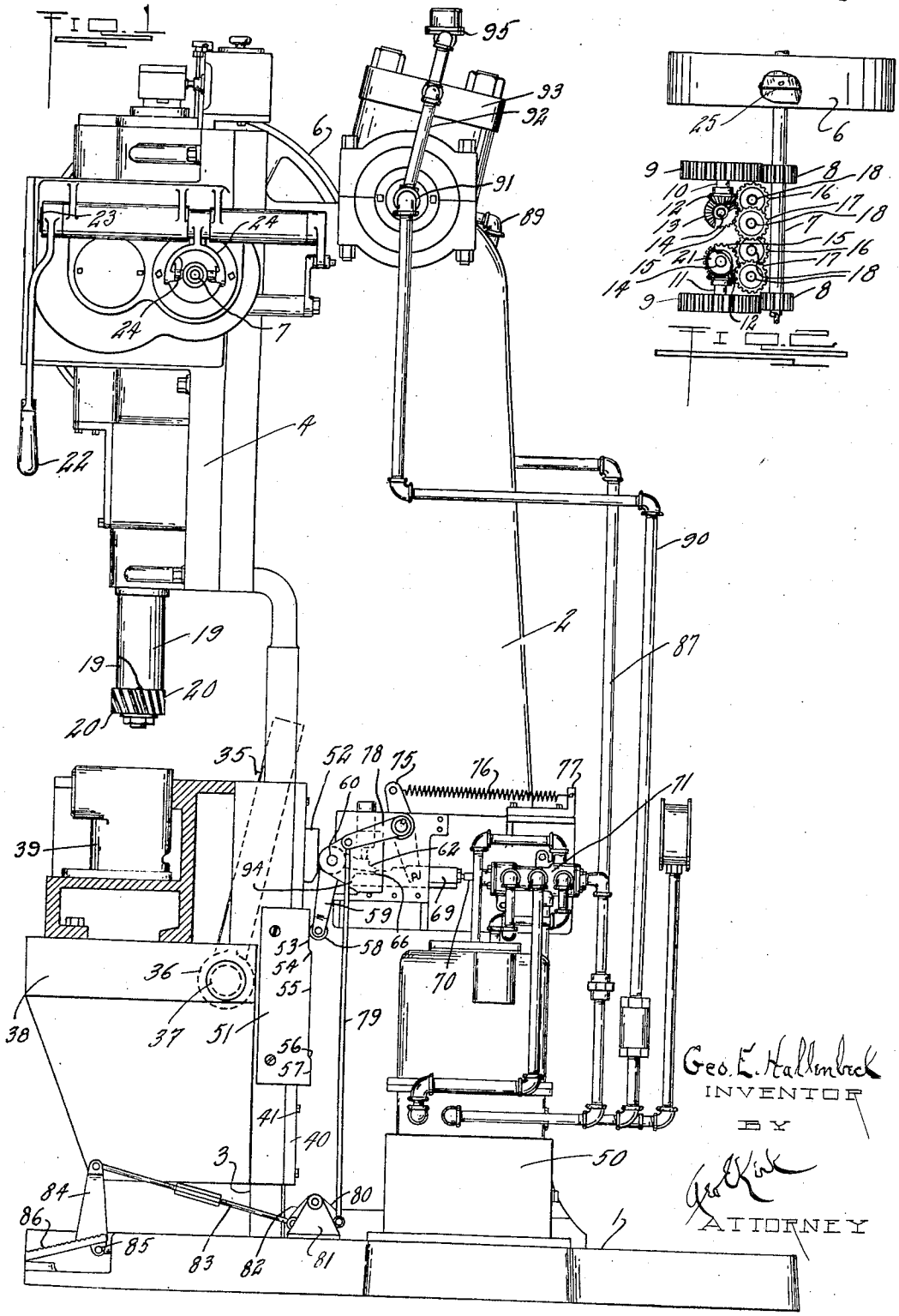
June 7, 1932. G. E. HALLENBECK 1,861,497

