No. 863,681. PATENTED AUG. 20, 1907.

J. N. WARNER.

FEED DEVICE FOR LATHES.

APPLICATION FILED SEPT. 5, 1905.

4 SHEETS—SHEET 1.

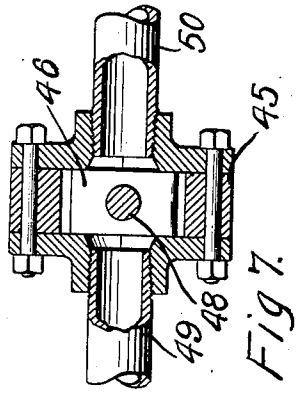


Fig 7.

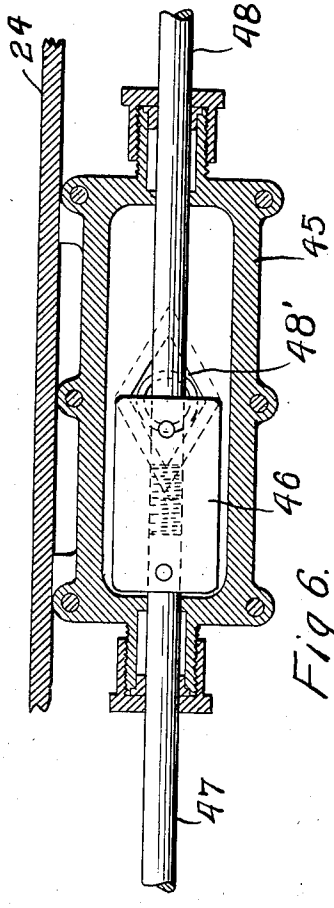


Fig 6.

