No. 876,428. PATENTED JAN. 14, 1908.

J. G. BLESSING.

FLUID PRESSURE OPERATED GRINDING MACHINE.

APPLICATION FILED MAR. 16, 1907.

4 SHEETS—SHEET 1.

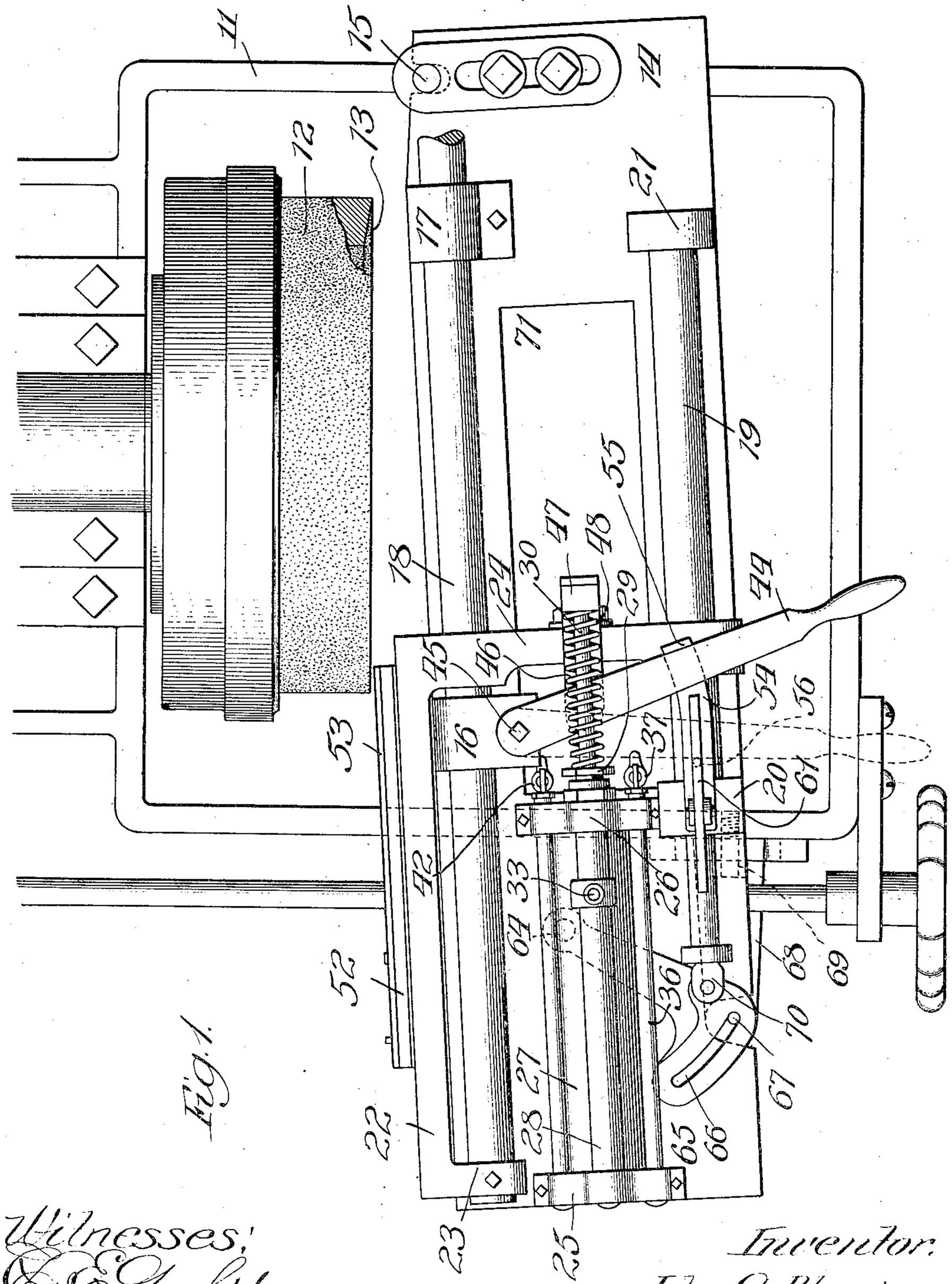

Fig. 1.

