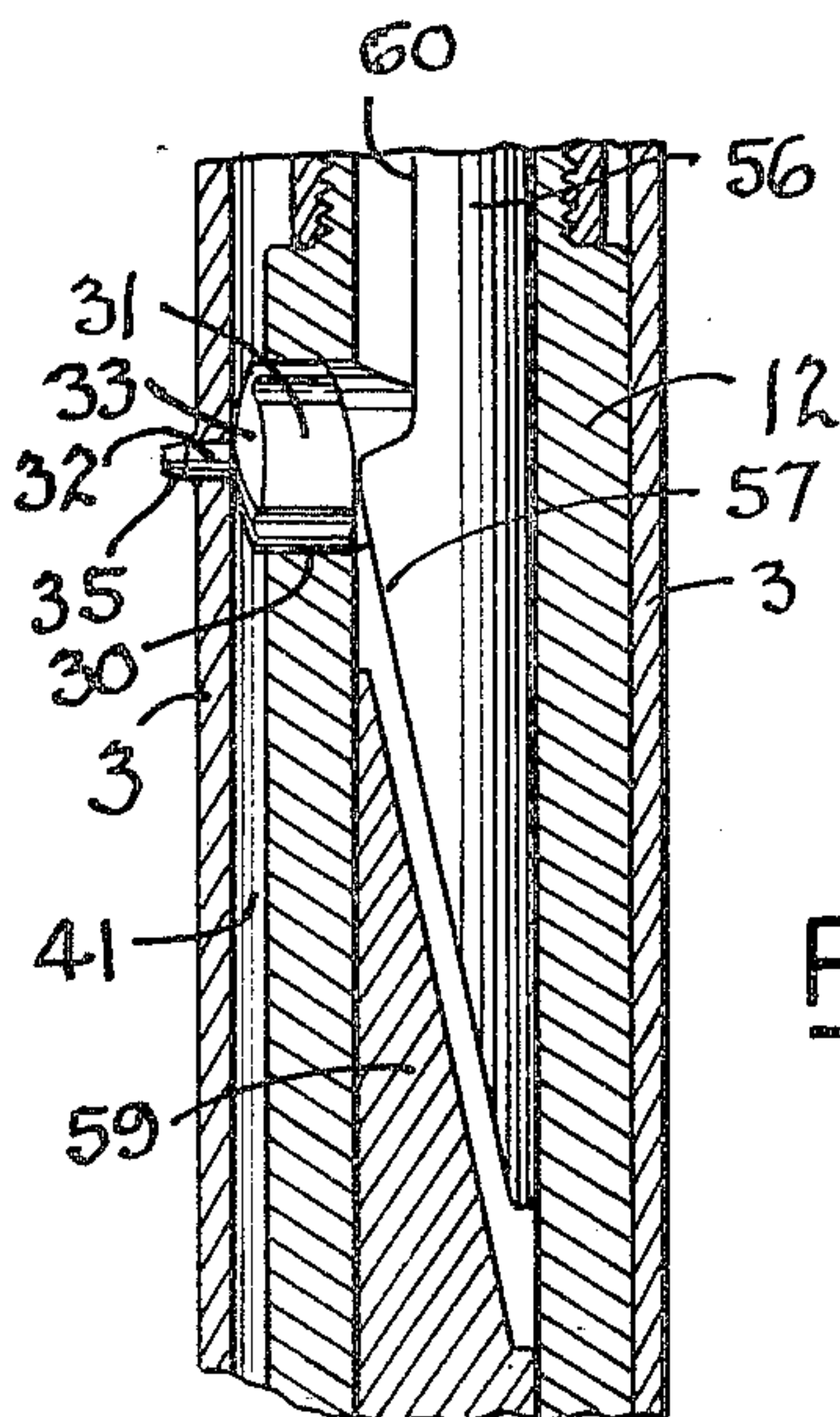


Fig. 2.

INVENTOR.  
M. M. KINLEY.  
BY Lester B. Clark  
& Ray L. Smith  
ATTORNEYS.



## UNITED STATES PATENT OFFICE

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## FLOW BUTTON FOR WELL PIPES

Myron M. Kinley, Houston, Tex.

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1 Claim. (Cl. 166—1)

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The invention relates to a flow button for pipe in wells which can be inserted in situ in the pipe while the pipe is positioned in the well bore.

The invention relates generally to the means for explosively inserting orifices in pipe in wells, set forth in my prior co-pending application No. 453,008, filed July 31, 1942, now Patent No. 2,426,106, granted Aug. 19, 1947, wherein broadly an inserted orifice bullet or bushing is inserted in the pipe in the well bore.

The present invention contemplates an improvement in the structure and apparatus whereby the bushing is inserted in the pipe in such a position that the flow through the orifice in the bushing will be directed upwardly in the pipe so as to facilitate the flow upwardly of the pipe and also to avoid damage to the pipe diametrically of the orifice due to the abrasive effect of the incoming stream of fluid.

It is one of the objects of the present invention to provide an orifice bushing to be inserted in a pipe in a well bore where the orifice in the bushing is directed inwardly and upwardly.

Another object of the invention is to provide a tool for inserting orifice bushings in pipe in a well which can be located definitely in the pipe with respect to a coupling or joint in the pipe.

Still another object of the invention is to provide a tool for inserting orifice bushings in a pipe which will advance or punch the bushing through the pipe only a predetermined amount.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view of the tool in position in the pipe in the well bore ready to manipulate to insert the bushing;

Fig. 2 is a broken vertical sectional view of the punch portion of the tool as it is being operated to insert the bushing; and

Fig. 3 is a broken vertical sectional view through the pipe and the orifice bushing, which has been punched through the pipe and disposed in operating position.

