May 10, 1932. J. E. RENFER 1,858,059

FLUID OPERATED TOOL

Filed Feb. 5, 1931

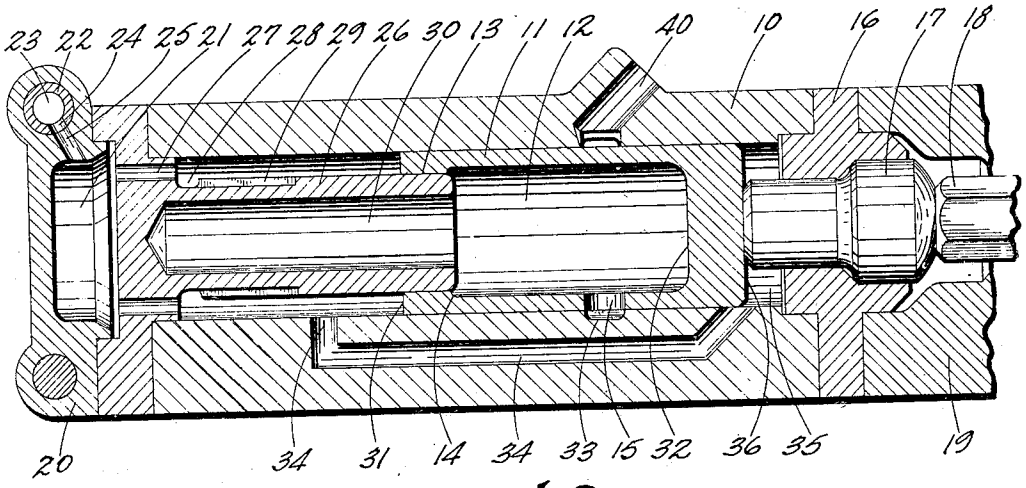

Fig. 2

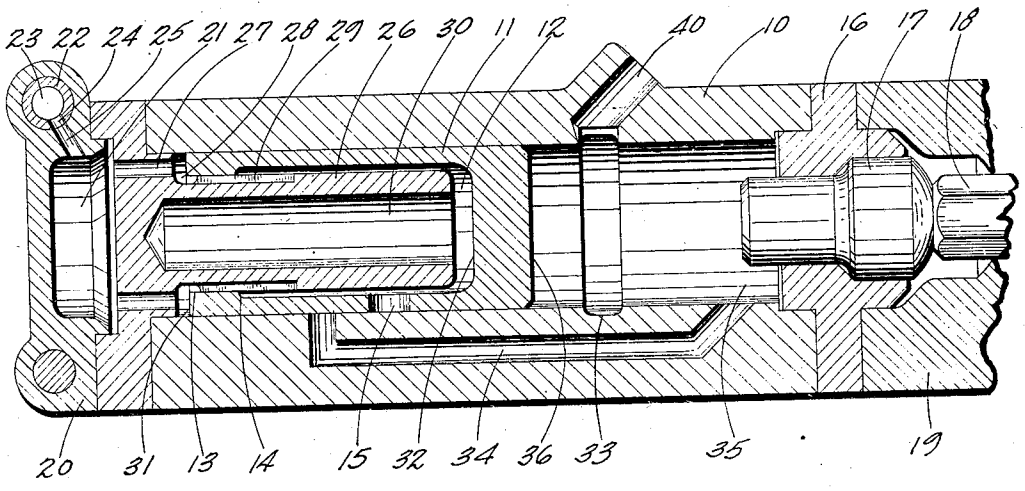

Fig. 1

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UNITED STATES PATENT OFFICE

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FLUID OPERATED TOOL

Application filed February 5, 1931. Serial No. 513,670.

This invention relates broadly to fluid operated tools but more particularly to fluid operated percussive tools of the valveless type in which the hammer piston controls the distribution of motive fluid.

The objects of this invention are to simplify the construction of tools of this type and increase their efficiency.

Other objects and advantages reside in the specific construction and aggroupment of the elements peculiar to this structure as will become apparent from a more complete examination of the specification wherein there are assembled and pointed out certain combinations of parts and specific construction indicative of the scope and spirit of the invention.

In the drawings, wherein like reference characters designate like parts throughout the several views:

Figure 1 is a longitudinal sectional view of a machine embodying the present invention and illustrating the hammer piston at the beginning of its forward stroke.

Figure 2 is a view similar to Figure 1, but illustrating the hammer piston at the beginning of its rearward stroke.

The structure shown in the drawings comprises a cylinder 10, having a hollow cup-shape piston 11 reciprocable therein and formed with internal differential bores 12 and 13 describing at their intersection an annular shoulder 14. The bore 12 is connected with the outside of the piston by a plurality of radially disposed apertures 15. Engaging the front end of the cylinder 10, there is a buffer spacer 16, formed for slidably receiving a buffer block 17 adapted to transmit the blows of the piston 11 to the tool implement 18 which is slidably mounted within the front end 19.

