

BEST COPY AVAILABLE

BEST AVAILABLE COPY

No. 789,566.

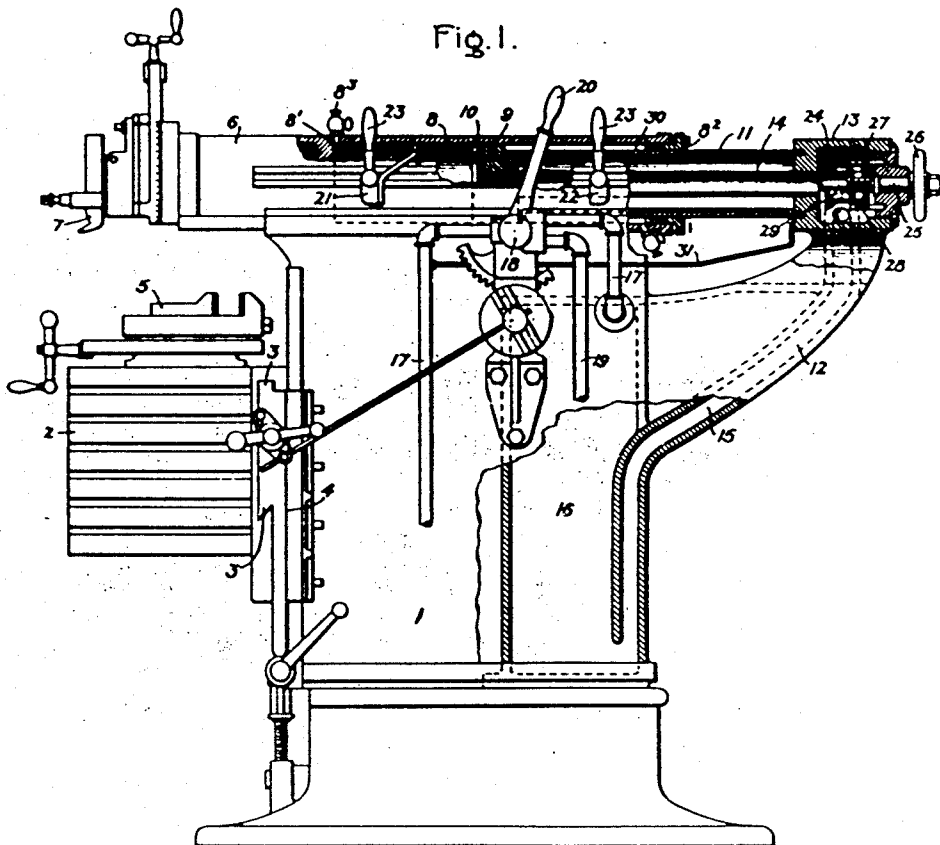
PATENTED MAY 9, 1905.

J. RIDDELL.

RECIPROCATING MOTOR FOR MACHINE TOOLS.

APPLICATION FILED AUG. 13, 1904.

4 SHEETS—SHEET 1.



Witnesses.

Harry H. Fildes
Allen Oxford

Inventor.

John Riddell.
by *Albert L. Davis*
Atty

BEST COPY AVAILABLE
BEST AVAILABLE COPY

No. 789,566.

PATENTED MAY 9, 1905.

J. RIDDELL.
RECIPROCATING MOTOR FOR MACHINE TOOLS.
APPLICATION FILED AUG. 13, 1904.

4 SHEETS—SHEET 2.

Fig. 2.