HYDRAULIC TABLE FEED MECHANISM

Filed June 23, 1926 4 Sheets-Sheet 1



Geo. E. Hallenbeck
INVENTOR
BY
ATTORNEY

June 7, 1932. G. E. HALLENBECK 1,861,497

HYDRAULIC TABLE FEED MECHANISM

Filed June 23, 1926 4 Sheets-Sheet 2

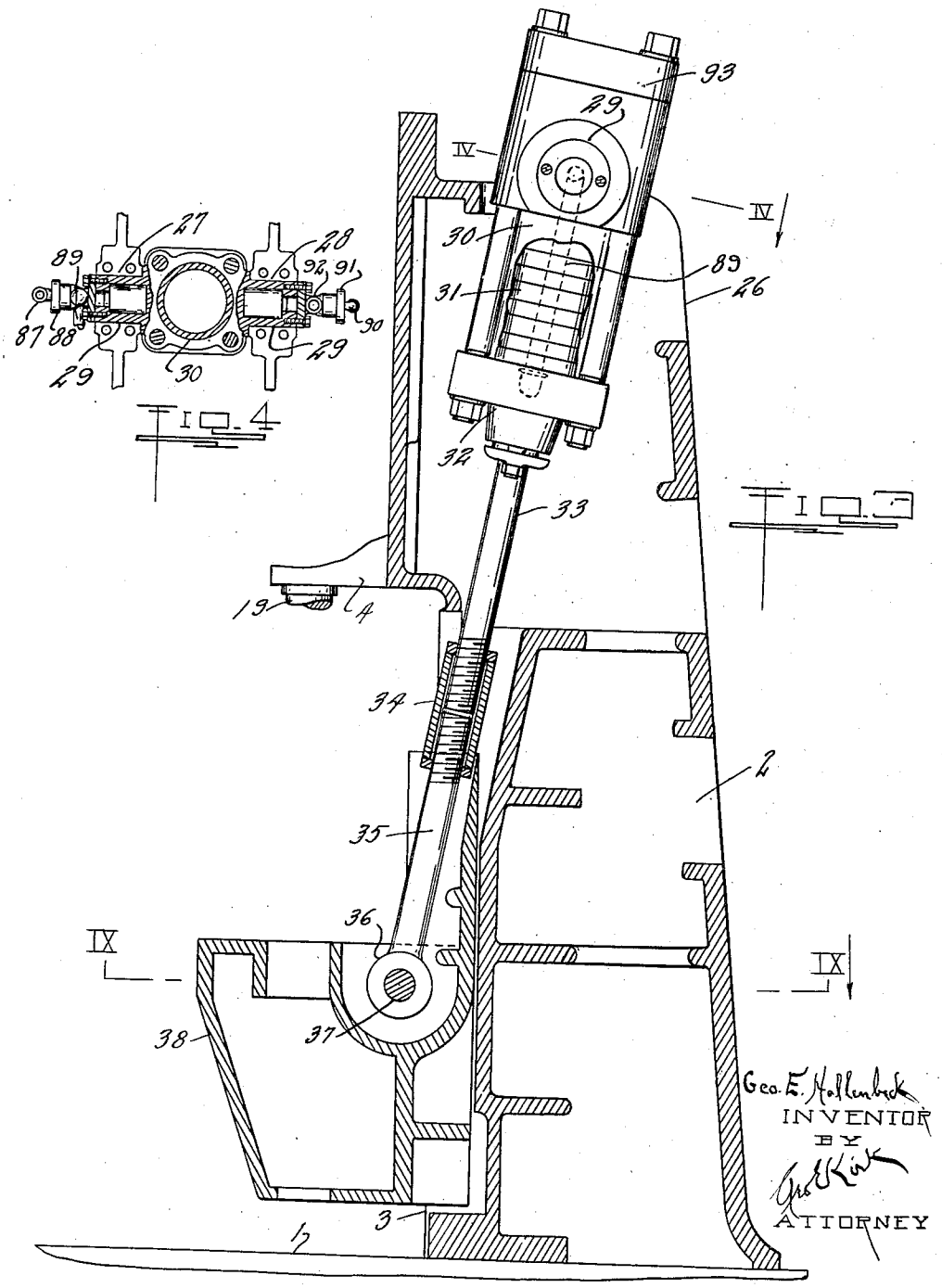