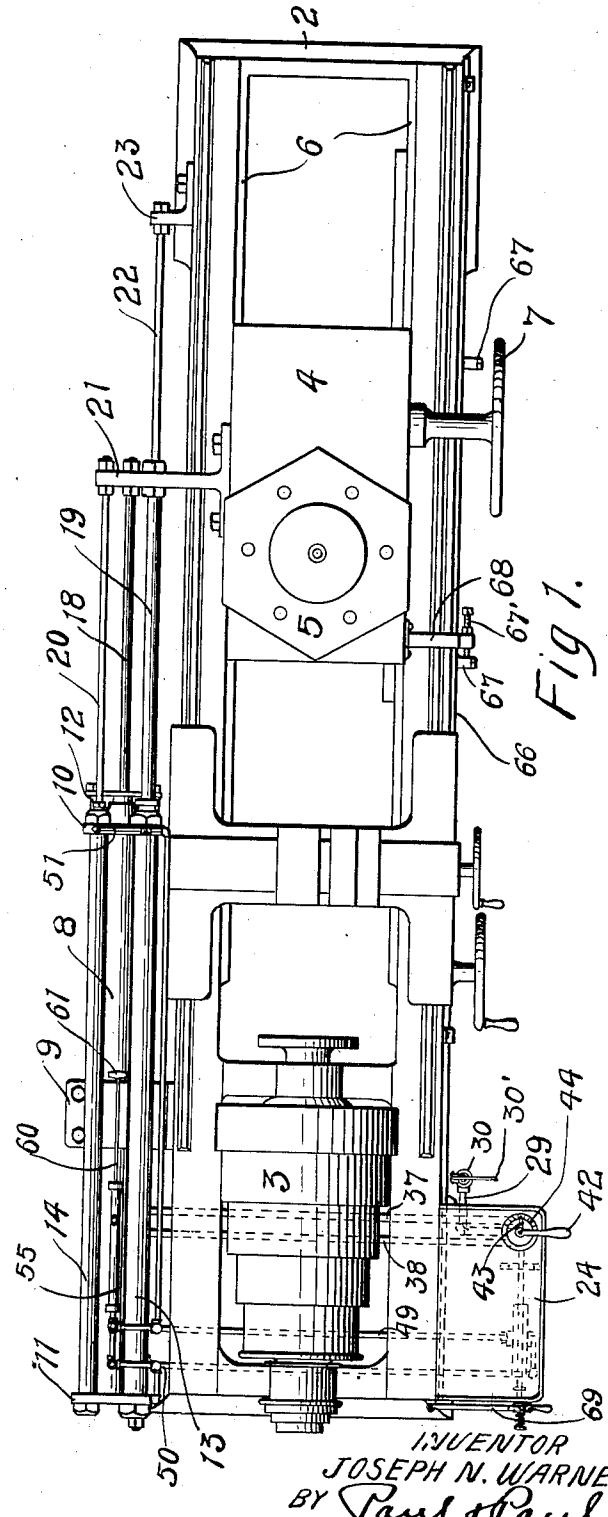


Fig 1.

WITNESSES

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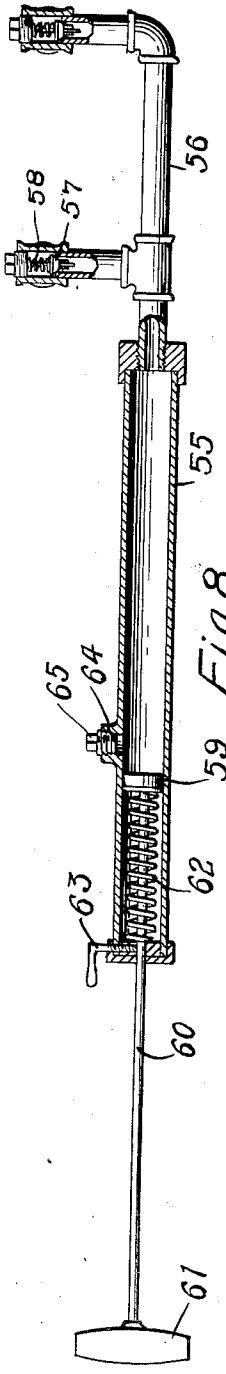


Fig 8.

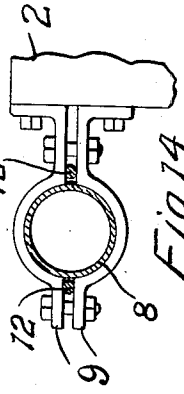


Fig 14.