Adjacent the rear end of the cylinder and secured thereto by a pair of through bolts (not shown) there is a backhead 20, formed with a centrally disposed cylindrical chamber 21. The backhead 20, is adapted to receive a throttle valve 22, provided with a central chamber 23 and radially disposed port 24 which is registrable with port 25 for supplying motive fluid to the chamber 21. Intermediate the cylinder 10 and the backhead 20 is a cylindrical plug 26, adapted for slidably engaging the piston bore 13 and provided with a plurality of inlet ports 27, allowing fluidic communication between the rear cylinder chamber 28 and the supply chamber 21. Within its periphery the plug 22 is provided with inlet passages consisting of longitudinally disposed grooves 29, and with internal enlarged chamber 30, the purpose of which will be explained later.

The cylinder 10 is provided intermediate its ends with an internal annular groove 33 connected to atmosphere through an exhaust opening 40 and within its wall has formed inlet passages 34 affording fluidic communication between the rear cylinder chamber 28 and the front cylinder chamber 35.

In the operation of the machine, assuming the parts are positioned as illustrated in Figure 1, with the throttle valve in the open position, motive fluid flows from the chamber 21 through the ports 27 to the rear of the cylinder chamber 28 and to the piston chamber 12 through the inlet grooves 29, and the circumferential clearance formed between the external wall of the plug 26 and the internal wall of the piston chamber 12, exerting pressure upon the rear piston area 31 and 32 to drive it forwardly. During its forward movement, the piston is first cutting off the flow of motive fluid to the piston chamber 12, when the internal shoulder 14 is overlapping the front end of the longitudinal grooves 29. However, the piston is continuing its forward movement due to the constant pressure exerted upon the rear area 31, and the pressure fluid stored within the plug chamber 30, acting by expansion upon the rear area 32. After the rear end of the piston has uncovered the port 34, motive fluid is admitted to the front cylinder chamber 35. Immediately before the striking of the piston upon the buffer block 17 takes place, the piston chamber 12 is exhausted to atmosphere by the registration of the aperture 15 with the annular groove 33 and opening 40.

After delivering its blow, the piston is moved rearwardly by the fluid pressure admitted in the front cylinder chamber 35, ex-

erting pressure upon the front piston area 36 and overcoming the constant pressure exerted upon the rear piston area 31. During its rearward movement, the piston is first covering the inlet port 34, cutting off the supply of motive fluid to the front chamber 35, and maintaining its rearward movement due to the expansion of the motive fluid within the front chamber 35. The pressure fluid is again admitted within the chamber 27, when the annular shoulder 14, uncovers the front end of the inlet grooves 29. Consecutively the front end of the piston is uncovering the annular recess 33 allowing the front cylinder chamber 35 to exhaust to atmosphere through the opening 40.

Although the foregoing description is necessarily of a detailed character, in order to completely set forth the invention, it is to be understood that the specific terminology is not intended to be restrictive or confining, and it is to be further understood that various rearrangement of parts and modification of structural details may be resorted to without departing from the scope or spirit of the invention are herein claimed.

I claim:

1. In a fluid actuated machine, a cylinder, a plug secured to one end of said cylinder and extending therein, a cylinder constant pressure chamber adjacent to one end of said plug, inlet passages within said plug for continually supplying motive fluid to said chamber, a cup-shaped piston reciprocable within said cylinder having a periodical pressure chamber, exhaust passages from said chamber to the periphery of said piston, intermittent pressure area formed by one end of said piston, means within said plug and controlled by said piston for admitting pressure fluid to said periodical pressure chamber, ports within said cylinder controlled by said piston for supplying motive fluid to said intermittent pressure area and ports within said cylinder for exhausting the pressure exerted upon said intermittent pressure area and within said periodical pressure chamber.

2. In a fluid actuated machine, a cylinder, a plug secured to one end of said cylinder and extending therein, a cylinder constant pressure chamber adjacent to one end of said plug, inlet passages within said plug for continually supplying motive fluid to said chamber, an expansion chamber within said plug, a cup-shaped piston reciprocable within said cylinder having a periodical pressure chamber in constant communication with said expansion chamber, intermittent pressure area formed by one end of said piston, means within said plug and controlled by said piston for admitting pressure fluid to said periodical pressure chamber, ports within said cylinder controlled by said piston for supplying motive fluid to said intermittent pressure area and passages within said cylinder and said piston for exhausting to atmosphere the pressure exerted upon said intermittent pressure area and within said periodical pressure chamber.

3. In a fluid actuated machine, a cylinder, a plug secured to one end of said cylinder and extending therein, a cylinder constant pressure chamber toward one end of said cylinder, inlet passages within said plug for continually supplying motive fluid to said chamber, a cup-shaped piston reciprocable within said cylinder having a periodical pressure chamber, exhaust passages from said chamber to the periphery of said piston, intermittent pressure area formed by one end of said piston, means within said plug and controlled by said piston for admitting pressure fluid to said periodical pressure chamber, ports within said cylinder controlled by said piston for supplying motive fluid to said intermittent pressure area and ports within said cylinder for exhausting the pressure exerted upon said intermittent pressure area and within said periodical pressure chamber.

In testimony whereof I hereunto affix my signature this 27 day of January, 1931.

JOHN E. RENFER.