

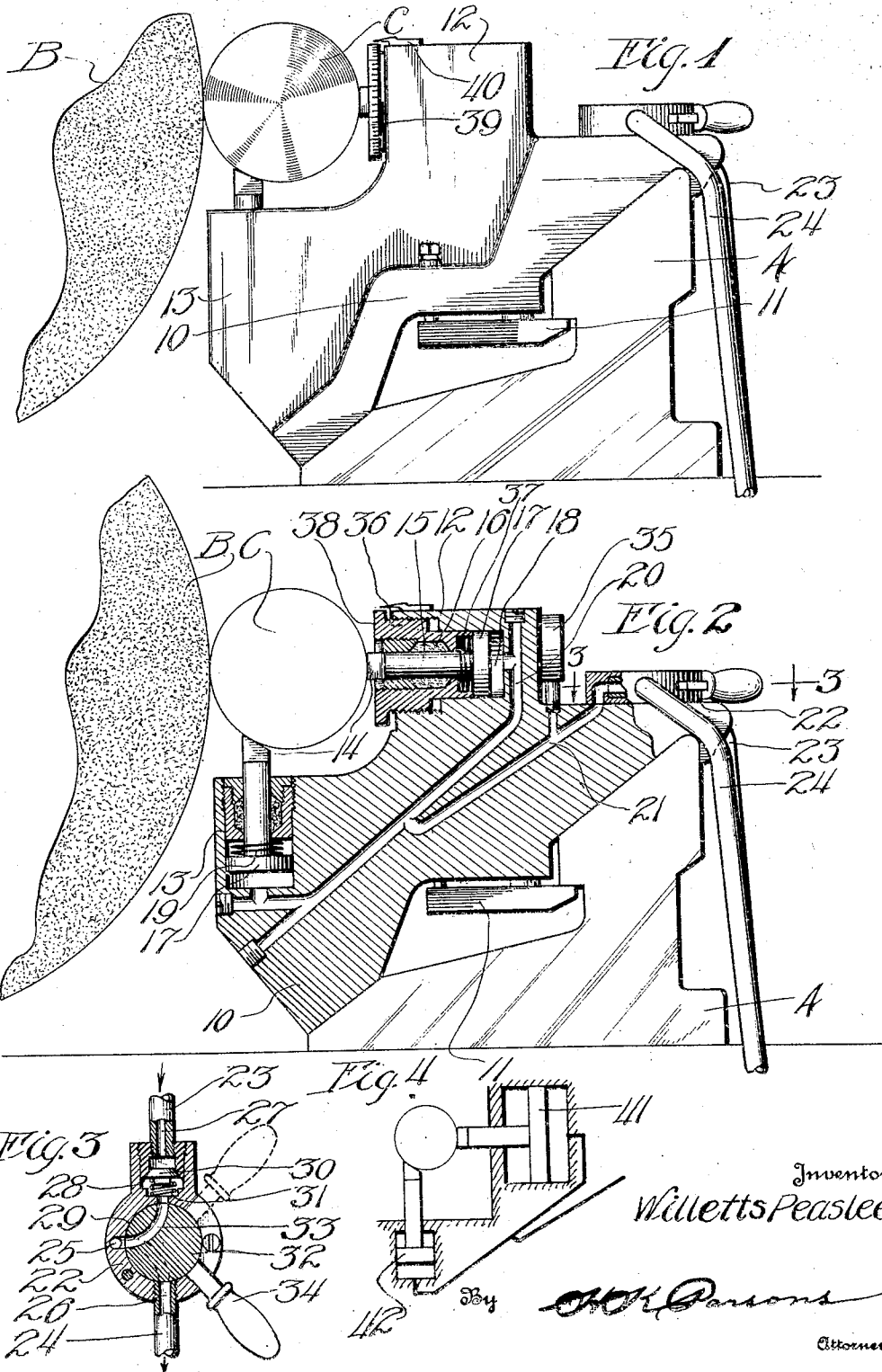
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STEADY REST MECHANISM

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STEADY REST MECHANISM

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This invention relates to improvements in steady rest mechanism for grinding machines and has for its object the provision of a novel and improved mechanism of this character for producing a continuous even supporting pressure against a work piece at a point or points remote from the engagement of the grinding wheel therewith.