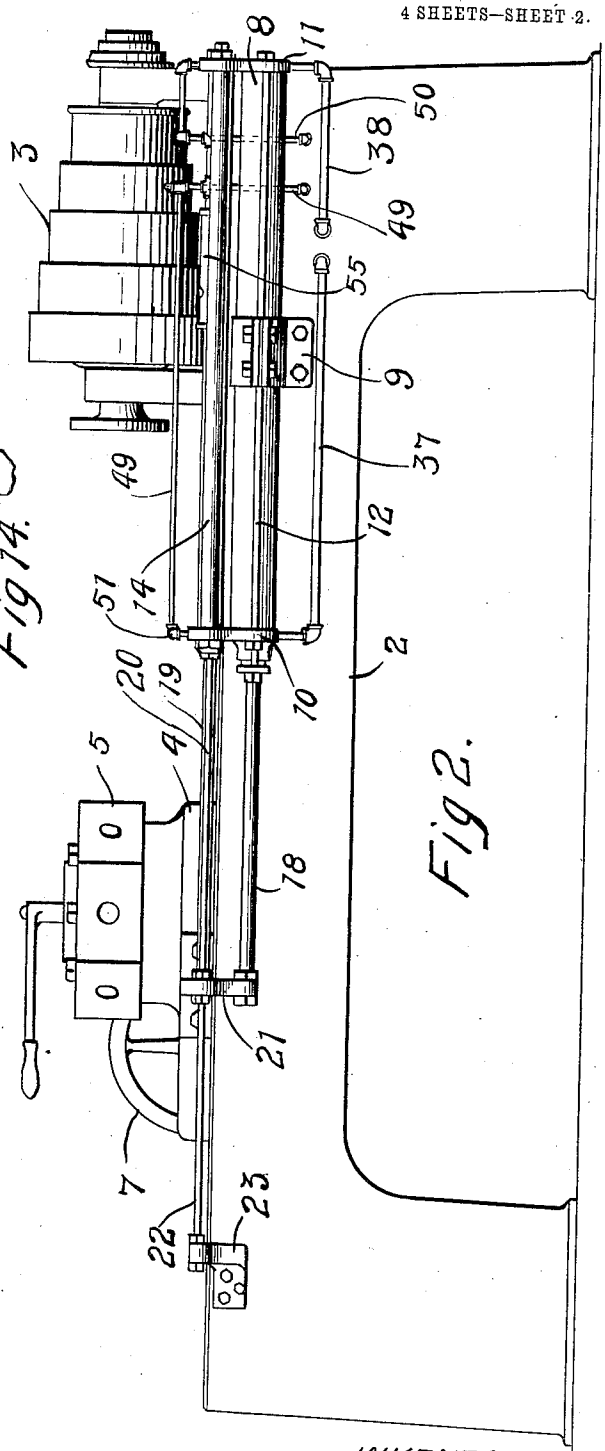


Fig 2.

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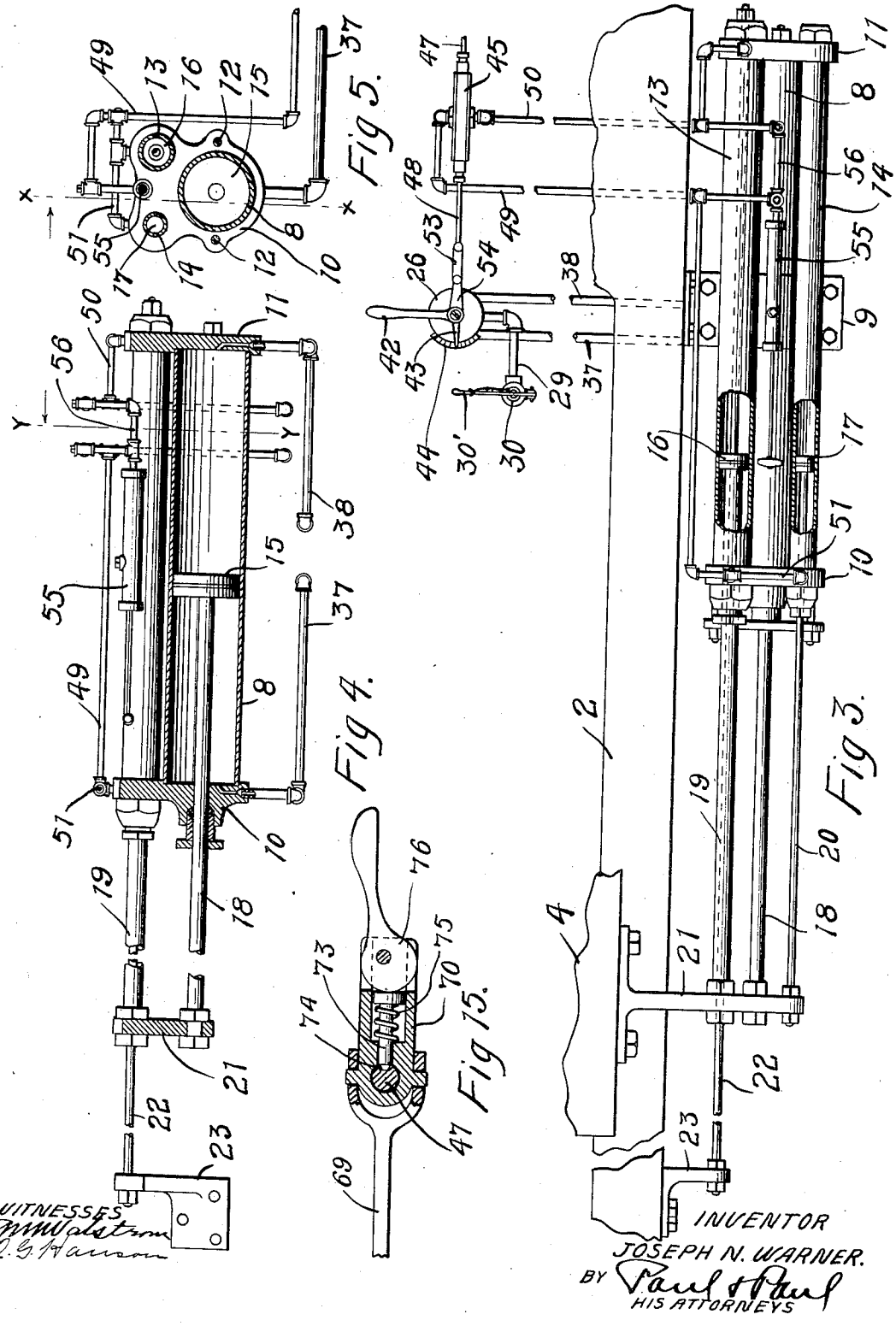
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4 SHEETS—SHEET 3.



