(No Model.)

E. J. McCLELLAN.

MILLING MACHINE.

No. 527,213. Patented Oct. 9, 1894.

FIG. 1

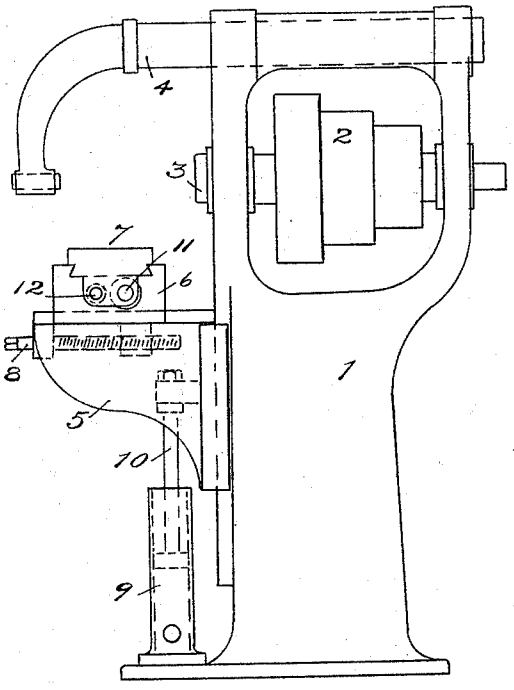


FIG. 2

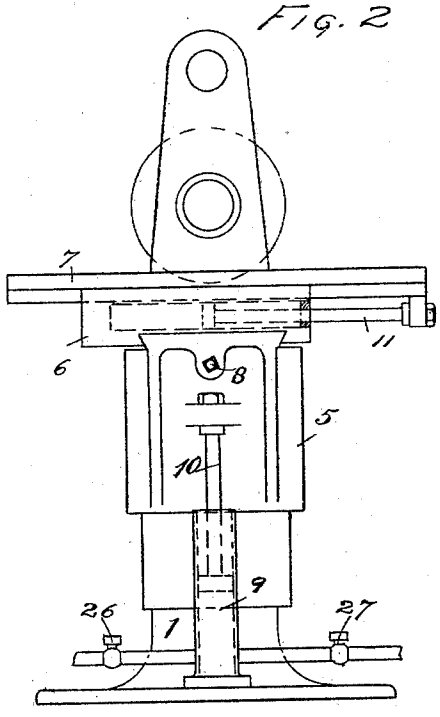


FIG. 3

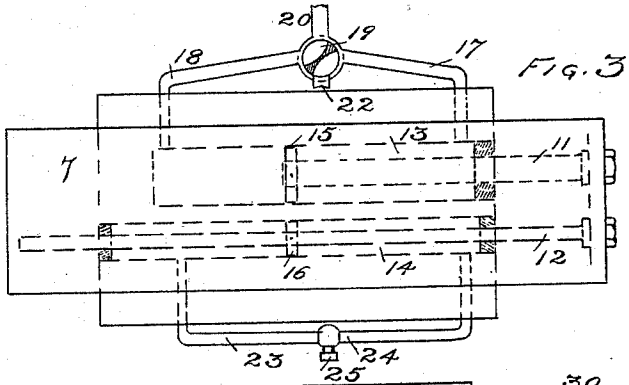


FIG. 4

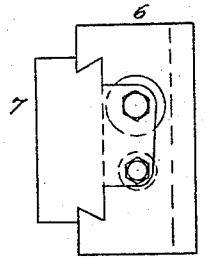


FIG. 5

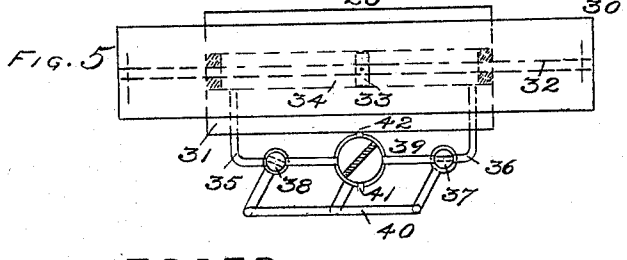


FIG. 6

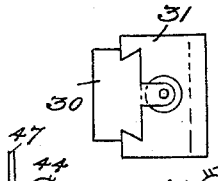
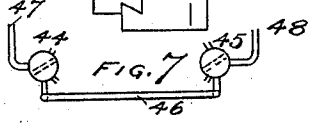


FIG. 7



WITNESSES

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C. H. McClellan

INVENTOR

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EDWARD JOSEPH McCLELLAN, OF NEW YORK, N. Y.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 527,213, dated October 9, 1894.

Application filed January 9, 1894. Serial No. 496,290. (No model.)

To all whom it may concern:

Be it known that I, EDWARD JOSEPH McCLELLAN, a citizen of the United States, residing in New York, in the county and State of New York, have invented an Improvement in Milling-Machines, of which the following is a specification, reference being had to the accompanying drawings.

The special feature of the machine here shown is the use of hydraulic power as a feed for the slide, elevating the knee, &c.

Figure 1 is a side elevation of the machine. Fig. 2 is a front view. Fig. 3 is a plan view, showing the slide and the feed and check cylinders and their pistons. Fig. 4 is an end view of the same. Fig. 5 is a plan view of slide, showing another arrangement, in which the feeding or pushing cylinder and the check cylinder are combined in one. Fig. 6 is an end view of the same. Fig. 7 is a view of a modification of the valve arrangement.