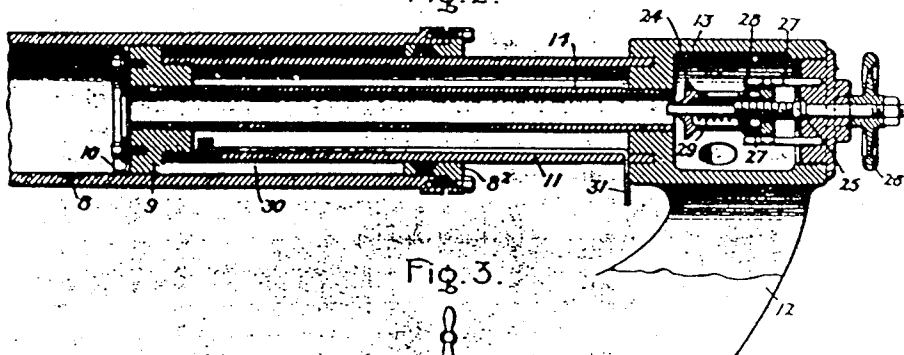
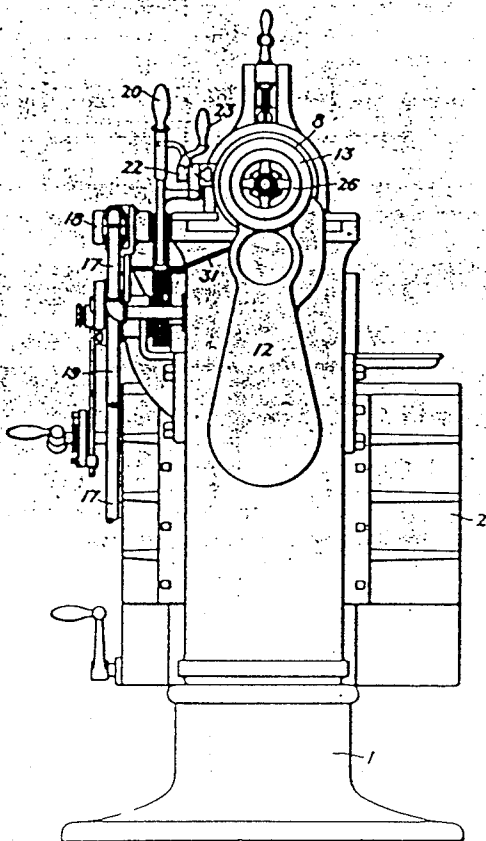


Fig. 3.



Witnesses.

Harry H. Tilden
Henry Oxford

Inventor.

John Riddell.
by *Alb. H. D.*
Att'y

No. 789,566.

BEST AVAILABLE COP

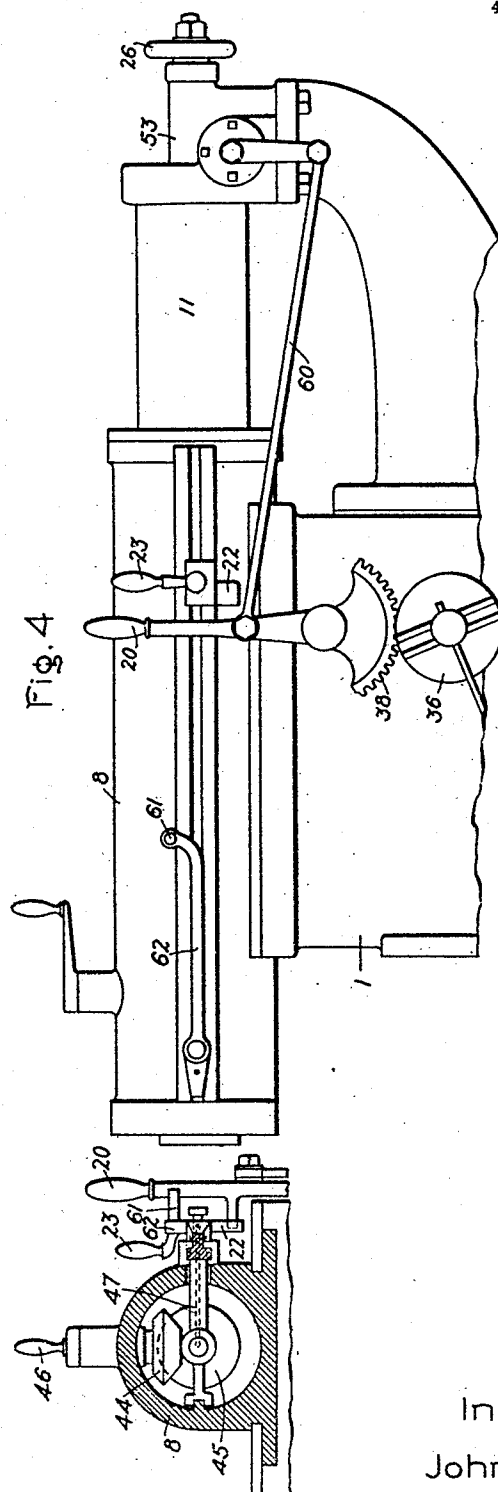
PATENTED MAY 9, 1905.

