E. E. SLICK.

SHEARING MACHINE.

APPLICATION FILED SEPT. 18, 1919.

1,334,718.

Patented Mar. 23, 1920.

Fig. 1.

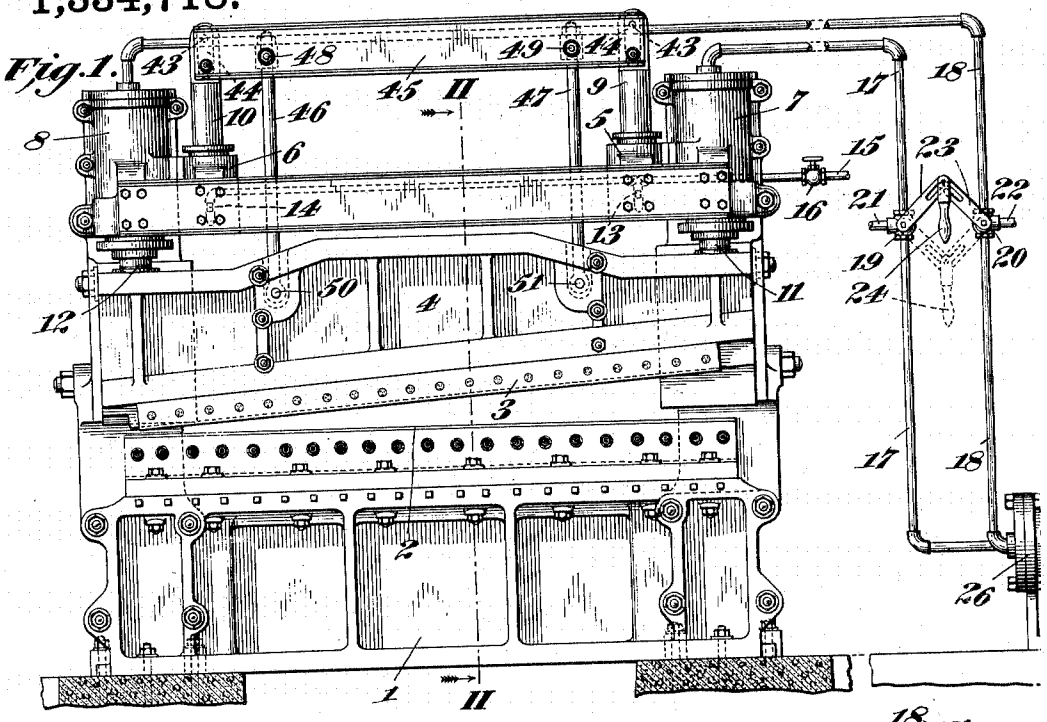


Fig. 2.

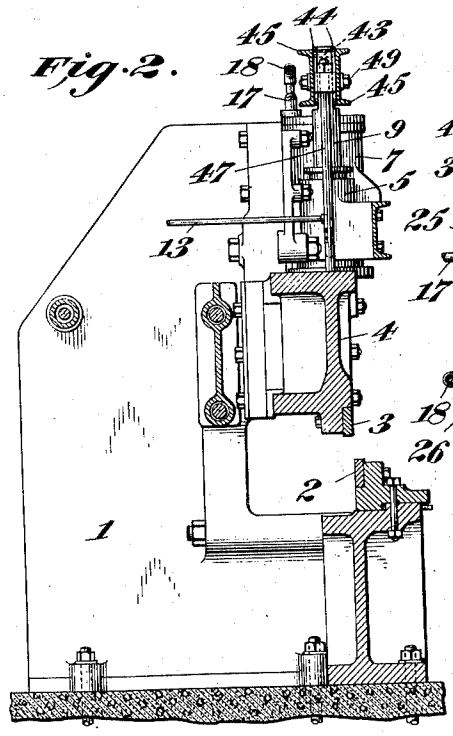


Fig. 4.

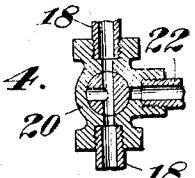
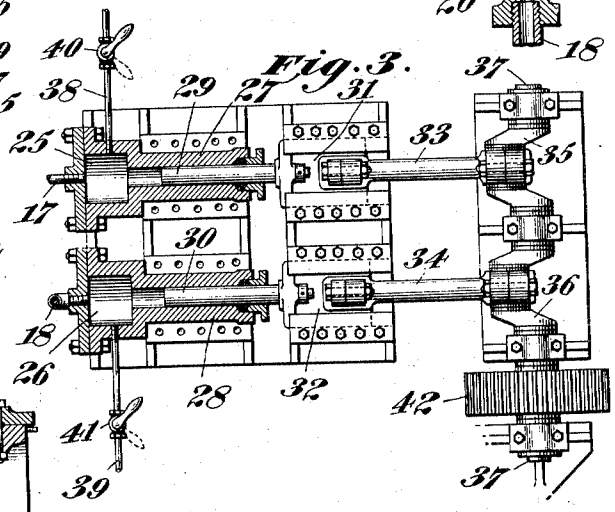


Fig. 3.



