

May 10, 1938.

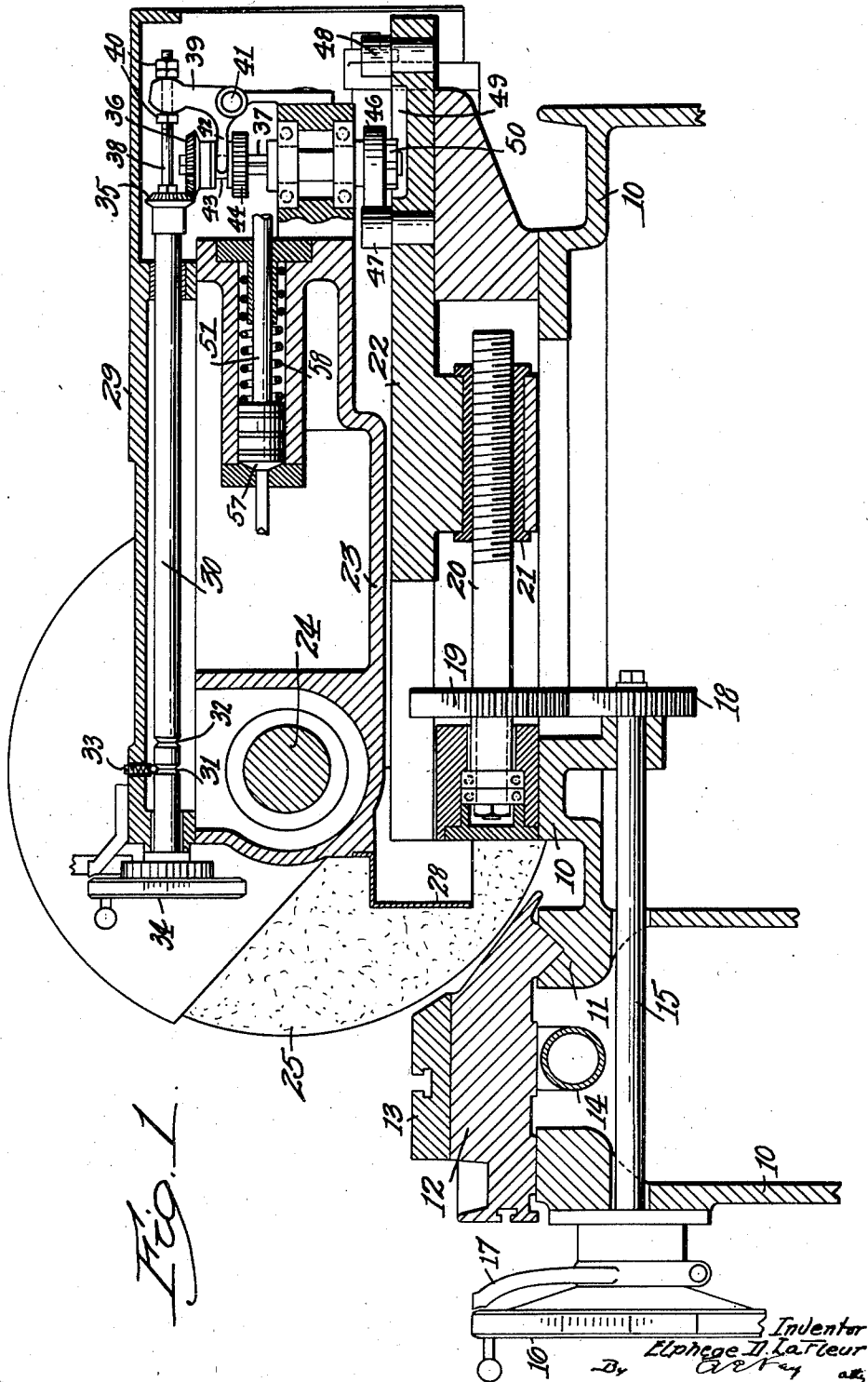
E. D. LA FLEUR

2,116,794

DIMINISHING FEED

Filed Dec. 21, 1937

4 Sheets-Sheet 1



May 10, 1938.