J. RIDDELL.

RECIPROCATING MOTOR FOR MACHINE TOOLS.

APPLICATION FILED AUG. 13, 1904.

4 SHEETS—SHEET 3.



Witnesses.

Harry H. Tilden
Helen Orford

Inventor.

John Riddell.
by *Albert H. Davis*
Atty.

BEST AVAILABLE COPY

No. 789,566.

PATENTED MAY 9, 1905.

J. RIDDELL.
RECIPROCATING MOTOR FOR MACHINE TOOLS.

APPLICATION FILED AUG. 13, 1904.

4 SHEETS—SHEET 4.

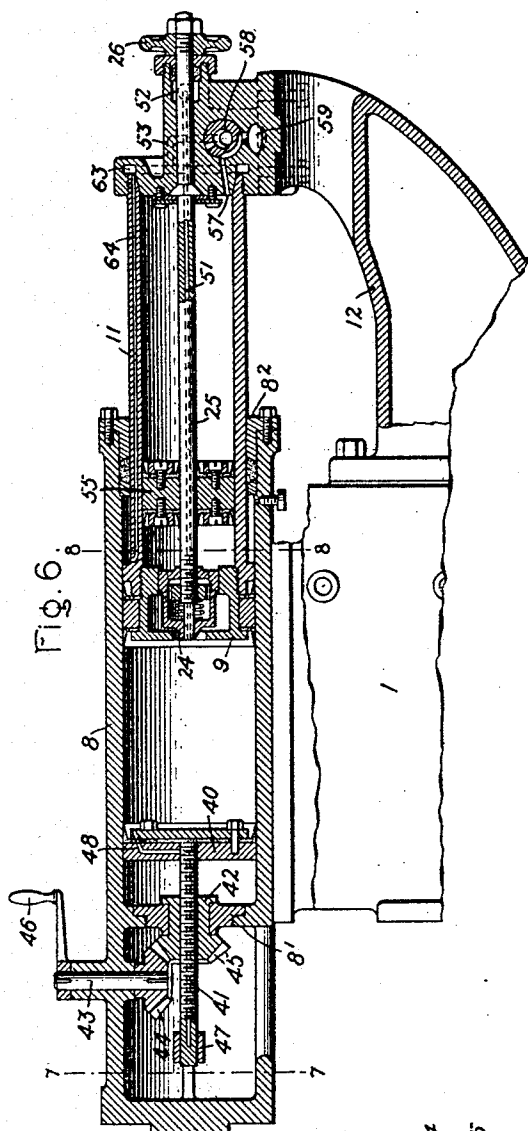


Fig. 6.

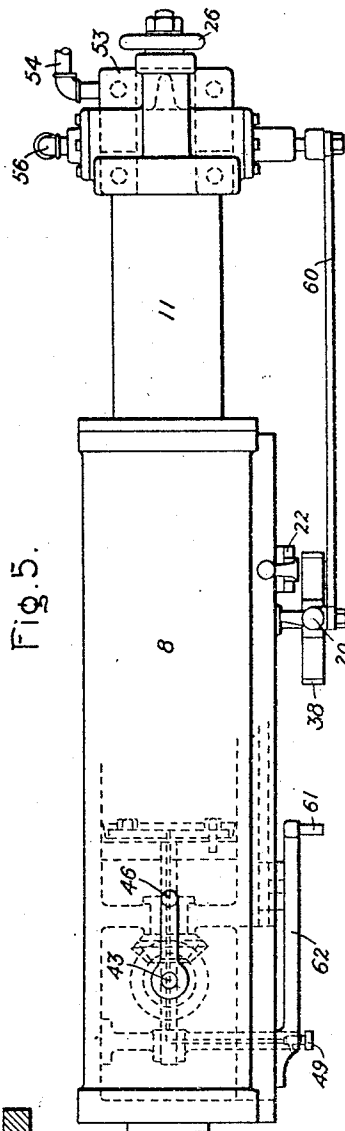


Fig. 5.