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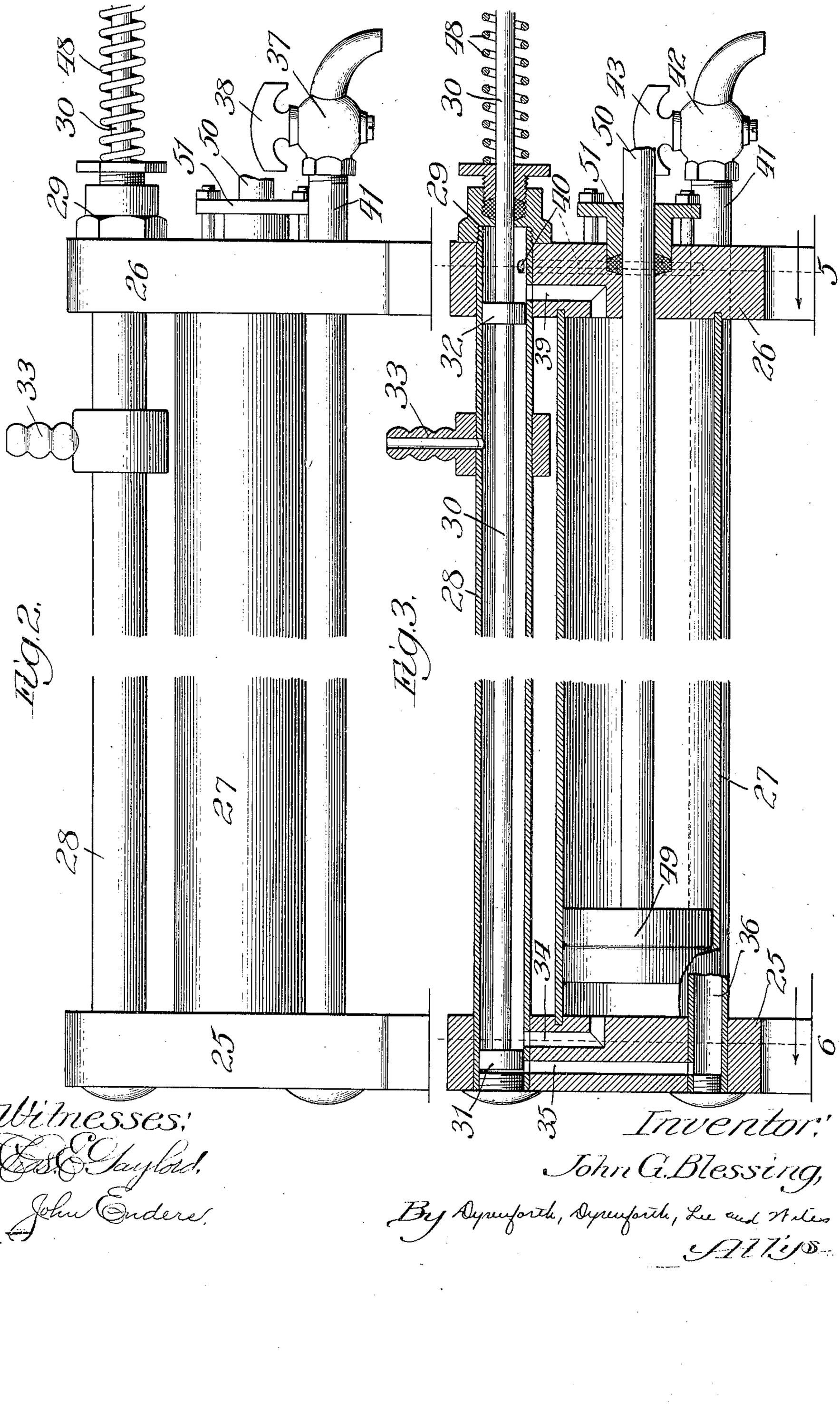

FIG. 2.

FIG. 3.

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4 SHEETS—SHEET 3.

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Fig. 4.

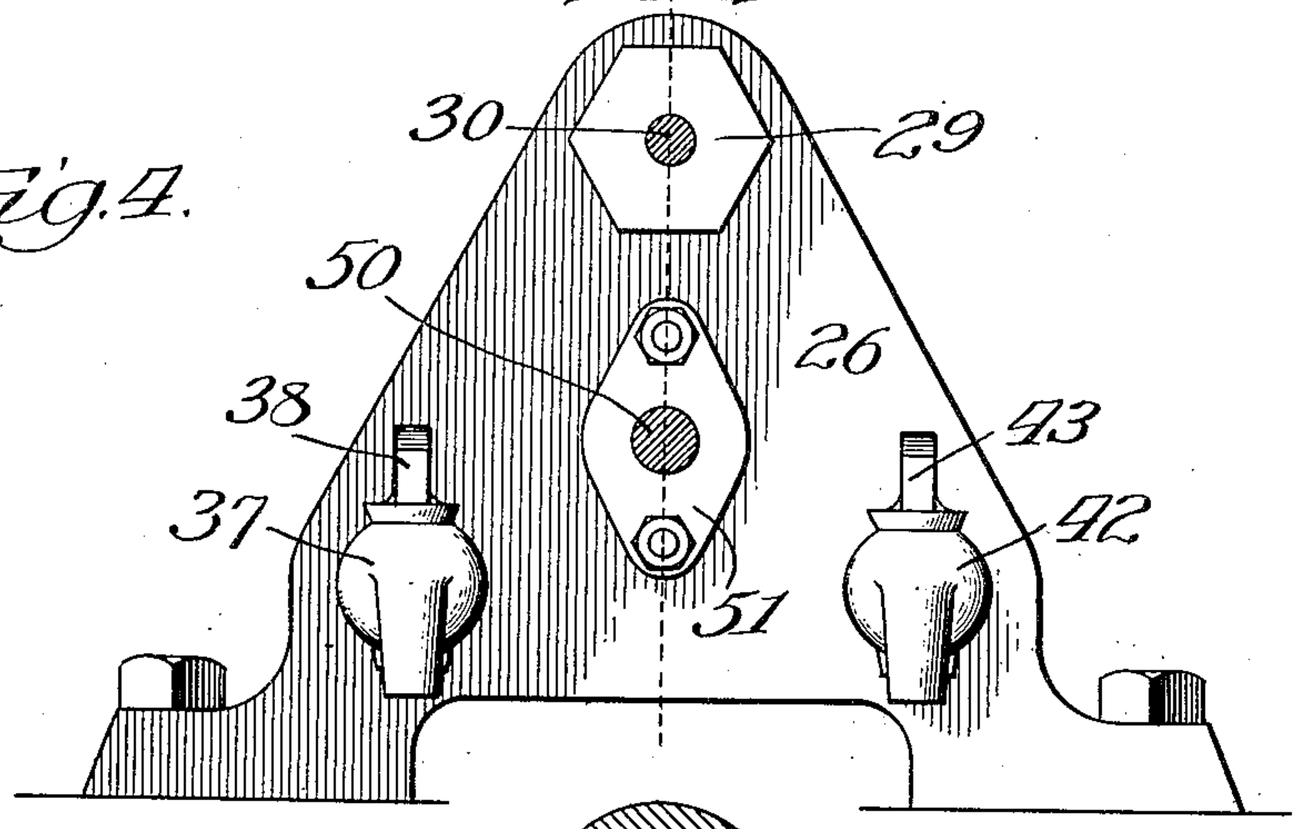


Fig. 5.