A further object of the present invention is the provision of improved work steadying mechanism for use in connection with a grinding machine which shall satisfactorily engage and steady a work piece with a balanced pressure at a plurality of points, so that distortion of the work piece due to unequal pressures may be avoided.

Another object of the invention is the provision of an improved mechanism of the fluid pressure type, in which yielding of the work engaging members due to pressure fluctuations will be automatically prevented.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification taken in connection with the accompanying drawing, and it will be understood that I may make any modifications in the specific structural details hereinafter disclosed within the scope of the appended claims, without departing from or exceeding the spirit of the invention.

Figure 1 is a fragmentary side elevation of the mechanism in use.

Figure 2 is a vertical sectional view thereof, and,

Figure 3 is a horizontal section of the control valve mechanism taken as on the line 3-3 of Figure 2.

Figure 4 is a semi-diagrammatic sectional view showing a variation in size of the two piston members.

In the drawing the letter A designates the customary work supporting table of a grinding machine and the letter B the grinding wheel disposed in opposition to said table. These parts may be of any conventional construction, the work C being carried by the table as between head and footstocks in the usual manner.

Supported by the table is the block 10 of my improved steady rest having the clamp

or clamps 11 for attachment thereof. Said member has the upwardly extending portion 12 and the second horizontal portion 13. Each of these portions provide a support for one of the work steadying shoes 14. These shoes are carried by the inward termini of the plungers 15 which extend through the stuffing boxes 16 and have on their outer ends the piston portions 17 riding in chambers or cylinders 18. Springs 19 serve to outwardly urge the pistons and therefore to shift the shoes 14 into retracted position.

To press the shoes inward toward the work piece C against the pressure of the springs, the block 10 is formed with the conduits or passages 20 and 21, the latter leading to the control valve casing 22. Passage 20 has branches communicating with the rear ends of the two cylinders 18 for introduction of suitable actuating pressure thereinto. This pressure may be either oil, compressed air or other suitable actuating fluid, which is led to valve casing 22 through inlet pipe or tube 23 and exhausts therefrom through pipe 24. These may be either rigid pipes or flexible connections, depending on whether the steady rest is employed in connection with a reciprocating table or a plunge cut type of grinder.

The valve casing 22 includes the passage 25, communicating with passage 21 of the block, the outlet port 26, inlet port 27, inlet valve chamber 28 and the control valve chamber 29. Disposed in valve chamber 28 is a poppet or like valve 30 actuated into closed position as by spring 31. This valve when in closed position prevents reverse flow of the actuating fluid, so that pressure when entering the main valve and distributing pipes will be retained thereby and prevented from escape into the supply line as upon variations of pressure or the like, so that when pressure once introduced will be maintained until suitably released. Disposed within the main valve chamber 29 is rotary valve 32, having a passage 33 selectively adapted to connect inlet 23 with port 25 or port 25 with exhaust or outlet 26. The position of this valve may be manually controlled by attached handle 34.

It will be understood that in grinding of cylindrical work pieces a suitable feeding

action is secured between work and grinding wheel, tending to remove stock from the work piece. At the same time the feed pressure tends to laterally displace the work or spring same with respect to the grinding wheel, particularly in the case of long or slender work pieces. Also, the downward thrust of the grinding wheel produces a cut pressure on the work which may tend to spring same somewhat downwardly. Steady rests are therefore desirable to prevent this springing or distortion of the work, in order that the same may be ground to an accuracy determined in fractional thousandths of an inch. Inasmuch as the diameter of the work decreases during the grinding, it has in the past been customary to frictionally continuously set up the steady rests employed by hand to provide support for the work, a delicate operation to prevent undue pressure and equal adjustment of these work supporting members. As contrasted with this, in the use of the present invention, as the work has been placed in position and ready for grinding, the valve 32 is shifted as indicated in Figure 3, allowing actuating pressure to flow inward from tube 23 through the valve and into the pressure chambers 18, equally inwardly actuating the work engaging shoes with a pressure which may be determined as by gauge 35. When this pressure has been secured, if the desired pressure is less than the total available pressure in the actuating line, the valve may be shifted to an intermediate position, shutting off further ingress and at the same time preventing escape of the pressure within the system. If, however, the pressure is substantially up to maximum, the valve is left in open position, but the control valve 30 prevents escape of pressure in the event that there may be fluctuations in the line, due to other use of pressure from the common system or the like. By suitable manipulation therefore of the control valve as guided by gauge 35, the contact shoes may be readily maintained with an equal and constant pressure against the work, which pressure may be maintained from the initiation of the grinding until the work has been completed, irrespective of the amount of stock removed and therefore variation from initial position of the work steadying members. Also, with the mechanism illustrated it will be seen that the pressure of the two steady rest members will be equal, although it will be understood that if a variable balanced ratio between the members were desired it can be effected by varying the diameter of the pistons and their containing chambers.