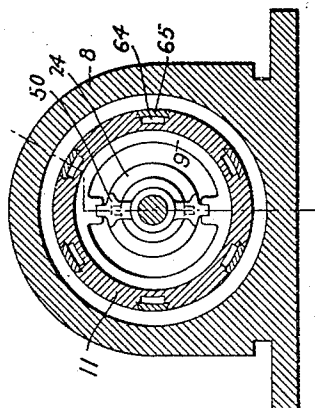


Fig. 8.

Witnesses.

Harry W. Tilden
Steen Orford

Inventor

John. Riddell.

by *Albert G. Davis*
Att'y

UNITED STATES PATENT OFFICE.

JOHN RIDDELL, OF SCHENECTADY, NEW YORK.

RECIPROCATING MOTOR FOR MACHINE-TOOLS.

SPECIFICATION forming part of Letters Patent No. 789,566, dated May 9, 1905.

Application filed August 13, 1904. Serial No. 220,611.

To all whom it may concern:

Be it known that I, JOHN RIDDELL, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Reciprocating Motors for Machine-Tools, of which the following is a specification.

This invention relates to metal-working machines; and its object is to provide a machine-tool with a driving device capable of being operated by compressed air, steam, or water under pressure.

In tools such as planers, shapers, and the like, where the work affords a considerable resistance to the cutting-tool, the means for applying the power to it must be rigid and inelastic in order to avoid sudden shocks when the depth of the cut varies, as in planing a piece of work that has high and low spots. For this reason compressed air has been regarded as an impracticable motive power for such machines, since its elasticity causes it to drive the tool with a yielding pressure that produces a recoil and breaks the tool when the resistance at the cutting edge is suddenly lessened; but the general use in shops of compressed air for operating hoists, chipping-tools, hammers, drills, and the like makes the possibility of applying it to other machines most desirable.

By my invention the objection above noted is overcome and air is made available for driving machine-tools.

The novel features of my invention will be described hereinafter and will be definitely pointed out in the claims appended hereto.

In the accompanying drawings, Figure 1 is a side elevation of a shaping-machine equipped with my invention. Fig. 2 is an enlarged view of the rear end of the motor device. Fig. 3 is a rear elevation of the machine. Fig. 4 is a side elevation of a modified construction. Fig. 5 is a top plan view of the same. Fig. 6 is a section thereof. Fig. 7 is a sectional end elevation on the line 7 7, Fig. 6; and Fig. 8 is a cross-section on the line 8 8, Fig. 6.

Referring first to Figs. 1, 2, 3, and 4, the machine illustrated has a pedestal 1, which

supports a work-table 2, mounted on horizontal guides 3, so as to be laterally movable. The guides are formed on a slide 4, which is vertically movable on the pedestal. A work-holder 5 is transversely movable on the table 2. The top of the pedestal forms a bed on which slides a tool-carrier 6, moving horizontally in a line transverse to the work-table. On the end of the carrier is a holder for the cutting-tool 7. The carrier is actuated by a cylinder and piston, the former being preferably the movable element of the pair. To this end the rear end of the carrier is provided with a horizontal cylinder 8, whose axis is parallel with the line of movement of the carrier. In the cylinder is a piston 9, provided with suitable water-tight packing 10 and supported in a fixed position by a tubular piston-rod 11, which is fastened at one end to the piston and at the other end to an arm 12, projecting rearwardly from the pedestal. The rear end of the cylinder has a packed joint encircling the tube 11. This construction enables the cylinder to slide back and forth over the piston and piston-rod. In order to actuate the cylinder, and thus impart movement to the tool-carrier, I provide means for admitting liquid under pressure to said cylinder. To this end the upper end of the arm has a hollow head 13, from which a tube 14 runs through the tube 11 and through the piston 9. The chamber in the head 13 communicates by a passage-way 15, preferably cored out in the arm 12, with a reservoir 16, filled with an incompressible liquid, such as water or oil. The reservoir may be conveniently located in the pedestal. An air-pipe 17, leading from a source of compressed air, enters the upper end of the reservoir and is provided with a three-way cock 18 to admit the air to the reservoir and exhaust it therefrom through an escape-pipe 19. The cock is provided with a handle 20, by which the cylinder can be started, stopped, or reversed at will. In order to render the movements of the tool-carrier automatic, two tappets 21 22 are adjustably secured to the side of the carrier, as by clamping-screws, having handles 23 and arranged to strike the handle at each end of the stroke of the tool-carrier. By adjusting the space