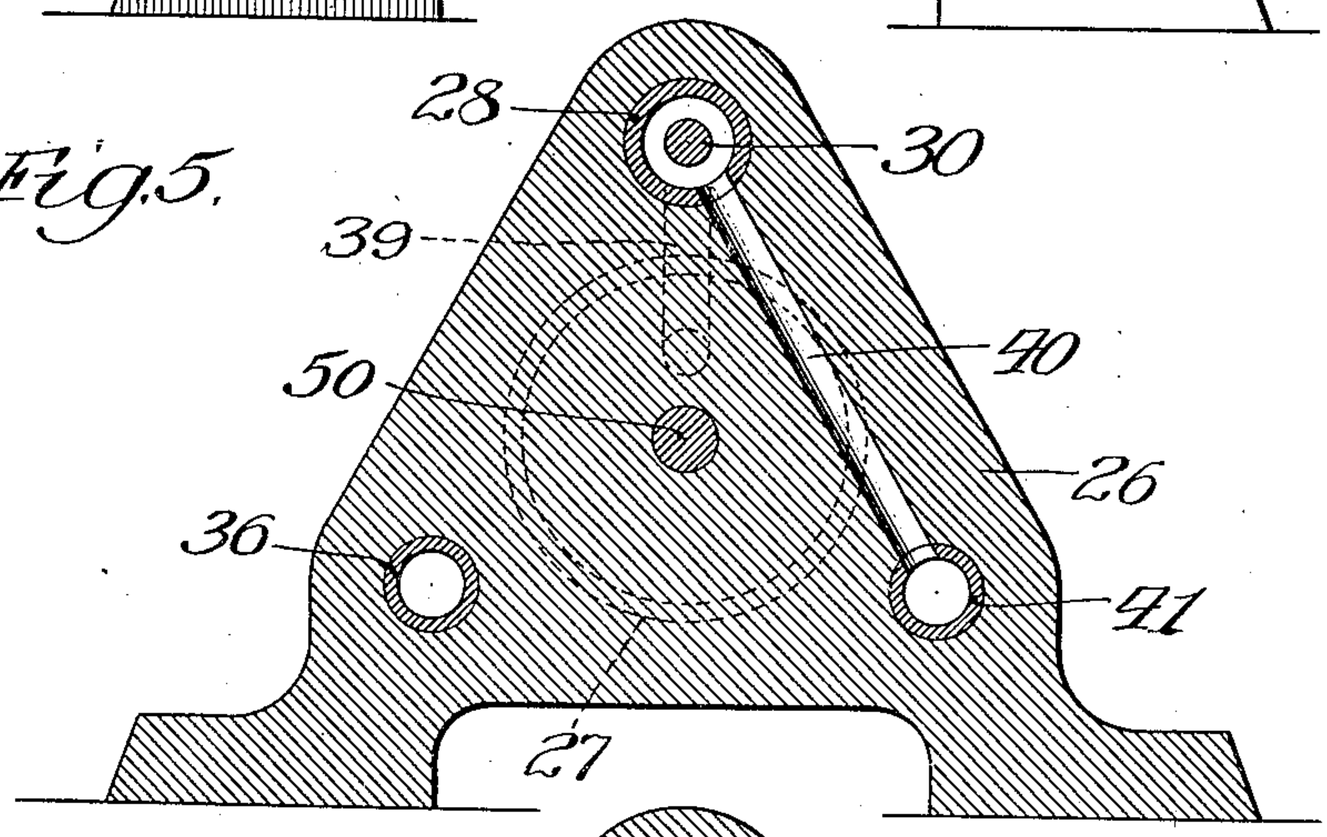
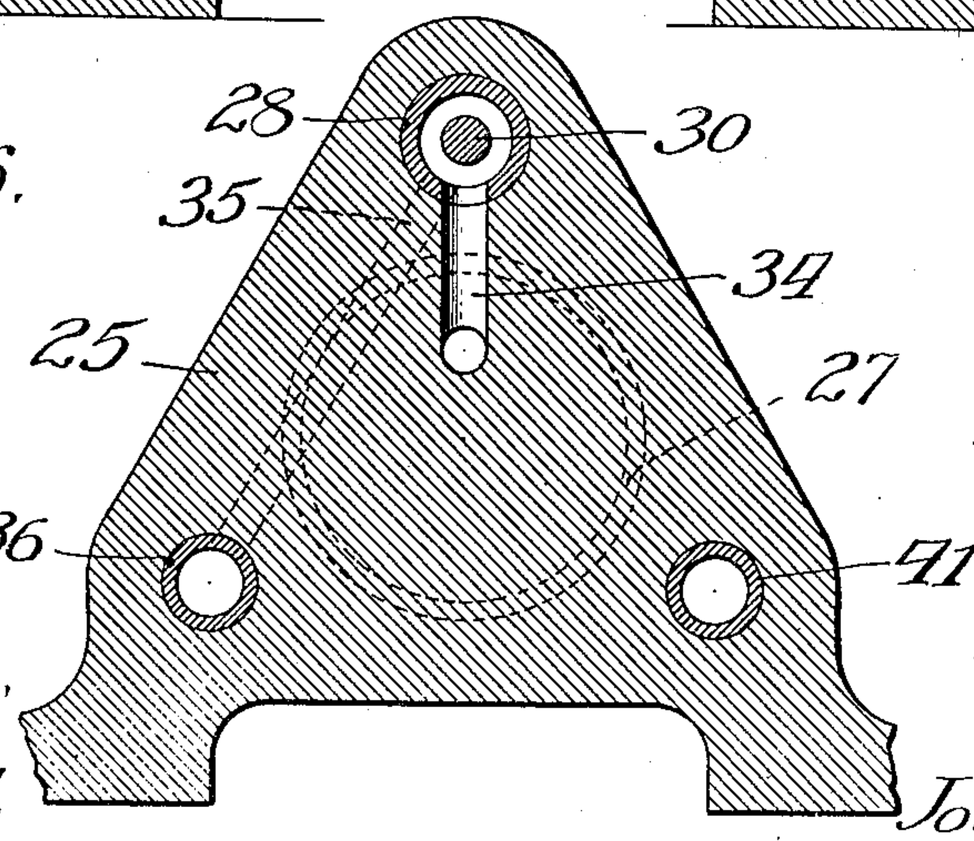