A pipe 2 is illustrated in section in Fig. 1 and is made up of the upper pipe section 3, the lower pipe section 4 and a coupling 5 threading the two pipe sections together. This is usual construction of a well tubing or casing or other string of pipe in a well bore.

The tool for inserting the orifice buttons of the present invention is illustrated generally at 6 and embodies a head 7 threaded at 8 to a coupling 9, which coupling has the barrel 10 threaded to its

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lower end. This barrel is in turn threaded at 11 to the base 12 of the tool. In order to lower the tool into position, a plunger rod 15 may have a cable or wire line connected to its upper end. The tool is thus suspended and lowered into the well bore until the approximate elevation is reached at which the orifice bushing is to be inserted. The tool will then be raised slowly so that the spring finger 15 will snap into the recess 16 between the ends of the pipe sections 3 and 4 in the coupling 5. This spring finger 15 is fastened at 17 in a recess 18 in the base 12 and is normally urged to an outward position by the lever 19 and the spring 20 bearing against a stop pin 21. It seems obvious that as the tool moves downwardly the spring finger 15 will click past any couplings in the pipe. When the tool is to be removed, a sharp upward pull on the cable connected to the tool will tend to break or buckle the finger 15 so as to release the tool.

The base 12 of the tool is provided with an opening 30 which is of a size to receive the carrier 31 mounted for sliding movement in such opening. This carrier, as seen in Figs. 1 and 2, carries the orifice bushing or button 32 which is temporarily affixed to the forward face 33 of the carrier. If the carrier is moved from the position of Fig. 1 to the position of Fig. 2, it is apparent that the bushing will be punched through the wall of the pipe such as the pipe section 3. The bushing is of a length to project through the wall of the pipe, and its forward end may be slightly tapered at 35 to facilitate the punching action.

Fig. 3 shows an enlarged detailed view of the button 32 where the tapered portion 35 has punched out an opening 37 and has carried some of the material of the wall of the pipe forwardly with it so as to form a lip such as 38, tending to form a seal about the orifice button.

It will be noted that the base 39 of the button is substantially flush with the inside surface or periphery 40 of the pipe section 3 so that it does not interfere with any upflow of fluid through the pipe through the passage 41, which is the inside of the pipe.

The bushing or button 32 is of a peculiar configuration in that it is provided with an orifice 43 which is inclined upwardly and inwardly of the bushing. This orifice preferably crosses the longitudinal axis of the bushing or button so as to obtain the maximum upward inclination of the orifice. Such arrangement is desirable because if the fluid flowing through the bushing orifice 43 is at any substantial pressure, or if it carries abrasive materials, it may tend to drill



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a hole by abrasion in the diametrical wall of the pipe. Whereas it has been found in natural practice that if the orifice is inclined upwardly there is a much less tendency to abrade the opposite wall of the pipe and the upward direction of the flow through the orifice facilitates upward movement of the fluids in the pipe.

It seems obvious that this button may be inserted in tubing so as to provide an inlet orifice for the pressure fluid in elevating the tubing, or it may be provided as an inlet passage for formation fluid. In either event, however, the flow is directed upwardly, which has been found to be of substantial advantage.

In operation, the tool will be lowered, and after it has been properly anchored by an upward pull, the plunger 15 may be lowered sharply by releasing the pull on the cable attached thereto. This plunger carries a firing head 50 on its lower end which is slidable in the chamber 51 inside of the head 7 and is arranged to strike the upper end of the firing pin 52, normally held in retracted position in the coupling 9 by means of a shear pin 53.

When struck, this firing pin advances to detonate a cartridge 54 disposed in the barrel 10 and arranged to cause a sharp increase in pressure in the chamber 55 above the wedge member 56 in the barrel 10.

This wedge member 56 has a tapered face 57 which engages the complementary tapered face 58 on the rear of the carrier 31 so that as the wedge member moves downwardly under the force of the explosion of the cartridge 54 it will cause the carrier 31 to move radially outward and punch the bushing 32 through the pipe. A stop member 59 is arranged inside of the lower portion of the chamber 55 and receives the wedge member to bring it to rest. The wedge member preferably has a recessed portion 60 in the side thereof into which the carrier 31 may return when the tool is raised upwardly in the well bore after it has been fired.

It seems obvious that the orifice 43 in the bushing may be of any desired size in accordance

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with the conditions and circumstances encountered, and that broadly the invention contemplates the insertion of a flow bushing or control port in a pipe in a well so that the flow is directed upwardly in the pipe.

What is claimed is:

An apparatus for inserting a pressure fluid control orifice bushing in a pipe in situ in a well bore so as to obviate the removal of the pipe from the well bore to accomplish such insertion comprising a body, a bushing carrier, a lateral opening in said body to slidably receive said carrier, an orifice bushing, means supporting said orifice bushing on the front of said carrier, means in said body to hold said carrier against turning and movable to force said carrier laterally in said opening to punch said bushing into the metal of the pipe to project the forward end of the bushing through the pipe and to position the rear end flush with the inner pipe surface, said bushing having a flow control orifice extending along a diagonal of the bushing, said means supporting said bushing so that said orifice is inclined inwardly and upwardly when punched into the pipe so as to direct the flow of pressure fluid upwardly and inwardly into the interior of the pipe to facilitate the lifting effect thereof and to avoid abrasive wear on the inside wall of the pipe due to the fluid flow thru the orifice.

MYRON M. KINLEY.

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