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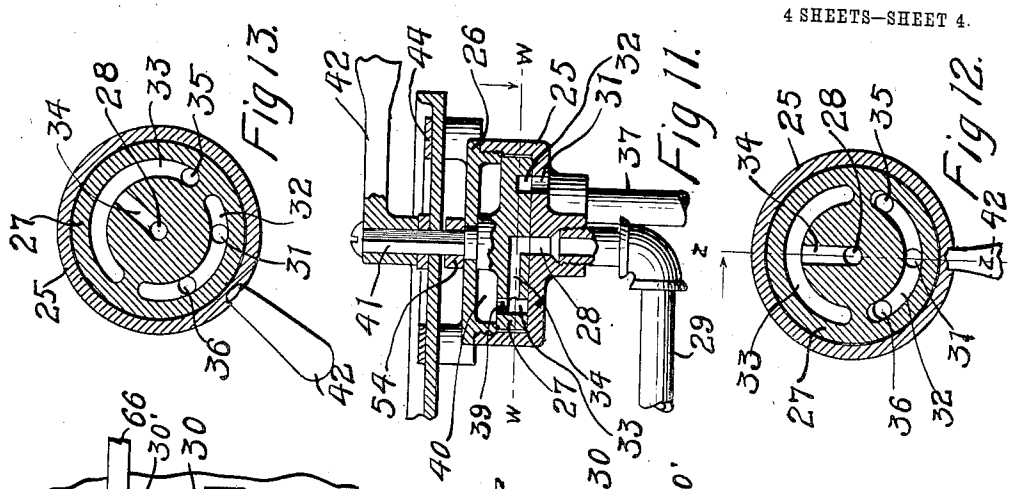
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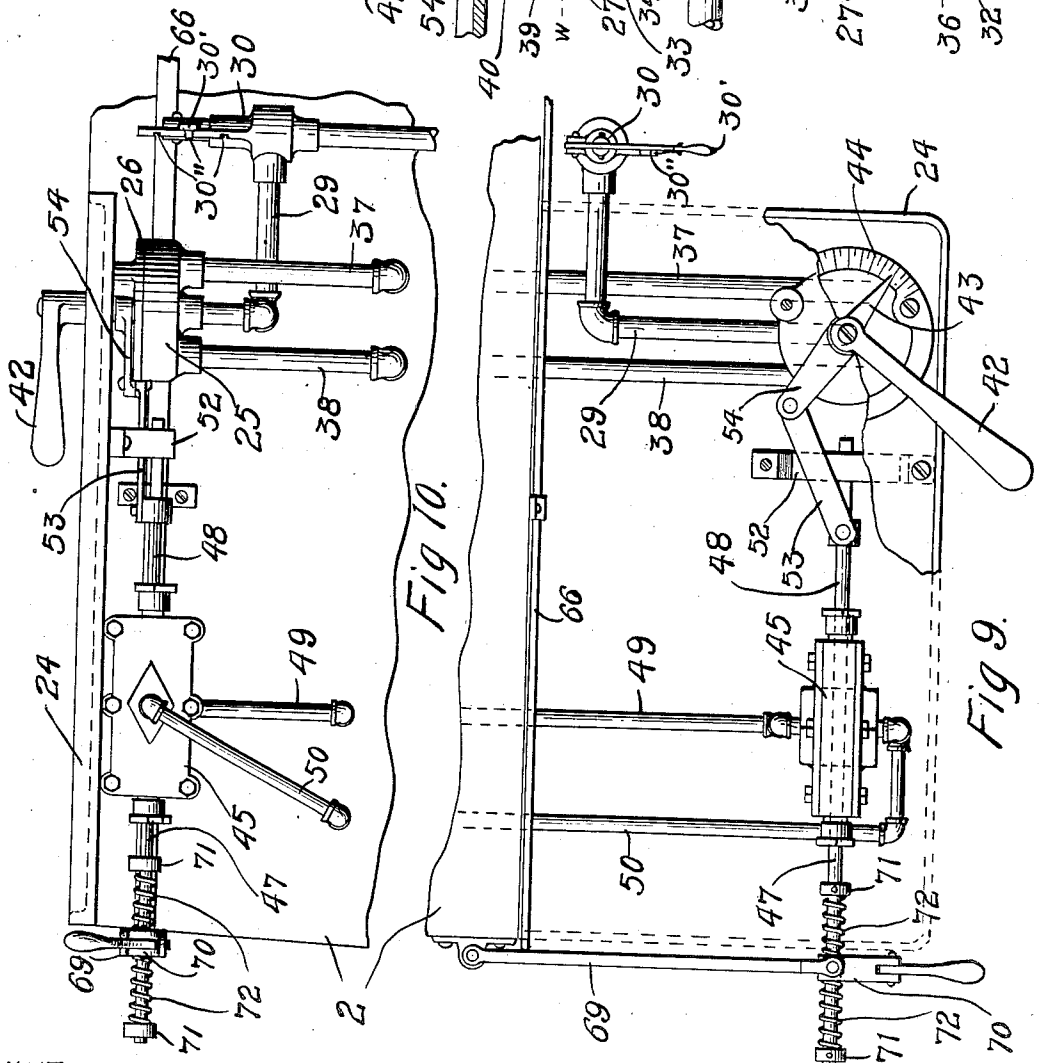
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4 SHEETS—SHEET 4.