E. D. LA FLEUR

2,116,794

DIMINISHING FEED

Filed Dec. 21, 1937

4 Sheets-Sheet 2

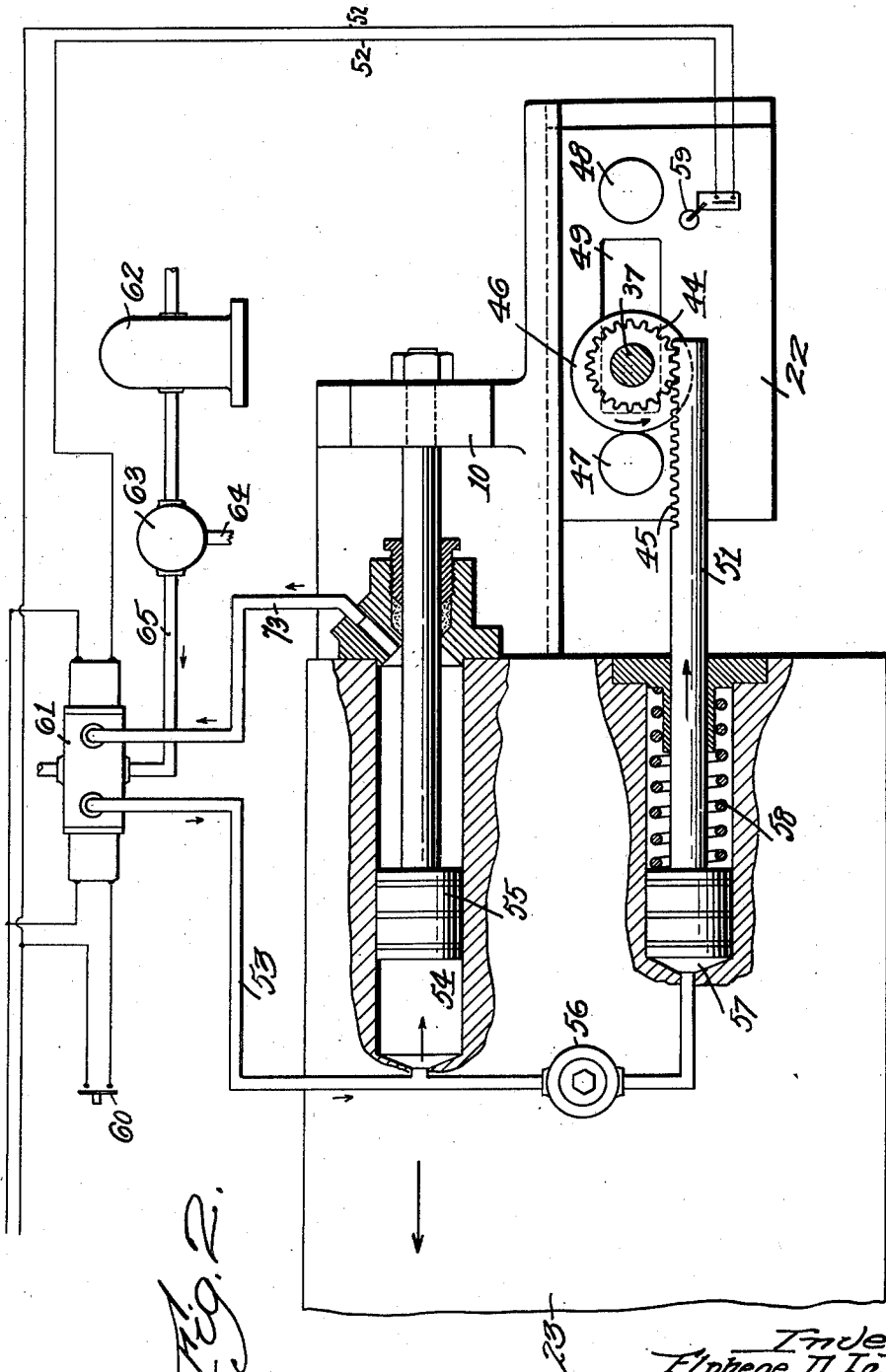


Fig. 2.