On the base or column 1 is the spindle 3 carrying the cone pulley 2, and on top the overhanging arm 4 to support the outer end of the cutter arbor. Adjustable on the front of the column is the knee 5 and adjustable in and out on the top of the knee is the saddle 6 in which slides the table or slide 7. The saddle 6 is shown as adjustable by means of the screw 8. The knee is raised by means of the hydraulic cylinder 9 and piston rod 10. The supply of fluid to the cylinder 9 is regulated by the valves 26—27.

Referring to Fig. 3, the piston rod 11 for feeding the slide is attached to the end of the slide 7 and carries the piston 15 which moves in the cylinder 13. The fluid is admitted to either end of the cylinder by the pipes 17—18 and the four way valve 19. Attached also to the end of the slide 7 is the piston rod 12 carrying the piston 16 which moves in the check cylinder 14. Connecting with each end of the cylinder 14 are the pipes 23—24 which are connected by the valve 25 which serves to regulate the rate at which the liquid can move from one end of the cylinder to the other. In this cylinder the piston rod is extended through both ends of the cylinder in order to preserve the same area before and behind the piston.

In Fig. 5 the piston rod 32 for feeding the slide is attached to both ends of the slide 30 and carries the piston 33 which moves in the cylinder 34. Connecting to each end of the cylinder 34 are the pipes 35—36 with valves 37—38 and connecting with the four way valve 39, all the valves being regulated simultaneously by the link connection 40. The valves 37—38 are set so that when one is open, the other is nearly closed and the central valve 39 is arranged to allow considerable surplus motion before the supply of fluid is affected or reversed. This surplus motion is available for regulating the valves 37—38 independent of the central valve 39.

Fig. 7 is a view of a modification of the valve arrangement, in which the central valve 39 is dispensed with.

The action is as follows:—Supposing the fluid to enter at 20 Fig. 3, it passes through the pipe 18 to the cylinder 13 and pushes on the piston 15 and consequently feeds the slide 7 to the right. As the piston 15 advances toward the right, the fluid in front of the piston leaves the cylinder by the pipe 17 and passes through the outlet 22 in valve 19. To prevent the slide from jumping ahead with every variation of stress of cut, the check cylinder 14 is provided. This cylinder 14 is completely filled with fluid and the piston 16 simply moves through it. If the valve 25 were closed, the piston 16 could not move at all, and I can regulate the rate at which the piston can move through the cylinder by regulating the valve 25. As the knee and slide are heavy I can raise the knee by power by admitting fluid under the lifting piston in cylinder 9 and when the fluid is permitted to run out, the knee will descend. The admission of fluid is regulated by the valves 26—27 which can be combined in one valve or connected by a common lever and of course placed in a convenient position.

To save one cylinder I may combine the check cylinder in the main cylinder as shown in Fig. 5. Supposing the fluid to enter at 41 in valve 39, it passes through valve 37 which is open to the cylinder 34, through the pipe 36 and pushes the piston 33 and consequently the slide 30 to the left. As the piston 33 advances toward the left, the fluid in front of the piston passes out through the valve 38 to the valve 39 and out by the outlet 42. The valve 38 is partly closed and this retains the

fluid and acts as a check, since if the valve 38 were closed motion would cease. When the valve 39 is thrown over, the action is reversed and the slide feeds the other way.

Instead of having the valves on the pipes 35—36 to connect with a central valve, I may make these two valves with three openings each as shown in Fig. 7 so that the pipe leading to each end of the cylinder can be put in communication with the incoming fluid or with the exhaust opening. With this style of feed I get a very simple mechanism dispensing with all screws and gears and at the same time obtain a feed capable of infinite adjustment and the equivalent of a friction disk feed without the objections of the latter.

Of course, checking the fluid reduces the power, so that a large surplus of pressure must be provided and this pressure must be high, but when the feed is fastest the power is greatest, which is as it should be.

To provide the pressure, the preferable way is to have a pressure pump and accumulator in a central location and pipe to the different machines, though each machine may have its own pump, using the column as a convenient reservoir. Any fluid may be used, such as water, glycerine, or even air. I may pump direct from one end of the pushing cylinder and into the other end, and regulate the feed by the amount allowed to be pumped at each stroke.

The valves give complete control of all motions and also the means of quick return.

The same principle can of course, be applied to other tools having a sliding table or spindle.

Different arrangements of valves may be used as are found most convenient and practical.

What I claim is—

1. The combination in a machine tool, of a slide, a hydraulic feed cylinder to feed said slide, and a hydraulic check cylinder with regulating valve, to control said slide, substantially as described.

2. The combination in a milling machine, of a slide, a hydraulic feed cylinder to feed said slide, and a hydraulic check cylinder with regulating valve to regulate the rate of feed and control the slide, substantially as described.

3. The combination in a milling machine, of a slide, a hydraulic cylinder organized both to feed and check said slide, and pipes connecting the ends of said cylinder with regulating and reversing valves, said valves being arranged to be worked by but one handle in common, substantially as described.

EDWARD JOSEPH McCLELLAN.

Witnesses:
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