WITNESSES.

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JOSEPH N. WARNER, OF ST. PAUL, MINNESOTA.

FEED DEVICE FOR LATHES.

No. 863,681. Specification of Letters Patent. Patented Aug. 20, 1907.

Application filed September 5, 1905. Serial No. 277,058.

To all whom it may concern:

Be it known that I, JOSEPH N. WARNER, of St. Paul, Ramsey county, Minnesota, have invented certain new and useful Improvements in Feed Devices for Lathes, of which the following is a specification.

My invention relates to lathes and particularly to a pneumatic and hydraulic device for controlling the feed of the turret carriage and regulating the movement of the same.

The object of my invention is to provide means within control of the lathe operator for easily and quickly regulating or controlling the travel of the carriage, to the end that considerable time may be saved in the operation of the lathe and the labor incident to such operation greatly reduced.

The invention consists generally in providing an elastic fluid motor cylinder in connection with the turret carriage and inelastic fluid regulating cylinders also connected with said carriage for regulating the distance of its travel and its speed of movement.

Further, the invention consists in various constructions and combinations, all as hereinafter described and particularly pointed out in the claims.

In the accompanying drawings forming part of this specification, Figure 1 is a plan view of a turret lathe with my invention applied thereto. Fig. 2 is a side elevation of the same. Fig. 3 is a detail plan view illustrating the position of the oil and air cylinders and their valves, and the pipes connecting them. Fig. 4 is a longitudinal sectional view through the air cylinder taken on the section line *x—x* of Fig. 5 looking in the direction of the arrow. Fig. 5 is a sectional view on the line *y—y* of Fig. 4. Figs. 6 and 7 are detail views of the oil valve which controls the passage of oil from one side of the oil cylinder piston to the other. Fig. 8 is a detail sectional view illustrating a device for maintaining a constant supply of oil in the cylinders. Fig. 9 is a detail plan view of the air valve showing its connections with the oil valve and with its cylinder. Fig. 10 is a side elevation of the same. Fig. 11 is a vertical sectional view on the line *z—z* of Fig. 12. Fig. 12 is a sectional view on the line *w—w* of Fig. 11 showing the intake closed and both ends of the cylinder open to the exhaust. Fig. 13 is a similar view showing the air intake port open and one end of the cylinder open to the exhaust. Fig. 14 is a detail sectional view illustrating the clamp device for supporting the air cylinder on the lathe. Fig. 15 is a detail view illustrating the locking device for securing the collar on the oil valve spindle.