Inventor
Elphège H. LaFleur.
By attorney
W. D. Fay

May 10, 1938.

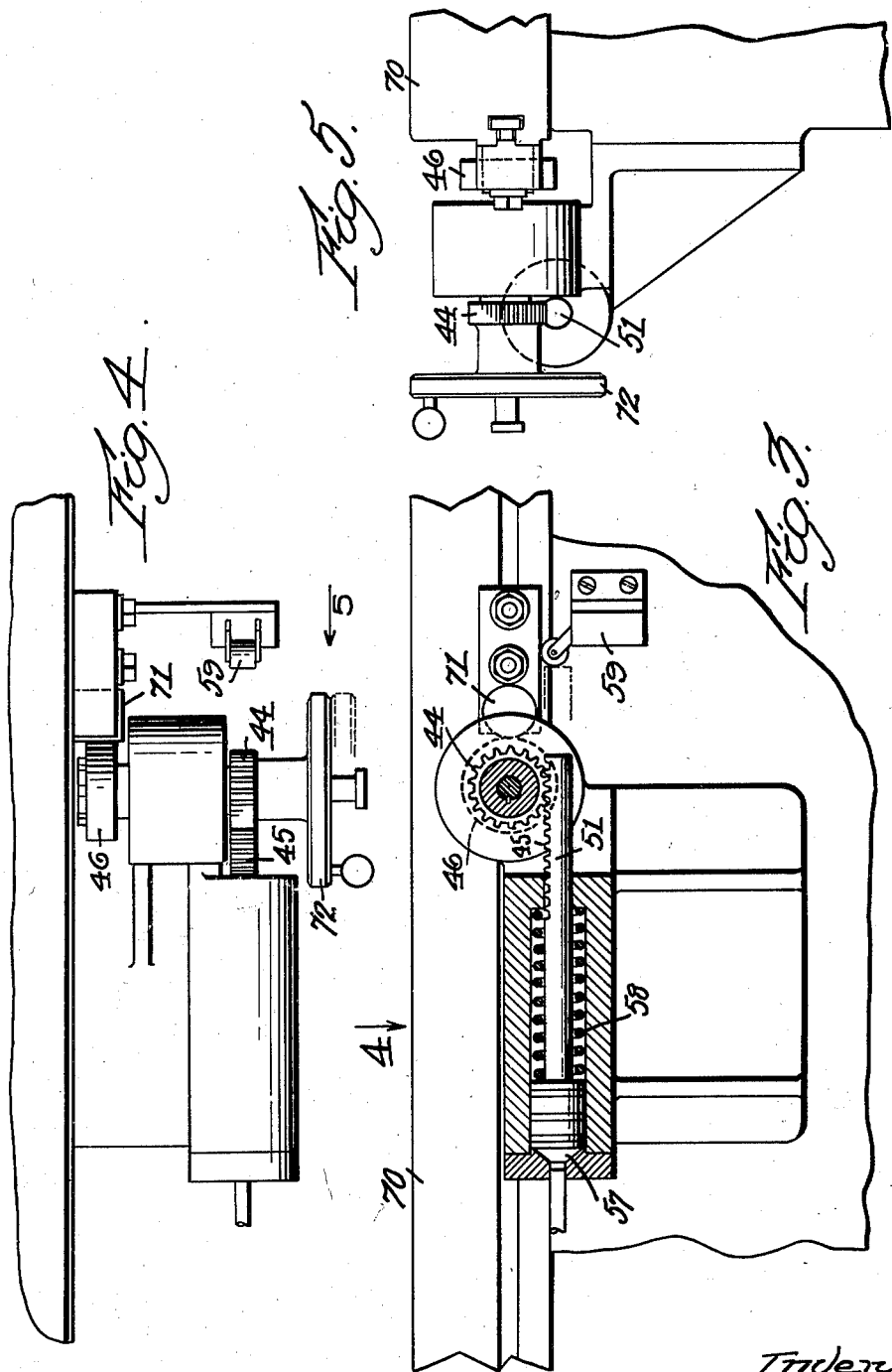
E. D. LA FLEUR

2,116,794

DIMINISHING FEED

Filed Dec. 21, 1937

4 Sheets-Sheet 3