FIG. 4

FIG. 3

Geo. E. Hallenbeck
INVENTOR
BY
ATTORNEY

June 7, 1932. G. E. HALLENBECK 1,861,497

HYDRAULIC TABLE FEED MECHANISM

Filed June 23, 1926 4 Sheets-Sheet 3

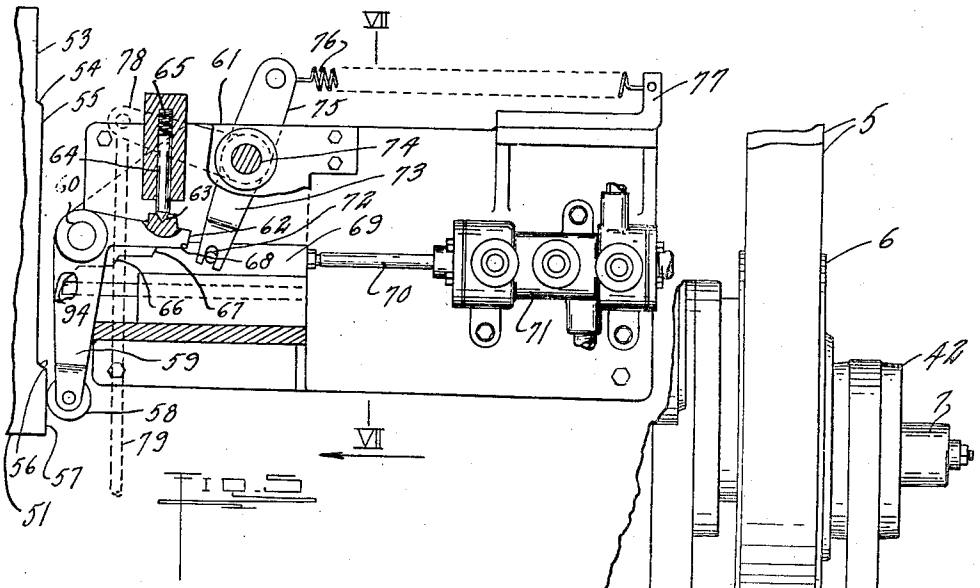
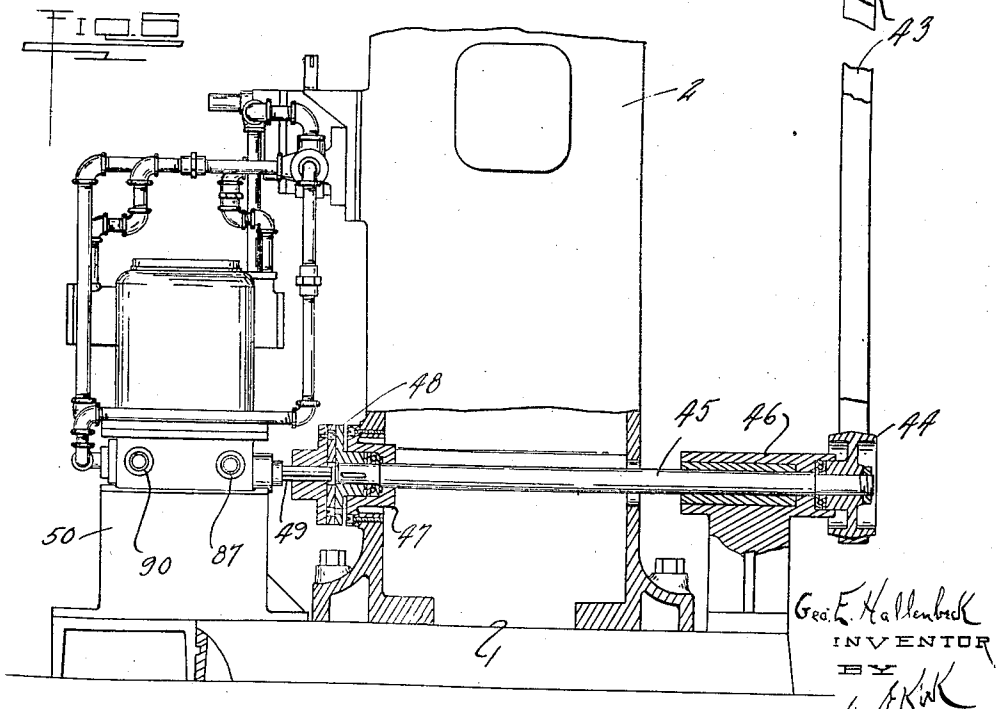