between the tappets the stroke can be made of any desired length within the range of the machines. The speed of the tool can be regulated by a valve in the water-conduit, preferably a throttle-valve 24 in the hollow head 13, arranged to shut against the rear end of the tube 14. The valve is preferably constructed as follows: A screw-threaded spindle 25 engages with the valve and has an operating-handle 26 outside the head 13. In order to allow the valve to open wide when the carrier makes its back stroke, and thus offer no obstruction to the return of the water to the reservoir, the valve is preferably mounted to slide freely on the spindle and on two studs 27 fixed in the rear wall of the chamber, while the spindle meshes with a nut 28, splined inside the tubular body of the valve. A helical spring 29 abuts between the head of the valve and this nut. When the spindle is turned, the nut rides along in the valve-body until it abuts against the back end thereof, whereupon further turning of the spindle withdraws the valve from its seat and permits the water to enter the cylinder 8 and produce the cutting stroke. On the return stroke the water forces the valve back against the tension of the spring, giving a wide opening for its escape. The cutting stroke is effected by the pressure of the water on the front head 8' of the cylinder, the stationary piston serving as an abutment. The return stroke is effected by the air-pressure admitted constantly to the annular space 30 between the cylinder and the tube 11 through a small pipe 31, leading from the supply-pipe 17 through the tube 11 and opening into the annular space 30 just back of the piston. The pressure operates against the annular rear head 8" of the cylinder.

The operation is as follows: When the operator throws the handle 20 over to the position shown in Fig. 1, the air is admitted to the reservoir 16 and forces the liquid through the passage-way 15 and tube 14 into the cylinder 8 with a speed depending on the adjustment of the valve 24. The area of the front head of the cylinder is so much greater than the annular surface of the rear head exposed to the air-pressure at the rear end of the space 30 that the cylinder moves to the left, making a cutting stroke. When the tappet 22 reverses the position of the handle 20, the air exhausts from the reservoir and the air-pressure in the space 30 drives the cylinder backward to the right, the valve 24 opening wide to let the liquid flow back freely to the reservoir. At the end of the back stroke the tappet 21 again shifts the handle, and the operation is repeated.

In order to economize air when the tool is making short cuts with the tool-carrier working near the limit of its outstroke, I provide an adjustable front end for the cylinder. This is illustrated in the modification shown

in Figs. 4 to 8; but it is applicable also to the first-described form of machine. Referring to Fig. 6, there will be seen in the cylinder a false head 40, suitably packed and secured to the rear end of an adjusting device, preferably a screw-threaded rod 41, which engages with a nut 42, rotatably mounted in the front end of the cylinder. The nut can be rotated from outside the cylinder, preferably by a short shaft 43, carrying a bevel-gear 44, meshing with a similar gear 45 on the nut. A handle 46 enables the workman to rotate the nut, and thus advance or retract the head 40. To prevent the rod 41 from rotating, it is attached to a cross-head 47, one end of which projects through a longitudinal slot in the side of an extension of the cylinder, forward of the front end 8' thereof. When the tool is to make short strokes at any point except the rear limit of the travel of the carrier, the head 40 is adjusted to give a corresponding short space between itself and the fixed piston 9, so that the volume of air exhausted at each stroke will be small. The head 40 has a duct 48, opening into the cylinder near its top and running out through the rod 41 and the cross-head 47. A small screw plug-valve 49 controls the outlet of this duct, whose purpose is to afford an escape for any air that may be entrained in the water and accumulate in the top of the cylinder. In Fig. 1 the petcock 8" serves the same purpose.