Inventor
E. D. La Fleur
By *ROF*

W. H. C. W. C.

May 10, 1938.

E. D. LA FLEUR

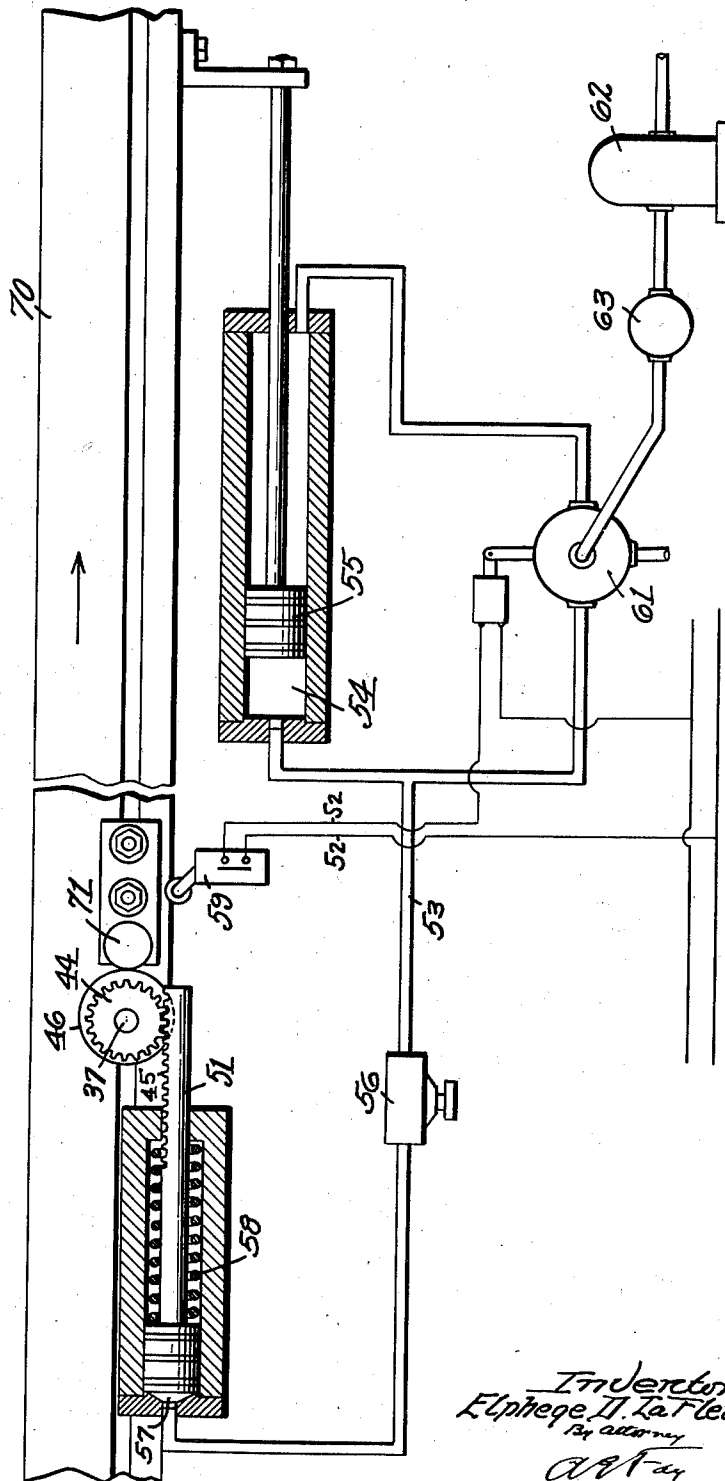
2,116,794

DIMINISHING FEED

Filed Dec. 21, 1937

4 Sheets-Sheet 4

Fig. 6.