When the grinding has been completed the control handle 34 is shifted to the position shown on dotted lines in Figure 3, connecting port 25 with outlet 24 when the pressure is released and the springs 19 serve to retract the steady rests to their most rearward posi-

tion. The combined spring and manual control has the further advantage that by a partial release of pressure and the reshifting of the control valve to intermediate position the steady rests may be allowed to move back a slight amount only, while similarly by a slow shifting of the control valve letting in a gradual amount of pressure in opposition to the force of springs 19, an easing in of the steady rests until they engage the work will be effected.

To variably limit the movement of the contact shoe 14 in the direction of the work piece C, use may be made of the bushing 36 having threaded engagement with the portion 12 of the main frame and having at its inner end a flange 37 adapted to contact with piston 17. The outer portion of the bushing 36 is provided with a peripheral flange 38 bearing the graduations 39 for cooperation with pointer 40 on the member 12.

It will be noted that the stuffing box 16 is carried by the bushing 36 sealing in plunger 15, while the interfitting of the inner portion of the bushing with member 12 and the interlocking of the threads of the outer part thereof serve as a sufficient seal for the forward end of the pressure chamber.

It will thus be seen that the bushing may be readily adjusted in and out as desired to limit exactly the ultimate inward movement of plunger 15 and its contact shoe 14 and thus to control the final size of the finished work piece.

Mention has previously been made of the fact that variation in the piston size will vary the relative pressures of the two plungers against the work piece. This is illustrated in Figure 4 in which use is made of the large piston 41 on the horizontal plunger to augment the pressure of the work toward the grinding wheel for stock removal, while a smaller piston 42 is employed to resist the downward springing of the work, these two pistons being so designed that proper effective pressure for maintaining the work piece in a balanced position will be applied thereagainst.

I claim:—

1. A steady rest mechanism of the character described, including a supporting block, pressure cylinders within the block, pistons movable in the cylinders and having projecting work engaging shoes, means for jointly introducing pressure into the cylinders, and automatic means preventing reverse flow of introduced pressure.

2. A steady rest mechanism of the character described, including a supporting block, pressure cylinders within the block, pistons movable in the cylinders and having projecting work engaging shoes, means for jointly introducing pressure into the cylinders, automatic means preventing reverse flow of introduced pressure, and additional

means for manually controlling the introduction and relief of pressure from the cylinders.

3. A steady rest mechanism of the character described, including a supporting block, pressure cylinders within the block, pistons movable in the cylinders and having projecting work engaging shoes, means for jointly introducing pressure into the cylinders, automatic means preventing reverse flow of introduced pressure, additional cooperating means carried by the adjusting means and supporting block for manually controlling the introduction and relief of pressure from the cylinders, and independent resilient means for reversely actuating the pistons on relief of pressure thereagainst.

4. A steady rest mechanism for grinding machines, including a supporting block, pressure cylinders within the block of different diameters, pistons in the cylinders, a joint pressure supply line for said cylinders, and work contacting members carried by the pistons and movable into engagement with the work, the piston areas being related to counteract the particular grinding wheel forces operating against the respective work contacting members.

5. A hydraulic steady rest mechanism for a cylindrical grinder including a main block having angularly related pressure cylinders formed therein, pistons slidable within the cylinders and having projecting portions terminating in work engaging shoes for engagement with peripherally spaced portions of the work to take up the cut pressure and feed pressure of the grinding wheel, a pressure supply line for the cylinders, means controlling the admission of pressure to the cylinders, means for indicating the amount of pressure so introduced whereby undue urge of the contact shoes may be prevented and means for automatically preventing decrease of pressure in the chambers.