In the drawing, 2 represents the bed or base of an ordinary turret lathe, 3 the cone pulley and 4 the turret carriage supporting the turret 5. The carriage is movable in a way 6 provided in the top of the bed and extending lengthwise thereof, and has the usual hand wheel 7 for moving the carriage back and forth by hand. The carriage in a large turret lathe is heavy and cumbersome and lathe operators have found the work of moving it by hand back and forth on the bed not only a very laborious operation but also one requiring considerable time. To avoid this objection to the operation of this type of lathe, I provide a motor cylinder 8, preferably secured to one side of the lathe bed by a clamp 9 and having heads 10 and 11 connected by rods 12. This cylinder is supplied with compressed air or other suitable elastic fluid. Primary and secondary cylinders 13 and 14 are also provided between said heads parallel with the cylinder 8. These cylinders are supplied with oil or other suitable inelastic fluid. The air cylinder 8 has a piston 15 and the oil cylinders have pistons 16 and 17, and piston rods 18, 19 and 20 connect the said pistons respectively with a bracket 21 which is secured to one side of the turret carriage 4. (See Figs. 1 and 3).

The piston rod 19 is preferably formed of tubing, and its piston 16 has a hole extending therethrough, and a guide rod 22 extends through the said rod and piston and the cylinder 13, and is secured at one end in a bracket 23 on the bed of the lathe and at the other end in the head of the primary cylinder 13. This rod 22 acts as a guide and support for the bracket 21 and the pistons and cylinders connected therewith, and allows a free reciprocation of the same when the carriage is operated. It also supports the rod 19 and allows the use of a smaller tubing than would ordinarily be required. The oil flows into one end only of the secondary cylinder, and the capacity of the primary oil cylinder on the right of its piston is substantially equal to the capacity of both the primary and secondary cylinders on the left of their pistons. By providing the secondary cylinder and admitting oil to one end only I am able to offset the loss in the capacity of one end of the primary cylinder caused by the presence of the rod 19, and obtain oil receiving chambers of equal capacity upon opposite sides of the primary oil cylinder piston and insure a regular uniform movement of the carriage.

A shelf 24 is provided on one side of the lathe bed convenient to the lathe attendant, and beneath the said shelf a circular casing 25 is provided having a removable cover 26 and inclosing a flat rotary valve 27. The bottom of the casing 25 has a centrally arranged air inlet port 28 communicating with a pipe 29, which is provided with a reducing valve 30 and communicates with a suitable source of air supply. The reducing valve has a lever 30′ adjustable in notches 30″, by means of which the operator can regulate the flow of air. The bottom of the casing 25 is also provided with an exhaust port 31.

The valve 27 is provided in its under surface with peripherally arranged curved grooves 32 and 33, the latter communicating through a horizontal radial duct

34 with the air inlet port 28. Air inlet ports 35 and 36 are provided leading through pipes 37 and 38 to the ends of the air cylinder 8 to deliver the air thereto upon each side of the air cylinder piston. A port 39 leads from the groove 33 through the upper surface of the valve 27, and forms a communicating passage from the air inlet duct 34 to the chamber 40 above the rotary valve. This allows the pressure of air to be equalized above and below the valve to balance the same and allow it to be easily operated.