Inventor
Elphège H. LaFleur
By attorney
A. T. Ay

McKinnon
67, W. 11th St.

UNITED STATES PATENT OFFICE

2,116,794

DIMINISHING FEED

Elphege D. La Fleur, Lancaster, Mass.

Application December 21, 1937, Serial No. 181,002

10 Claims. (Cl. 51—92)

This invention relates to a feed for a grinding or milling machine or automatic lathe, or the like, in which the feed will be diminished at the end of the stroke.

5 The principal objects of the invention are to provide an auxiliary piston and cylinder with a shaft operated by the piston and having an eccentric or cam thereon adapted to engage stops at one or both ends of the stroke to cut down the feed when the grinding wheel or cutting element is coming to the end of its stroke for purposes that are obvious; to provide said piston with a rack and a gear construction on the shaft for operating the eccentric cam and to provide a slide adjustable along the wheel bed head and thereafter practically constituting a part of it for supporting the stops used for providing the diminishing of feed at the end of the stroke.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

Fig. 1 is a sectional view through the table of a grinding machine for carrying the work and through the shaft of the grinding wheel to operate thereon, showing the invention as applied thereto;

Fig. 2 is a view, largely diagrammatic, of the same mechanism, showing the course of the liquid for operating the same hydraulically;

Fig. 3 is a view similar to the lower right hand corner of Fig. 2, showing a modification for application to another machine;

Fig. 4 is a plan of the same, as indicated by the arrow 4 in Fig. 3;

Fig. 5 is an end view as indicated by the arrow 5 in Fig. 4, and

Fig. 6 is a diagrammatic view of the same device.

40 The form of the machine to be described first embodies Figs. 1 and 2 and it also includes mechanism shown in Figs. 3, 4, and 5 except that in these figures only one stop is shown so that in describing Figs. 1 and 2, Figs. 3, 4, and 5 will be taken into consideration.

50 The bed 10 of the machine to which this invention is applied carries ways 11 for a reciprocating table 12 on which is a rest 13 to which the work is to be directly clamped in the usual way. The means for reciprocating this table is not shown except that the central cylinder 14 is indicated.

On this bed is mounted a shaft 15 provided with a hand wheel 16 for operating it and gauge 17. On the other end of this shaft 15 is a gear 18 meshing with a gear 19 on a screw shaft 20. The

rotation of the gear 19, which is fixed to the screw shaft 20, rotates that screw shaft and, through a screw threaded nut 21 carried by a slide 22, adjusts the slide back and forth. This adjustment is made before the operation of the machine and is kept, of course, in constant position during that operation. Furthermore, this renders the slide 22 practically a part of the bed 10, as they do not move relatively to each other after the machine is once adjusted.

Movable relatively to these two parts 10 and 22 is a wheel head 23 carrying a shaft 24 on which is supported the grinding wheel 25. This head 23 is provided with a protecting skirt 28 and with a hollow separate top 29. In this top is mounted a shaft 30 parallel to the shaft 20 and having a pair of notches 31 and 32 for a spring pawl 33. On the end of the shaft is a graduated hand wheel 34 by which the shaft can be moved back and forth to bring it into either of the positions in which the spring pawl is held in one or the other of the circumferential notches 31 or 32. By this hand wheel the shaft 30 also can be turned.