FIG. 5



Geo. E. Hallenbeck
INVENTOR
BY
ATTORNEY

June 7, 1932. G. E. HALLENBECK 1,861,497

HYDRAULIC TABLE FEED MECHANISM

Filed June 23, 1926 4 Sheets-Sheet 4

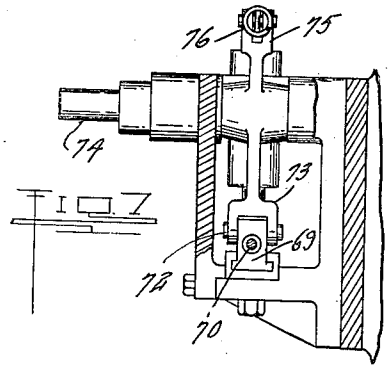


FIG. 7

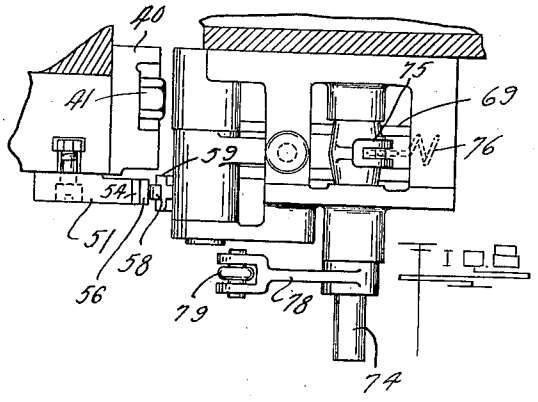


FIG. 8

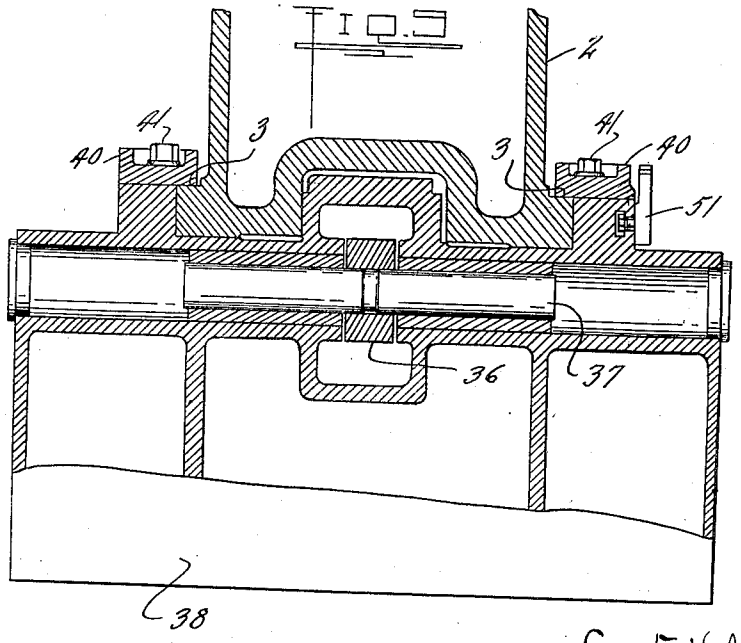


FIG. 5

Geo. E. Hallenbeck
INVENTOR
BY
ATTORNEY

Patented June 7, 1932 1,861,497

UNITED STATES PATENT OFFICE

GEORGE E. HALLENBECK, OF TOLEDO, OHIO, ASSIGNOR TO BAKER BROTHERS, INC., OF TOLEDO, OHIO, A CORPORATION OF OHIO

HYDRAULIC TABLE FEED MECHANISM

Application filed June 23, 1926. Serial No. 118,045.

This invention relates to power actuated tools and the relative feeding of tool and work holders as to each other.

This invention has utility when incorporated in boring machines and hydraulically shifted work tables therefor.

Referring to the drawings:

Fig. 1 is a side elevation, with parts broken away, of an embodiment of the invention in a multiple spindle boring machine;

Fig. 2 is a plan view of the driving gear train for the tools for the machine of Fig. 1;

Fig. 3 is a vertical section of the boring machine of Fig. 1, parts being broken away;

Fig. 4 is a section on the line IV—IV, Fig. 3;

Fig. 5 is a fragmentary view, on an enlarged scale, of the reciprocable holder and its control connections for the cycle of travel;

Fig. 6 is a fragmentary view of the drive connections for the hydraulic actuator for the table;

Fig. 7 is a section on the line VII—VII, Fig. 5;

Fig. 8 is a plan view of features of the control of Fig. 7; and

Fig. 9 is a section on the line IX—IX, Fig. 3.