Fig. 6.



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4 SHEETS—SHEET 4.

Fig. 7.

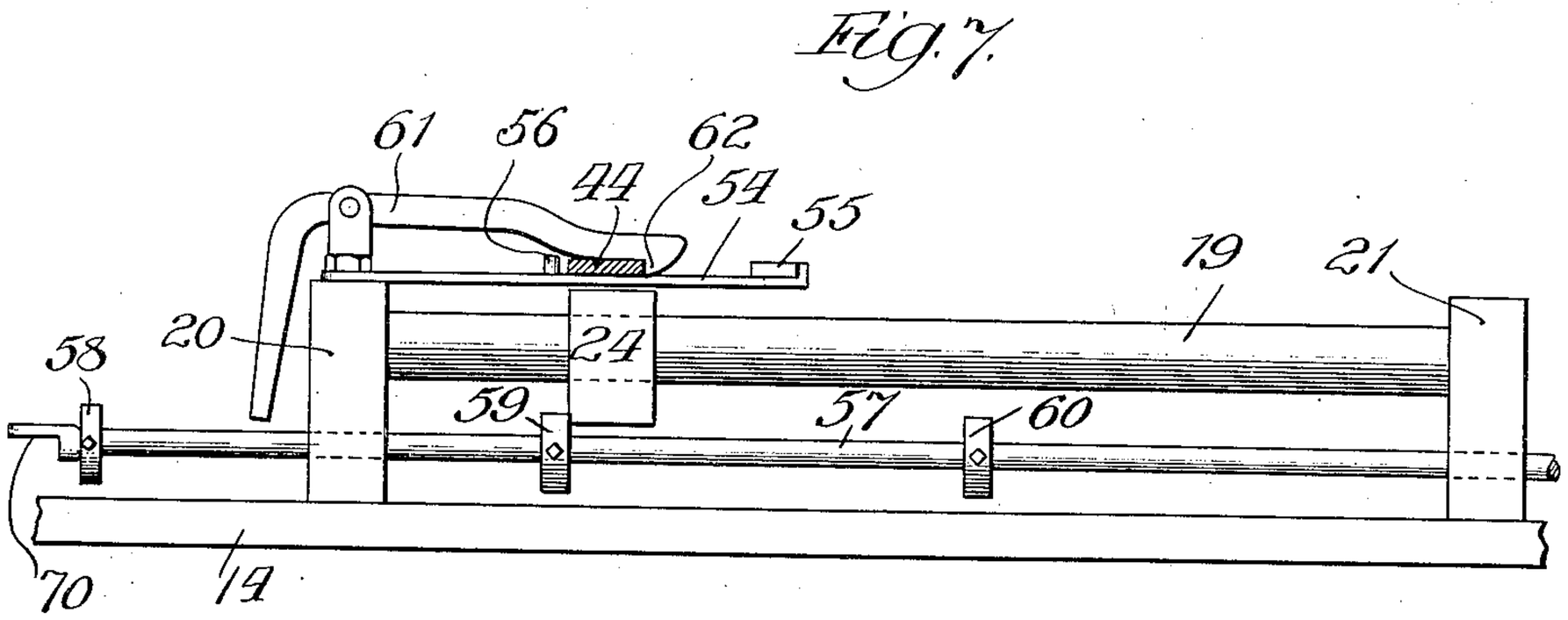


Fig. 8.