The modified structure shown on Sheets 3 and 4 of the drawings does away with a water-reservoir in the pedestal and utilizes the tube 11 for that purpose. The regulating-valve 24 is located in the fixed piston 9, its spindle 25 extending through the tube 11. The valve has ribs 50, which slide in guides in the interior of the tubular piston, so that the liquid can pass by it freely. The spindle has a longitudinal passage-way 51, running from the interior of the cylinder to a chamber 52 in the head 53 of the arm 12. A pipe 54 enters this chamber and supplies liquid to fill the cylinder originally and make up any leakage losses thereafter. The tube 11 contains a floating piston 55, which fits liquid-tight in the tube and on the spindle. The liquid fills the space between this piston and the movable head 40. An air-pipe 56 communicates with the space behind said floating piston by means of a port 57. The port is controlled by a suitable valve, such as the rotary valve 58. When it is turned, as shown in Fig. 6, the air can escape from the tube 11 through an exhaust-port 59. When given a partial turn, the valve closes the exhaust and admits live air to the tube. An arm on the valve-stem is connected by a rod 60 with the handle 20 of the segment-gear. The handle is automatically actuated by the adjustable tappet 22 and a pin 61 on an arm 62, fastened to the cross-head 47 and extending parallel with the cylinder to a point

coinciding with the position of the head 40 inside the cylinder. This arm therefore acts as an indicator to show where the head 40 is. The air-pipe communicates with an annular passage 63 in the head 53, from which one or more ducts 64 run lengthwise of the tube 11 to points just in the rear of the fixed piston, when they open into the annular space 30. The ducts may be made as shown in Fig. 8, being grooves in the outside of the tube 11, covered with strips 65, having beveled edges engaging undercut rabbets in the sides of said grooves. The operation of this modification is as follows: When air is admitted to the tube 11, it forces the floating piston forward, driving the water through the valve 24 against the head of the cylinder and pushing the tool-carrier outward. As soon as the valve 58 is reversed by the tappet 22 the air exhausts from the tube 11; but the live air in the annular space 30 forces the cylinder backward, the water passing freely through the valve 24 and pushing the floating piston rearwardly.

In accordance with the provisions of the patent statutes I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a machine-tool, the combination with a support, of a cylinder movable thereon, a piston in said cylinder secured to a fixed tubular piston-rod and having an opening through it, a valve-spindle in line with said opening, a valve controlling said opening and movable lengthwise on said spindle, a body of liquid controlled by said valve, and a source of fluid-pressure for moving said liquid.

2. In a fluid-pressure-operated machine-tool, the combination with a relatively movable piston and cylinder, of a false head in said cylinder, a rod for adjusting the same, a vent-duct in said head and rod, and a valve controlling said duct.

3. In a fluid-pressure-operated machine-tool, the combination with a relatively mov-

able piston and cylinder, of a false head in said cylinder, a reciprocating rod and holding means for adjusting said head, a cross-head attached to said rod, and an arm fastened to said cross-head and extending along outside said cylinder.

4. In a fluid-pressure-operated machine-tool, the combination with a movable cylinder, of a fixed piston having an opening, a tubular piston-rod, a floating piston in said tubular rod, a body of liquid on one side of the floating piston, and means for applying fluid-pressure to the other side thereof.

5. In a fluid-pressure-operated machine-tool, the combination with a movable cylinder, of a fixed piston having an opening, an adjustable valve controlling said opening, a tubular piston-rod, a floating piston in said tubular rod, a body of liquid between said floating piston and the cylinder-head, and an air-pipe connected with the tubular rod on the other side of said floating piston.

6. In a fluid-pressure-operated machine-tool, the combination with a movable cylinder, of a fixed piston having an opening, an adjustable valve controlling said opening, a tubular piston-rod, a floating piston in said tubular rod, a body of liquid between said floating piston and the cylinder-head, an air-pipe connected with the tubular rod on the other side of said floating piston, and a valve controlling the admission and exhaust of air-pressure.

7. In a fluid-pressure-operated machine-tool, the combination with a movable cylinder, of a fixed piston having an opening, a valve controlling said opening, a tubular piston-rod, a spindle running through said rod for adjusting said valve and containing a passage-way communicating with the cylinder, a liquid-supply pipe communicating with said passage-way, a floating piston in said tubular piston-rod slidable along said spindle, and means for supplying fluid-pressure to said tubular rod in the rear of said floating piston.

In witness whereof I have hereunto set my hand this 12th day of August, 1904.

JOHN RIDDELL.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.