From base 1 upwardly extends frame 2 having pair of parallel guides 3 (Figs. 1, 9). The upper portion of this frame 2 on the side thereof carrying the guides 3, has auxiliary frame 4 thereon. Driven belt 5 may be effective through pulley 6 for rotating shaft 7 carrying pinions 8 (Fig. 2) in mesh with gears 9 on stub shafts 10, 11. The shaft 10 carries bevel pinion 12 in mesh with bevel gear 13 therebelow, and is effective for driving shaft 14 carrying gear 15 in mesh with pair of gears 16, 17, for rotating spindles 18 mounting rotating head 19 as holders herein shown carrying tools 20 instead of work. The stub shaft 11 carries bevel pinion 12 in mesh with the under side of bevel gear 21 on shaft 14 carrying gear 15 in mesh with gears 16, 17, for rotating spindles 18 also carrying heads 19 for tools 20 in this four spindle boring machine.

Operating handle 22 through rock shaft 23 and fork 24 may operate clutch 25 for connecting the pulley 6 to shaft 7.

The frame 2 has opening 26 in its upper portion with bearings 27, 28, (Figs. 3, 4) on opposite sides thereof mounting trunnions 29 carrying cylinder 30 in this opening 26. This cylinder 30 has piston 31 therein. From this piston 31 through cylinder head 32, extends piston rod 33 having adjustable connection 34 with piston rod extension 35 terminating in eye 36 engaging pin 37 in table or holder member 38 as a carrier for work 39 instead of tool or tools.

The table 38 has gibs 40 connected by bolts 41 bringing this table in embracing relation with the guides 3 for shifting of the table toward and from the base 1. The position of the cylinder 30 is on the opposite side of the direction of the guides 3 from the position of the table 38. Furthermore, as herein shown this position of the cylinder is in upward or lift direction for pulling such table 38 toward the tools. The axis of the rod 33 extends at an acute angle transversely of the guide 3.

Mounted on the shaft 7, opposite the pulley 6, is pulley 42 (Fig. 6) driven with the pulley 6. From this pulley 42 extends belt 43 about pulley 44 on shaft 45 mounted in bearings 46, 47, carried by the base 1. This shaft 45 has flexible coupling connection 48 with shaft 49 extending into oil or liquid circulating pump housing 50.

Fixed with the table 38 are plates 51, 52. The plate 51 (Figs. 1, 5) has track portions 53, 54, 55, 56, 57. Disposed for coacting with the track portions of this cam 51 is roller 58 on arm 59 of angle lever having fulcrum bearing 60 in frame 61 fast with the frame 2. This angle lever 59 has horizontally extending arm 62 with seat 63 therein normally engaged by plunger 64 held thereagainst by compression spring 65. Accordingly, this angle lever 59, 62, is normally rocked on its fulcrum 60 to have its roller 58 ride along the cam plate 51. The short arm 62 of this lever is a dog positioned for engaging in seats 66, 67, 68, of reciprocable control member 69 fixed with stem 70 extending into valve housing 71. This member 69 is pro-

vided with pin 72 engaged by forked arm 73 mounted on fulcrum 74 and having upwardly extending lever arm 75 from which extends tension spring 76 having anchor terminus 77 fixed with the valve bracket 61 in the frame 2 upon which the valve 71 is mounted. Accordingly, the action of the spring 76 is to shift the member 69 away from the valve 71 and thus draw the rod 70 outward from the valve 71.

Fixed with the lever 73, 75, is angle arm 78 from which depends link 79 to angle lever arm 80 fulcrumed in bracket 81 on the base 1. Fixed with angle lever arm 80 is angle lever arm 82 from which extends adjustable link 83 to upstanding arm 84 from fulcrum bearing 85 carrying treadle 86.

In carrying on operations hereunder, the handle 22 may be thrown to cause the tools 20 to rotate. With the work 39 as anchored in position on the table 38, such work table may be controlled for movement upward toward the work by the action of the belt 43 effecting rotation through the shaft 45 of the shaft 49 within the pump housing 50. With the roller 58 upon cam track portion 53, the rod 70 is so positioned in the casing 71, that there is supplied by way of duct 87 (Figs. 1, 4, 6) from the housing 50, the flow of liquid through coupling 88 and duct 89 to cylinder head 32 thereby supplying liquid to the under side of the piston 31 at a determined rate for causing the piston rod 33, 34, 35, to pull the work table 38 upward, while simultaneously holding such work table against the guides and accordingly automatically taking up any working looseness which permits such guided travel. This insures elimination of any play in the holding of the work with resultant accuracy in the operation of the tools on the work. This initial travel upward of the table 38 with the roller 58 along the track portion 53 may be at a rather rapid rate say by a gear pump as operated in the housing 50.