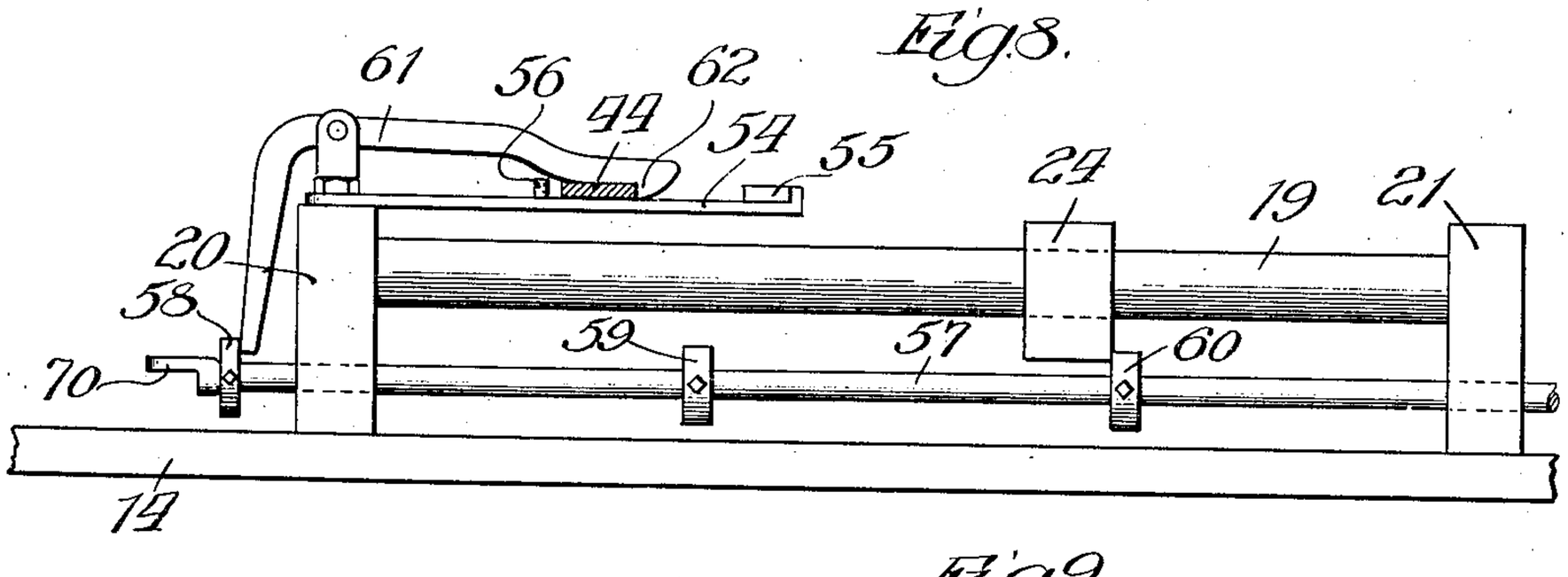


Fig. 9.

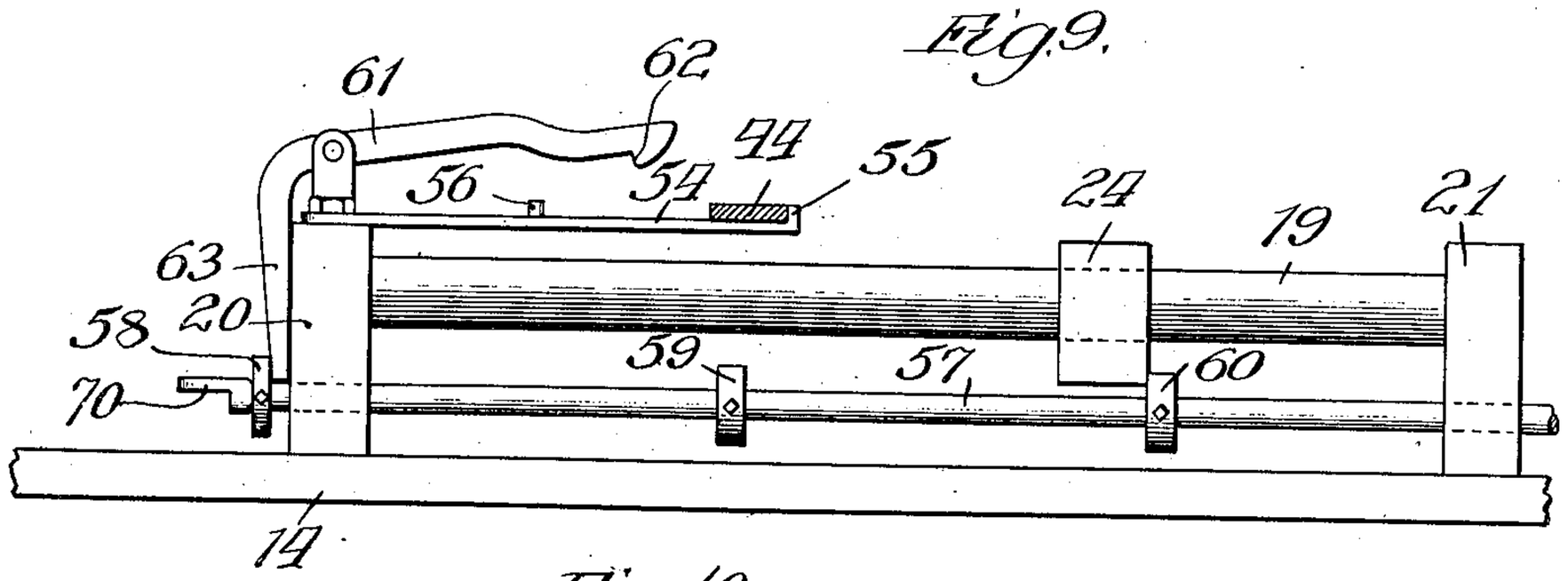
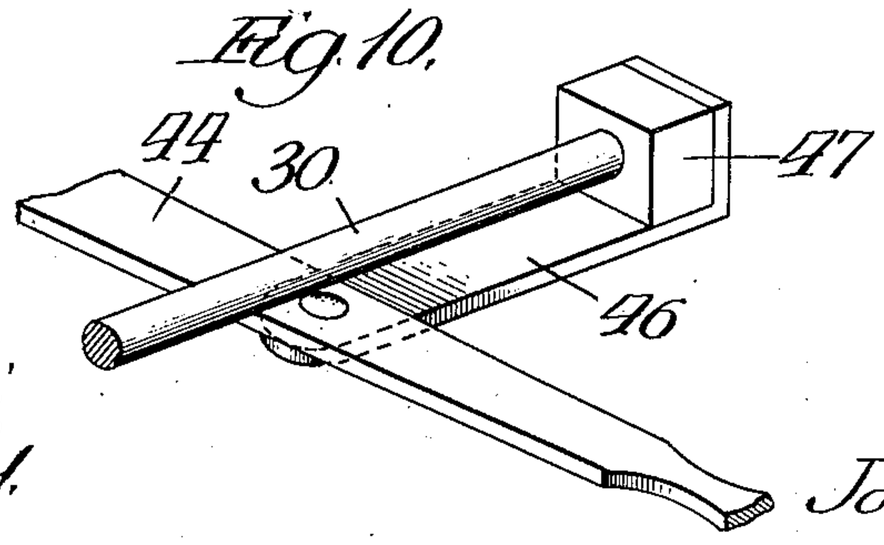