6. In a pressure steady rest mechanism, a cylinder block, a cylinder, a piston operative therein, a steady rest shoe operatively associated with said piston and shiftable thereby, a guide sleeve for said piston interfitting with the cylinder and having a limiting abutment, and an exterior threaded portion on the sleeve adjustable in the cylinder block for variably limiting the movement of the piston.

7. In a steady rest mechanism the combination of a support, a cylinder formed therein, a piston in the cylinder, hydraulic pressure for actuating the piston through the cylinder in one direction, a rod extending from the piston having formed at its free end a contact shoe, a sleeve threaded into one end of the cylinder and surrounding the piston rod, the inner end of the sleeve being adapted to contact with the piston to limit

its movement under influence of the hydraulic pressure, and means for variably adjusting the sleeve relative to the cylinder to variably limit the movement of the piston in the cylinder.

8. In a steady rest mechanism the combination of a support, a cylinder formed therein, a piston in the cylinder, hydraulic pressure for actuating the piston through the cylinder in one direction, a rod extending from the piston having formed at its free end a contact shoe, a sleeve threaded into one end of the cylinder and surrounding the piston rod, the inner end of the sleeve being adapted to contact with the piston to limit its movement under influence of the hydraulic pressure, means for variably adjusting the sleeve relative to the cylinder to variably limit the movement of the piston in the cylinder, means including suitable packing and packing gland carried by the sleeve surrounding the piston rod to prevent escape of hydraulic pressure from the cylinder around the said piston rod, and means carried by the sleeve and support cooperating with one another for indicating the adjustment of the sleeve and cylinder.

9. In a steady rest mechanism the combination of a support, a cylinder formed therein, a piston in the cylinder, hydraulic pressure for actuating the piston through the cylinder in one direction, a rod extending from the piston having formed at its free end a contact shoe, a sleeve threaded into one end of the cylinder and surrounding the piston rod, the inner end of the sleeve being adapted to contact with the piston to limit its movement under influence of the hydraulic pressure, means for variably adjusting the sleeve relative to the cylinder to variably limit the movement of the piston in the cylinder, means including suitable packing and packing gland carried by the sleeve surrounding the piston rod to prevent escape of hydraulic pressure from the cylinder around the said piston rod, and means carried by the sleeve and support cooperating with one another for indicating the adjustment of the sleeve and cylinder, said means comprising an enlarged flange on the outer end of the sleeve having formed thereon graduation marks, and a pointer carried by the support overlying the said flange and graduation marks.

10. In a steady rest mechanism the combination of a support, a cylinder formed therein, a piston in the cylinder, hydraulic pressure for actuating the piston through the cylinder in one direction, a rod extending from the piston having formed at its free end a contact shoe, a sleeve threaded into one end of the cylinder and surrounding the piston rod, the inner end of the sleeve being adapted to contact with the piston to limit its movement under influence of the

hydraulic pressure, and means for variably adjusting the sleeve relative to the cylinder to variably limit the movement of the piston in the cylinder, the inner end of the sleeve additionally having formed therein a counterbored seat, and a spring surrounding the piston rod having one end contacting the seat and the other end contacting the piston to effect a shifting of the piston in the other direction.

11. In a steady rest mechanism the combination of a support, a pair of cylinders each of a different diameter formed in said support, a piston fitted in each cylinder, a work contact shoe associated with each piston, one of said shoes contacting with the work at a point between the center thereof and the point of contact with the grinding wheel to take the cut thrust on the work and the other of said shoes contacting with the work at a point in opposition to the infeed thrust of the grinding wheel, and means for exerting a different constant unit pressure on each of the pistons to thereby exert a different pressure through the contact shoes on the work during grinding.

12. In a steady rest mechanism the combination of a support, a pair of cylinders each of a different diameter formed in said support, a piston fitted in each cylinder, a work contact shoe associated with each piston, one of said shoes contacting with the work at a point between the center thereof and the point of contact with the grinding wheel to take the cut thrust on the work and the other of said shoes contacting with the work at a point in opposition to the infeed thrust of the grinding wheel, means for exerting a constant unit pressure on each of the pistons to thereby exert a different pressure through the contact shoes on the work during grinding, and means limiting the movement of the shoe in opposition to the infeed thrust of the grinding wheel.

In testimony whereof I affix my signature.
WILLETTS PEASLEE.

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