A stem 41 is provided on the valve 27 extending up through the top 26 and the shelf 24, and is provided with an operating handle 42 and an indicator or pointer 43 which travels over a graduated plate 44 when the valve is rotated, the graduations representing different positions of the valve and enabling the operator to readily determine the location of the valves with respect to the ports leading to the cylinders. For instance, in the position of the pointer shown in Fig. 3 both ends of the air cylinder are open to the exhaust, and the oil valve is open to allow the free passage of the oil. In Fig. 13 the air valve is set to allow the air to flow into one end of the cylinder and exhaust from the other end.

The oil valve comprises a casing 45 within which a slide valve 46 is arranged having stems 47 and 48 on each end. Diamond-shaped ports 48′ are provided in the opposite side walls of the casing 45 communicating with pipes 49 and 50 which lead to the ends of the oil cylinder 13, the pipe 49 having a branch 51 communicating with one end of the secondary cylinder 14, the opposite end of said cylinder being open to the air. These ports 48′ allow the flow of oil from one end of the primary oil cylinder to its other end and the corresponding end of the oil cylinder to be easily and accurately controlled. The oil valve is shown wide open in Fig. 6, and upon moving it toward the right the flow of oil will be checked and finally entirely cut off. If the valve is moved in either direction from the closed position shown in Fig. 9, the flow of oil will begin and gradually increase as the valve is moved until it reaches the wide open adjustment of Fig. 6. The movement of this valve, therefore, positively controls the flow of oil through the valve and the speed of the carriage, the motive power, or air, being supplied to the cylinder by the operation of the rotary valve. If a slow speed is desired, the slide valve is only partially opened, and by moving the valve back and forth the flow of oil can be accurately controlled and the speed of the carriage easily regulated. The stem 48 is squared at the end and is slidable in a guide 52, and a link 53 pivotally connects the said stem with an arm 54 secured on the valve stem 41 and movable with said stem when the valve is rotated. The operation, therefore, of the single lever 42 imparts a reciprocating movement to the slide valve 46 to open or close the diamond-shaped ports and allow the passage of the oil from one end of the oil cylinder to the other, and also controls the flow of air to the air cylinder. I am thus able to control both valves with one lever.

To maintain a uniform supply of oil in the cylinders and make up for the loss by leakage, I provide a cylinder 55 connected with the pipes 49 and 50 by a pipe 56 having valves 57 normally closed by springs 58, but adapted to yield upwardly and allow the passage of the oil to the oil cylinders when the supply has fallen below a predetermined volume. A piston 59 is provided in the cylinder 55 having a rod 60 and a handle 61, and a spring 62 is arranged between the piston and the end of the cylinder and normally tends to press said piston away from said end and force the oil up through the valves 57 and maintain a uniform supply in the oil cylinders. A screw device 63 in said end is adapted to be turned down against the stem to lock it in any desired position in the cylinder head. When this screw is removed from contact with the piston stem, the spring 62 will move the piston against the body of oil in the cylinder. The cylinder is supplied with oil through a hole 64 having a suitable plug 65.

The controlling device may be used without the secondary cylinder if preferred by simply disconnecting the piston rod 20 from the bracket 21 and removing the check valve 57 by unscrewing the plug above it. When this has been done the cylinder 55 connected with the regulating cylinder will act as an overflow and allow the inelastic fluid to back up through the pipes against the yielding piston 59 and compensate for the difference in capacity between the chambers in the regulating cylinder on the opposite sides of its piston. As the oil flows into the cylinder 55 the piston 59 will be gradually forced outward against the tension of the spring 62 and permit the movement of the piston in the regulating cylinder.

It is desirable in an apparatus of this kind to provide means for closing the slide valve 46 automatically to stop the carriage when it reaches a certain predetermined point on the bed of the lathe. I therefore provide a rod 66 slidably supported on the lathe bed and having stops 67 secured thereon at intervals in the path of a set screw 67′ carried by an arm 68 on the lathe carriage. An arm 69 is pivoted at one end on the bed of the machine, and has a collar 70 at its opposite end loosely mounted on the stem 47, between which collar and stops 71 on said stem springs 72 are arranged. When the arm 68 strikes one of the stops on the rod 66, the said rod will be moved longitudinally to move and center the slide valve and close both oil ports and arrest further movement of the carriage. The springs 72 center the collar 70 on the stem 47 and allow the stem to be moved a sufficient distance by rotating the air valve, to open the oil ports and permit the carriage to be moved in the opposite direction. When it is desired to operate the carriage entirely by hand the rotary valve is set in the position shown in Figs. 3 and 12, and both ends of the air cylinder will be open to the exhaust and the oil valve will be wide open, allowing the oil to flow freely from one end of the primary oil cylinder to the other.