Fig. 10.



Witnesses:
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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE-OPERATED GRINDING-MACHINE.

No. 876,428. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed March 16, 1907. Serial No. 362,656.

To all whom it may concern:

Be it known that I, JOHN G. BLESSING, a citizen of the United States, residing at New Britain, in the county of Hartford and State of Connecticut, have invented a new and useful Improvement in Fluid-Pressure-Operated Grinding-Machines, of which the following is a specification.

My invention relates to improvements in fluid-pressure-operated grinding machines, and more particularly to the class in which the grinding is performed in a single reciprocation of the work-carrier.

My present invention is in the nature of an improvement upon the construction shown, described and claimed in an application filed by me April 17, 1906, and bearing Serial No. 312,112.

In its general construction and operation the present machine is very similar to that shown in my former application referred to; and my present object is to provide certain improvements in the construction of the fluid-pressure motor-device which reciprocates the work-carrier, to the end of adapting the machine more perfectly to its purpose.

Referring to the accompanying drawings, which illustrate the preferred embodiment of my invention, Figure 1 is a broken top plan view of a knife-blade grinding machine constructed with my improved motor and carrier swinging mechanism; Fig. 2, an enlarged broken fragmentary view in side elevation of the fluid-pressure motor; Fig. 3, a broken longitudinal section of the same; Fig. 4, an end view of the motor; Figs. 5 and 6, sections taken respectively on lines 5 and 6 in Fig. 3, and viewed in the direction of the arrows; Fig. 7, a broken, partly sectional, view showing in side elevation, mechanism for shifting the motor-valve to reverse the movement of the work-carrier, as well as means for moving the reciprocating work-carrier laterally with relation to the grinding-wheel; Figs. 8 and 9, views the same as Fig. 7, but showing the moving parts in different positions; and Fig. 10, an enlarged and broken fragmentary view showing the connection between the motor-starting lever and the motor-reversing valve.

The main frame of the machine is formed at its upper side with a water receptacle or basin 11 in which the usual hollow cylindrical grinding-wheel 12 rotates. The grinding-wheel has an inwardly-tapering annular grinding surface 13 and rotates constantly.

14 is a horizontal base-plate adjustably pivoted at 15 to the main frame 11 to swing on its pivot to a limited extent toward and away from the grinding-wheel. Secured upon the plate 14 are perforated lugs 16, 17, forming guides for a longitudinally movable rod 18. Parallel with the rod 18 is a stationary guide rod 19 mounted at opposite ends in lugs 20 and 21 rising from the plate 14.

22 is a work-holder carrier extending parallel with the rods 18, 19, having a flanged end portion 23 receiving and fastened to the rod 18 and terminating at its opposite end in a cross-head 24 having openings through which the rods 18, 19 pass. The cross-head slides freely upon the guide-rod 19. Secured upon the plate 14, in the positions shown, are heads 25 and 26 for a cylinder 27; and extending through the heads, above the cylinder, is a tube or valve-chamber 28 closed at one end and provided at its opposite end with a stuffing-box 29. Extending through the stuffing-box and working in the valve-chamber 28 is a valve-rod 30 provided with pistons 31 and 32 in the relative positions shown. Extending into the tube 28, between the pistons 31, 32, is a fluid-pressure supply-passage 33 connected in practice by a rubber hose, or the like, with a fluid-pressure supplier, not shown. In the head 25 is a port 34 affording communication between the interior of the tube 28 and interior of the cylinder 27 at one end. Adjacent to the port 34 is a port 35 cored in the head 25 and communicating at one end with the interior of the tube 28 and at its opposite end with a pipe 36 extending, parallel with the lower side of the cylinder, through the head 26, beyond which it is provided with a cock or faucet 37 provided with a rotary plug-valve 38. In the head 26 is a cored passage or port 39, communicating at one end with the interior of the tube 28 and at its opposite end with the cylinder 27, and a port or passage 40 extending from the interior of the tube 28 to a pipe 41 provided with a cock or faucet 42 having a rotary plug-valve 43.

44 is an operating lever or handle pivoted at 45 upon the stationary lug 16 and pivotally connected between its ends, as shown in Fig. 10, to a link 46 extending from a head 47 on the stem 30. Surrounding the said stem and confined between the stuffing-box 29

and head 47 is a spring 48 which tends normally to shift the stem and its pistons 31 and 32 in the direction to the right in Figs. 1, 2 and 3. Working in the cylinder 27 is a piston 49 on a stem 50 passing through a stuffing-box 51 in the head 26 and secured at its outer end to the cross-head 24.