In the position shown a bevel gear 35 on the shaft 30 meshes with a bevel gear 36 on a shaft 37 at right angles to the shaft 30 and rotates it by means of the hand wheel. On the end of the shaft 30 is a rod 38 passing through a passage in a lever 39 and adjustably connected therewith by a nut and check nuts 40. This lever 39 is pivoted at 41 on the wheel head 23 and is provided with an arm 42 which projects into a circular groove in a collar 43 on the shaft 37. In this way, when the hand wheel 34 is moved back from the position shown in Fig. 1 to a position in which the spring pawl 33 will enter the groove 32, the bevel gear 35 will drop back out of mesh and the collar 43 is moved down. Fixed to this collar, which is free on the shaft 37, is a pinion 44. This pushes the pinion 44 over into a position in which it can mesh with a reciprocating rack 45, as shown in Fig. 2.

Leaving this rack for the moment, it will be noticed that there is an eccentric or cam 46 on the end of the shaft 37 located between two stops 47 and 48 on the slide 22. Between these stops is a longitudinal depression or perforation 49 for receiving the nut 50 holding the cam 46 in position and also the end of the shaft 37. When it is desired, the hand wheel 34 is turned to bring the high portion of the cam 46 around in the direction of the arrow against the stop 47 to perform the operation of diminishing the feed, as will appear hereinafter. The hand wheel 34 is

drawn back to disconnect the feed and at the same time operate the lever 39 to bring the pinion 44 into the path of the rack 45, the results of which will appear later.

After oil under pressure is introduced into a chamber 54, constituting a cylinder, against the head of a stationary piston 55 fixed to the base 10, oil will be driven through a meter valve 56, which can be adjusted as desired, into a cylinder 57 in which the head of the piston 51 is located. It will be noticed that there is a spring 58 behind the head of the piston 51 which is guided and serves to reset that piston.

The novel features having been described, the operation will be described with reference to Fig. 2 which shows also some features that are in a general way in use at the present time. The pipe line 65 is supplied with oil or other operating liquid from a pump 62 through a relief valve 63 which has a connection 64 to a tank. Therefore, in operating the push button 60 the oil under pressure is sent through this connection from a pipe 65 to a pipe 53, energizing the solenoid operated four-way valve 61, allowing oil to flow into the cylinder 54. This builds up pressure against the stationary piston 55, forcing the wheel head 23 forward until the eccentric or cam 46 which, it will be remembered, is mounted on the wheel head, hits the stop 47 as illustrated.

The pressure then builds up in the cylinder 57 against the end of the piston which carries the rod 51 and the rack 45. This piston is forced back in the direction indicated by the arrow in Fig. 2. The rack being in mesh with the pinion 44 on the shaft 37 turns the cam or eccentric 46 mounted on the same shaft in the direction of the circular arrow in Fig. 2 against the stop 47. This gives the drive a diminishing feed rate at the end of the stroke. The rate of feed is controlled by the metering valve 56. When the rack comes to the end of its stroke it trips the limit switch 59 to energize the other side of the four-way valve 61, thus reversing the direction of the oil through a pipe line 73 and bringing the wheel head to the starting position. At the same time the spring 58 moves the piston rod 51 forward. This resets the eccentric or cam 46.

As there are two stops in the form shown in Fig. 2, this action can occur at both ends of the stroke. Meantime, the pressure is held in the forward cutting direction as the oil by-passes from the cylinder 54 to the cylinder 57, during the diminishing feed period. The relief valve 63 holds the pressure in the line 65 slightly under the high pressure limit.

It will be noted that the hand wheel 34 is pulled out to break the mesh between the bevel gears and at the same time it shifts the gear 44 into mesh with the rack 45 for hydraulic feed. The gear 44 is out of mesh with the rack for hand feed when the gears 35 and 36 are in mesh and the hand feed can take place by the turning of the hand wheel 34. The pressure is maintained between the base 10 and the threaded screw 25 at all times, thereby eliminating back lash. The bearings for this screw are mounted on the base 10. The adjustment of the slide 22 carrying the stops 47 and 48 is to take up wheel wear and also to provide for working of different diameters. The form shown in Figs. 1 and 2 and described above is to secure diminishing feed of a wheel head at the end of a stroke.