It is sometimes desirable, where the pressure of the air is not uniform, to provide means for locking the collar 70 on the valve spindle. I therefore mount a pin 73 in said collar and provide a flat surface 74 on the spindle 47 to be engaged by the end of said pin. A spring 75 normally holds the pin out of engagement with said surface. A cam lever 76 is pivoted in said collar and is adapted to engage the outer end of the pin 73 and force it into contact with the spindle 47 against the tension of the spring 75 whenever it is desired to lock the collar on the spindle. This lever 76 is within convenient reach of the lathe attendant and can be easily and quickly

thrown to its locked or unlocked position. When this collar is locked on the spindle, the spring 72 will yield sufficiently to allow movement of the oil valve.

I have shown and described this controlling apparatus in connection with a lathe bed and carriage but do not wish to confine myself entirely to that use as it is applicable to planers and other machines having a reciprocating carriage.

By having the pistons project at one end only of the cylinders the apparatus can be operated in a compact space and at no time during the operation of the device will it be necessary to have a moving part of the controlling mechanism projected beyond the frame of the machine on which it is mounted. The apparatus is hence particularly adapted as a controller where machines having carriages to be controlled are arranged close together on a shop or factory floor or where the space by reason of the particular use of the machine is necessarily very limited.

I claim as my invention:

1. The combination, with a machine bed and carriage, of an elastic fluid cylinder having its piston connected with said carriage, an inelastic fluid cylinder also having its piston connected with said carriage, elastic fluid pipes having a suitable valve connected with said elastic fluid cylinder, inelastic fluid pipes connected with the ends of said inelastic fluid cylinder and having a suitable valve arranged to control the flow of fluid from one end of said inelastic fluid cylinder to the other, and mechanism arranged to be actuated by said carriage for automatically closing said inelastic fluid valve to shut off the flow of fluid therethrough and stop said carriage, substantially as described.

2. The combination, with a carriage, of a motor cylinder having a piston connected with said carriage, primary and secondary regulating cylinders having their pistons also connected with said carriage, an elastic fluid supply connected with said motor cylinder and an inelastic fluid supply connected with both ends of said primary regulating cylinder and with one end of said secondary regulating cylinder, the piston rods of said primary and secondary regulating cylinders being on one side only of their pistons and the capacity of said primary regulating cylinder on one side of its piston being substantially equal to its capacity on the other side of its piston, plus the capacity of the corresponding end of said secondary cylinder, and means for controlling the flow of fluids to said motor and regulating cylinders.

3. The combination, with a machine bed and carriage, of a motor cylinder provided with a piston and arranged to move said carriage, a regulating cylinder having a piston arranged to be moved in said cylinder by said carriage, the rods of said motor cylinders and said regulating cylinder pistons projecting beyond one end only of their cylinders, an elastic fluid supply connected with said motor cylinder, an inelastic fluid supply connected with both ends of said regulating cylinder, a reservoir cylinder having a spring pressed plunger and a pipe and check valve connection with said regulating cylinder, whereby upon the removal of said check valve, said plunger will yield under pressure of the inelastic fluid and allow a sufficient quantity to flow into said reservoir to compensate for the difference in capacity of said regulating cylinder on opposite sides of its piston, means for controlling the flow of fluid to said motor cylinder and means for controlling the flow of fluid from one end of said regulating cylinder to the other, substantially as described.

In witness whereof, I have hereunto set my hand this 30th day of August 1905.

JOSEPH N. WARNER.

Witnesses:
RICHARD PAUL,
D. G. HANSON.