The pistons 31 and 32 are in effect slide valves, which, in the sliding of the stem 30, open and close the end ports in the tube or valve-chamber 28. When in the position shown in Fig. 3, the valves 31 and 32 open the port 34 to the tube, close the port 35, and open the passage from the cylinder through the ports 39 and 40 to the faucet 42. When in this position, motive fluid passes from the port 33 through the tube and port 34 to the cylinder to drive the piston 49 in the direction of the head 26, the fluid in advance of the piston escaping through the faucet 42. Movement of the stem 30 to the right, until the valve 32 covers the port 40, opens the passage 39 to admit the motive fluid into that end of the cylinder and opens the passage through the ports 34, 35 for the escape of fluid from the cylinder therethrough and through the pipe 36 to the faucet 37, whereby the piston 49 will be moved to the left. The piston 49, through its stem 50, moves the cross-head 24 and work-holder carrier 22 longitudinally with the guide-rod 18, while sliding upon the guide-rod 19.

The carrier 22 carries an adjustable work-holder bar 52 of the construction shown and described in my aforesaid pending application. It will suffice to say that the bar is adapted to receive and hold a knife-blade 53 placed against its face.

The handle 44, in its movement slides upon a bar 54, the bar being mounted upon the lug 20. The tendency of the spring 48 is to move the stem 30 until the piston or valve 32 covers the port 40 and the handle 44 contacts with the stop 55. This is the normal position of the parts, and the piston 49 comes to rest in the position shown in Fig. 3. The operation of the reciprocating work-carrier is started by moving the handle 44 to the stop 56, and means are provided for permitting the spring 48 to reverse the valves 31 and 32 and the movement of the piston 49 when the latter reaches the limit of its movement in the direction of the head 26. These means will be next described.

Beneath the guide-bar 19 is a rod 57 which slides longitudinally in guide openings in the lugs 20 and 21. The rod carries an adjustable head or stop 58 at one end beyond the lug 20 and adjustable stops or collars 59 and 60 between the lugs in the path of the cross-head 24. 61 is a bent rod or catch-device pivoted upon the upper end of the lug 20 and having a horizontally-extending arm formed near its end with a hook or shoulder 62 for engaging the lever 44, and a downwardly-extending arm 63 projecting into the path of the stop 58. When the handle 44 is moved to the stop 56 the catch drops to engage and hold the handle in that position, as indicated in Fig. 7, which starts the work-carrier in the direction to the right in Fig. 1. As the cross-head nears the limit of its movement in that direction, it engages the stop 60 and slides the rod 57 first to the position shown in Fig. 8, to cause the stop 58 to contact with the arm 63, and then to the position shown in Fig. 9, to swing the catch and lift the shouldered portion 62 to release the handle 44. This release of the handle permits the spring 48 to reverse valves 31, 32 and the movement of the piston 49, which latter is then forced to the left, to the position shown in Fig. 3, where it stops. In the movement of the carrier to the right, the knife-blade 53 is held out of contact with the grinding-wheel 12 and is moved into contact with the latter during the final movement of the parts in that direction, whereby the grinding is performed in the outward movement of the parts which is in a direction to the left in Fig. 1.

As before stated, the plate 14 is pivoted at 15. Resting on the upper surface of the plate 14 and pivoted at one end upon a pin 64 carried by the plate 14, is a lever 65 provided in its swinging end-portion with an elongated segmental slot 66 engaging a pin 67 fastened to and rising through an opening in the bed 14, from a bracket 68 adjustably secured to the side of the base 11, as by a screw-bolt 69, to adapt it to be shifted with its pin 67 transversely of the bed 14. The lever is pivotally connected at one end to a projection 70 on the adjacent end of the rod 57. In the movement of the said rod 57 to the left in the figures, for the purpose of reversing the movement of the carrier as described, it forces the lever 65 to the position shown in Fig. 1 with the effect of swinging the plate 14 on its pivot to move the knife-blade 53 out of contact with the grinding-wheel as indicated. As the carrier nears the limit of its movement to the right, it forces the rod 57, by contact therewith of the cross-head 24, to the position shown in Fig. 9 and draws the lever 65, whereby the engagement of the slot 66 with the pin 67 swings the plate 14 to press the knife-blade into contact with the grinding face of the grinding-wheel. Thus, when the knife-blade is inserted in the carrier it is moved inward nearly to the limit in that direction out of contact with the grinding-wheel, then pressed into engagement with the grinding-wheel, and during its movement in the outward direction remains pressed against the grinding-wheel to permit the grinding operation to be performed.

The motive fluid I prefer to employ is water which escapes from the faucets 37, 42 through an opening 71 in the base-plate 14

into the basin in which the grinding-wheel rotates. The speed of movement of the piston 49 in either direction is controlled by the back-pressure of the escaping fluid ahead. Thus by turning the plug-valves at the faucets to diminish or enlarge the fluid outlets the speed of reciprocation of the work-carrier may be increased or diminished by the attendant, as desired. For example, by opening wide the cock 43, and partly closing the cock 38, the carrier may be caused in each operation to move at maximum in the inward direction, and at comparatively slow speed in the outward direction while the grinding is being performed. The best results in grinding knife-blades, for example, are obtained by grinding in but one direction and moving the work at a certain speed with reference to the speed of rotation of the grinding-wheel. My improvements permit the movements of the carrier to be readily controlled to effect the best results. The pipes 36, 41, and valve-chamber 28 also operate to hold the heads 25, 26 in fixed relation to each other, thereby dispensing with the use of tie-rods.