In the form shown in Figs. 3 to 6 the corresponding device is designed for the feed of a table. It is hardly necessary to describe the

differences but it will be noted that the feed of the oil is substantially the same and the same reference numerals have been applied to it. In this case the table 70 is shown as moving in the direction of the arrow. The plunger 51 with the rack 45 thereon is operating in connection with the pinion 44 and turning the eccentric or cam 46 against a single stop 71. The pinion 44 is operated by a hand wheel 72 capable of moving into full and dotted line positions in Fig. 4 to bring it into and out of mesh with the rack 45. The operation is substantially the same as in the other case and the same results are secured, it being understood that the slide 22 shown in the other figures is also to be applied to this in the same way and with the same adjustment or in the equivalent thereof.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. In a speed diminishing device, the combination with a member to be reciprocated, of hydraulic means for moving said member, means for supplying said means with a motive liquid under pressure, a cylinder movable exactly with said member, a single acting piston movable in said cylinder and having a rod projecting therefrom, means for supplying said cylinder with a motive liquid under a measured pressure to move its piston backwardly with respect to the direction of motion of said member near the end of the stroke thereof, and means operated by said piston rod and cooperating with said member for reducing the speed of said member toward the end of its stroke.

2. In a device for diminishing the speed of feed at the end of a stroke, the combination with a machine for grinding or cutting, of a liquid pressure line, a cylinder and piston therein, means for introducing liquid under pressure from said line into said cylinder, said piston being fixed in stationary position and said cylinder being movable to produce the stroke, a second cylinder movable with the first cylinder, a second piston in the second cylinder movable relatively thereto, means for delivering liquid under pressure to the second cylinder to build up a pressure in the second cylinder to move the second piston, a shaft, a cam fixed to said shaft, means for transmitting the straight line motion of the second piston to the shaft and cam as a turning motion, and means whereby, near the end of the stroke, the speed of the stroke will be diminished.

3. In a device for diminishing the speed of feed at the end of a stroke, the combination with a machine for grinding or cutting, of a liquid pressure line, a cylinder and piston therein, means for introducing the liquid under pressure from said line into said cylinder, said piston being fixed in stationary position and said cylinder being movable to produce the stroke, a second cylinder movable with the first cylinder, a second piston in the second cylinder but movable relatively thereto, a metering valve in said line for delivering liquid under pressure to the second cylinder to build up a low pressure in the second cylinder to move the second piston, a shaft, an eccentric or cam fixed to said shaft, means for transmitting the straight line motion of the second piston to the shaft and cam as a turning motion, and a stop fixed with respect to said pistons, whereby near the end of the stroke, the eccentric cam can engage the stop and diminish the speed of the stroke.

4. In a device for diminishing the feed at the end of a fast hydraulic stroke, the combination with a machine for grinding or cutting, of a liquid pressure line, a member to be reciprocated, two cylinders carried by said member, a stationary single acting piston in the first cylinder against which a pressure can be built up to move said member, means for introducing pressure from said line into the first cylinder to move said member, means for introducing liquid under controlled reduced pressure from said line into the second cylinder, a single acting piston in the second cylinder adapted to be moved by the built-up pressure in its cylinder at the end of the stroke, and means operated by the second piston for diminishing the speed of the stroke of said member near the end of the stroke.

5. In a speed diminishing device, the combination with a member to be reciprocated, of hydraulic means for moving said member, means for supplying said means with a motive liquid under pressure, a cylinder movable exactly with said member, a single acting piston movable in said cylinder and having a rod projecting therefrom, means for supplying said cylinder with a motive liquid under a measured pressure to move its piston backwardly with respect to the direction of motion of said member near the end of the stroke thereof, said piston having a rod projecting from said member having a rack thereon, a transverse shaft, a pinion on said shaft adapted to mesh with said rack, whereby the shaft will be turned, a cam or eccentric fixed on said shaft, and a stop fixed with respect to said member, whereby the turning of the cam against the stop will slow down the speed of the stroke.