The roller 58 then passes by way of track portion 54 to track portion 55 thus lifting the dog portion of arm 62 out of the seat 67 in the member 69. At once the spring 76 from the lever 75, 73, throws the member 69 and arm 70 to bring the seat 68 into engagement with the arm of dog 62. This changed position of the rod 70 in the control valve 71 brings about a reduced rate of travel for the table 38 which may be effected by a multi-cylinder type of rotary pump in the housing 50, the eccentricity of which may be nicely adjusted for determining the desired rate of working travel during this second stage of driving.

The extent of the track portion 55 is proportionate to the length of cut or operation of the tool 20 on the work 39. The travel of the table 38 along the track 53 determines the clearance for setting the work up to the position for the tool to become effective in the work. As the roller 58 passes along the track 55 to the track portion 56, this track portion 56 is effective for further rocking of the angle lever 59, 62, lifting the dog out of the seat 67 so that the spring 76 is effective for a second throw of the member 69 and rod 70 to bring the dog 62 into the seat 68. At this position, the roller 58 has just started upon the track portion 57. This changed position for the rod 70 brings about a quick reversal in the travel direction of the table 38 by causing a high speed control, say as by the gear pump, to effect flow of fluid from the housing 50 by duct 90 to coupling 91 adjacent the trunnion 29, thence by duct 92 to upper cylinder head 93 permitting the flow of the power fluid to the upper side of the piston 31 in the cylinder 30 for a thrusting downward of the piston rod 33, 34, 35, in giving a quick lowering of the table 38 as its idle stroke.

In the descent of the table 38, cam plate 52 engages terminus 94 of the member 69 and thrusts the member 69 with rod 70 slightly inward as to the valve 71. This cuts off further flow of propelling liquid into the cylinder 30 and thus stops further descent of the table 38. The operator may now remove the work 39 as thus treated, or shift such work; replace by other work to be operated upon; and when the work is thus in position for a repetition of the cycle of operations, the operator may depress the treadle 86 against the action of the spring 76 and thus throw the member 69 with its rod 70 toward the valve 71 to such position that the plunger 64 is effective to bring the dog 62 into the seat 66 of the member 69 for a repetition of the cycle of operations.

In the operation of this table shifting by this hydraulic control device, and its regulator valve, there is a definiteness of control from this incompressible medium, as oil. To insure that the medium is at all times of an incompressible character, air separator 95 is mounted in a line of the duct 92.

The circulator as herein disclosed is of the general type as to the pump and mechanism of the showing in Patent No. 1,468,595, Ferris, October 26, 1922.

It is to be noted that in the recover or idle stroke, such is a movement of a piston rod 33 out of the cylinder 30, which may be considered here as a thrust or a permissive descent. At such time the tools are not doing their work in the feeding of the work as to the tools. However, in the operation wherein there is feeding of the tool relatively to the work, the piston rod 33 is pulling or has a tension action. This is effective as a definite holding means against chatter or vibration in the uniform progress of the one holder toward the other. This is a feature of importance for minute accuracies in

work production, as well as a matter of efficiency in reduced power consumption for operating notwithstanding the less effective area of the piston 31 at its piston rod end.

What is claimed and it is desired to secure by United States Letters Patent is:—

In a vertical boring machine; a frame provided near the base thereof with a guideway extending in a vertical plane, an outwardly projecting boring head on the upper end of said frame, a work table slidable on and projecting forwardly from said guideway and adapted to carry work pieces into engagement with said boring head, and table feeding mechanism comprising a cylinder pivotally mounted in the upper end of said frame and rearwardly from the plane of said guideway, a piston on said cylinder, a rigid piston rod pivoted to the upper end of said table at a point outwardly from said guideway, and intersecting the said plane of the guideway at a small acute angle, a source of fluid pressure and valve means controlling the movement of said table.

In witness whereof I affix my signature.

GEO. E. HALLENBECK.