What I claim as new, and desire to secure by Letters Patent, is—

1. In combination with a grinding-wheel and a reciprocal work-holder coöperating therewith, fluid-pressure means for operating said work-holder comprising a cylinder, a piston in said cylinder directly connected with the work-holder, a valve-chamber, fluid-pressure inlets and outlets leading from said valve-chamber to said cylinder, and a slide-valve in said valve chamber for controlling the opening and closing of said inlets and outlets.

2. In combination with a grinding-wheel and a reciprocal work-holder coöperating therewith, fluid-pressure means for operating said work-holder comprising a cylinder, a piston in said cylinder directly connected with the work-holder, a valve-chamber, fluid pressure inlet and outlet passages at opposite ends of said cylinder leading from said cylinder through the valve-chamber, a slide-valve in said valve-chamber provided with spaced pistons for controlling the admission into and discharge from the cylinder of the actuating fluid, and means for actuating the valve.

3. In combination with a grinding-wheel and a reciprocal work-holder coöperating therewith, fluid-pressure operating-means for said work-holder comprising a cylinder, a piston in said cylinder directly connected with the work-holder, a valve-chamber, a fluid-pressure inlet passage leading from said chamber to the cylinder, and a fluid-discharge outlet for the cylinder in said valve-chamber adjacent to said inlet, a fluid-pressure inlet passage at the opposite end of the cylinder leading into it from said valve-chamber and a fluid-pressure outlet in said valve-chamber adjacent to said last-named inlet, a slide valve in said valve-chamber comprising a rod and spaced pistons, fluid-pressure inlet and outlet ports for the cylinder in each end portion of said chamber, a valve rod, slide valves on the rod for opening and closing the ports at each end of the chamber alternately, and reciprocating means for the rod.

4. In combination with a grinding-wheel and a reciprocal work-holder coöperating therewith, fluid-pressure operating means for said work-holder comprising a cylinder, a piston in said cylinder directly connected with the work-holder, a valve-chamber, fluid-pressure inlets and outlets leading from said valve-chamber to said cylinder, a slide-valve device in said valve-chamber for controlling the opening and closing of said inlets and outlets, and means for shifting the slide-valve to reverse the travel of the piston in the final movement of the work-holder in one direction.

5. In combination with a grinding-wheel and a reciprocal work-holder coöperating therewith, fluid-pressure operating means for said work-holder comprising a cylinder, a piston in said cylinder connected with the work-holder, a valve-chamber, fluid-pressure inlets and outlets leading from said valve-chamber to said cylinder, a spring-controlled slide-valve in said valve-chamber for controlling the opening and closing of said inlets and outlets, catch-mechanism for releasably maintaining said slide-valves in one position against the tension of its spring, and means actuated by said work-holder for engaging said catch to free the valve and allow it to return under the action of its spring to normal condition.

6. In combination with a grinding-wheel and a reciprocal work-holder coöperating therewith, fluid-pressure operating means for said work-holder comprising a cylinder, a piston in said cylinder connected with the work-holder, a valve-chamber, fluid-pressure inlets and outlets affording communication between said cylinder and valve-chamber, a spring controlled slide-valve in said valve-chamber governing the opening and closing of said inlets and outlets, and means for actuating the slide-valve comprising an operating lever connected with said slide-valve for moving it against the tension of its spring, catch-mechanism for releasably maintaining said lever in shifted position, and means actuated by the work-holder during its movement in one direction to engage said catch-mechanism to release it and cause said lever and slide-valve to be returned by the spring to their normal positions.

7. In combination with a grinding-wheel and a reciprocal work-holder coöperating therewith, fluid-pressure means for operating said work-holder comprising a cylinder,

a piston in said cylinder connected with the work-holder, a valve-chamber, fluid-pressure inlets and outlets affording communication between said cylinder and valve-chamber, a spring-controlled slide-valve in said valve-chamber for controlling the opening and closing of said inlets and outlets, and means for actuating the slide-valve comprising a lever fulcrumed near one end to a support and pivotally fastened between its ends to said slide-valve for moving said valve against the resistance of said spring, a lever fulcrumed on the machine having a catch normally in the path of the lever by which said lever is releasably held in shifted condition, and means movable with said work-holder for engaging said lever to move the catch and release the lever to permit it and the slide-valve to be returned by the spring to their normal positions.

8. In combination with a grinding-wheel and a reciprocal work-holder coöperating therewith, fluid-pressure operating-means comprising a cylinder having heads provided with fluid-pressure passages, spent-fluid discharge pipes, a valve-chamber provided with inlets and outlets, said heads being held together in fixed relation to each other by said pipes and valve-chamber, a piston in said cylinder operatively connected with the work-holder, and a valve in said valve-chamber controlling the opening and closing of said inlets and outlets.

9. In combination with a grinding-wheel and a reciprocal work-holder coöperating therewith, fluid-pressure means for operating said work-holder comprising a cylinder, a piston in said cylinder operatively connected with the work-holder, a valve-chamber, a fluid-passage in one cylinder-head opening into said cylinder and into the valve-chamber, a fluid-passage in the opposite cylinder-head opening into said cylinder and valve-chamber and a spent-fluid passage in said last-named cylinder-head leading from said valve-chamber to exhaust, and a valve in said valve-chamber controlling the opening and closing of said passages.

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In presence of—
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