6. In a speed diminishing device, the combination with a member to be reciprocated, of hydraulic means for moving said member, means for supplying said means with a motive liquid under pressure, a cylinder movable exactly with said member, a single acting piston movable in said cylinder and having a rod projecting therefrom, means for supplying said cylinder with a motive liquid under a measured pressure to move its piston backwardly with respect to the direction of motion of said member near the end of the stroke thereof, said piston having a rod projecting from said member having a rack thereon, a transverse shaft, a pinion on said shaft adapted to mesh with said rack, whereby the shaft will be turned, a cam or eccentric fixed on said shaft, a stop fixed with respect to said member, whereby the turning of the cam against the stop will slow down the speed of the stroke, a limit switch in position to be engaged and closed by the rod at the end of the stroke of the piston rod, and means controlled by the limit switch for reversing the flow of pressure liquid in the liquid pressure line.

7. In a device for diminishing the speed of a stroke near the end thereof, the combination with a member to be reciprocated and hydraulic means for reciprocating it, of a cylinder mounted on and movable with said member, a single acting piston in said cylinder, a piston rod fixed to said piston and projecting beyond said member, whereby said piston rod can move independently of said member, a spring in said cylinder under the piston for restoring the piston to normal po-

sition after it has been operated, a rack on the piston rod, a transverse shaft having a pinion movable therealong to mesh with the rack or miss it, a cam or eccentric fixed on said shaft, a stop carried by said member against which the cam can be moved, a bevel gear on said shaft, a second shaft, a bevel gear on the second shaft adapted to mesh with the first named bevel gear, means for moving the second shaft longitudinally to bring the bevel gears out of mesh, and means whereby, when the second shaft is so moved, the pinion will thereby be moved into mesh with the rack.

8. In a device for diminishing the speed of a stroke near the end thereof, the combination with a member to be reciprocated and hydraulic means for reciprocating it, of a piston and piston rod, a rack on the piston rod, a transverse shaft having a pinion movable therealong to mesh with the rack or miss it, a cam or eccentric fixed on said shaft, a stop carried by said member against which the cam can be moved, a bevel gear on said shaft, a second shaft, a bevel gear on the second shaft adapted to mesh with the first-named bevel gear, means for moving the second shaft longitudinally to bring the bevel gears out of mesh, means whereby, when the second shaft is so moved, the pinion will thereby be moved into mesh with the rack, and a hand wheel on the second shaft, whereby, in one position of the second shaft, the cam can be turned by hand through the hand wheel and, in the other position of the shaft, the cam will be turned by power.

9. In a device for diminishing the speed of a stroke near the end thereof, the combination with a member to be reciprocated and hydraulic means for reciprocating it, of a cylinder carried by said member, a piston in the cylinder carrying a piston rod, a rack on the piston rod, a transverse shaft having a pinion movable therealong to mesh with the rack or miss it, a cam or eccentric fixed on said shaft, stops carried by said member against which the cam can be moved, a bevel gear on said shaft, a second shaft, a bevel gear on the second shaft adapted to mesh with the first-named bevel gear, means for moving the second shaft longitudinally to bring the bevel gears out of mesh, means whereby, when the second shaft is so moved, the pinion will thereby be moved into mesh with the rack, and means for adjustably holding the stops relatively to said member and to then fix them thereto in such a way as to eliminate backlash.

10. In a device for diminishing the speed of a stroke near the end thereof, the combination with a member to be reciprocated and hydraulic means for reciprocating it, a transverse shaft having a pinion movable therealong, a cam or eccentric fixed on said shaft, a stop carried by said member against which the cam can be moved, a bevel gear on said shaft, a second shaft, a bevel gear on the second shaft adapted to mesh with the first-named bevel gear, means for moving the second shaft longitudinally to bring the bevel gears out of mesh, and a hand wheel on the second shaft, whereby, in one position of the second shaft, the cam can be turned by hand through the hand wheel and, in the other position of the shaft, the cam will be turned by power.

ELPHEGE D. LA FLEUR.