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SHEARING-MACHINE.

1,334,718. Specification of Letters Patent. Patented Mar. 23, 1920.

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To all whom it may concern:

Be it known that I, EDWIN E. SLICK, a citizen of the United States, and a resident of the borough of Westmont, county of Cambria, and State of Pennsylvania, whose post-office address is Johnstown, Pennsylvania, have invented certain new and useful Improvements in Shearing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a shearing machine or similar apparatus operated by fluid pressure. One of the objects of my invention is to provide an apparatus which is actuated by two or more cylinders so as to distribute the pressures equally on the working head and at the same time maintain the moving parts in alinement to produce a parallel or predetermined motion thereof. In order to operate this apparatus for very heavy duty, such as shearing metal plates, blooms, billets, beams, large bars, etc., and to minimize the size of the parts, I make the actuating cylinders and plungers of comparatively small diameters, but work them under very high fluid pressures, and I prefer to intensify the fluid pressure by reciprocating pressure plungers of smaller diameters than the actuating plungers, said pressure plungers being driven from a crank shaft, actuated by an electric motor or other suitable source of power.

In order that the moving head of the machine may maintain its parallelism during its motion, I provide a separate source of fluid pressure supply to each actuating cylinder from a separate pressure plunger and each of the actuating cylinders and plungers are of the same sizes. All of the pressure plungers are of the same diameter and stroke, although preferably smaller in diameter than the actuating plungers, so that in a given time the same amount of fluid under pressure is supplied to each actuating cylinder, and the part to which each is connected therefore moves to the same extent in a given time.

Although I have illustrated my invention in connection with a plate shearing machine, I wish it understood that it is equally applicable to any other form of shear for cutting beams, blooms, billets, bars, rounds or any other sizes or shapes whatsoever.

Having thus given a general description of my invention, I will now, in order to make the matter more clear, refer to the annexed sheet of drawings, which forms part of this specification and in which like characters refer to like parts.

Figure 1 is a front elevation of my improved shearing machine; Fig. 2 is a vertical transverse sectional elevation taken on the line II—II of Fig. 1; Fig. 3 is a top plan view of the pressure plungers and driving shaft with the pressure cylinders shown in section; and Fig. 4 is a detail section of a three-way valve.

Referring now to the characters of reference on the drawing:—1 is the frame or body of the shears in general, 2 is the lower or fixed shear blade, 3 is the upper or movable shear blade, provided with suitable guides, 4 is the movable head or upper knife holder, 5 and 6 are the pull-back cylinders, which are adapted to be connected to any suitable source of fluid under pressure, preferably the general pressure supply, 7 and 8 are the actuating cylinders of my shearing machine, 9 and 10 are the plungers of the pull-back cylinders, 11 and 12 are the plungers of the actuating cylinders, 13 and 14 are fluid pressure supply pipes leading to the pull-back cylinders, which are supplied from ordinary source of fluid under pressure of sufficient intensity to lift the parts attached to the pull-back plungers. 15 is the main fluid supply pipe connected with the fluid supply pipes 13 and 14, 16 is a regulating or shut-off valve on the fluid pressure pipe 15, 17 is the fluid pressure supply pipe for actuating cylinder 7, 18 is the fluid pressure supply pipe for the actuating cylinder 8, 19 is the regulating and operating valve on the pipe 17, 20 is a similar valve on the pipe 18, 21 is the discharge or exhaust pipe leading from the valve 19, 22 is the discharge or exhaust pipe leading from the valve 20, 23 are links extending from the valve stems of the valves 19 and 20, which are connected by the handle 24 in such a way that the movement of the handle in either direction operates both valves in a similar manner to supply water under pressure to the actuating cylinders or discharge the same therefrom; 25 and 26 are the pressure plunger cylinder casings, 27 and

28 are the pressure plunger cylinders, 29 and 30 are the pressure plungers, which, as shown, are of comparatively small diameter, 31 and 32 are sliding cross-heads adapted to maintain the pressure plungers in alinement, 33 and 34 are connecting rods or pitmen which connect the pressure plungers with the cranks 35 and 36 of the crank shaft 37, on which is mounted the gear 42, adapted to be driven by an electric motor or any other suitable source of power, not shown; 38 and 39 are pipes adapted to supply additional fluid to the system to allow for waste or leakage from any part of the apparatus, 40 and 41 are regulating or controlling valves for opening or closing said pipes, these pipes 38 and 39 being connected to any usual source of fluid pressure supply. The pull-back plungers 9 and 10 are provided with pivots 43 at their upper portion on which are mounted the links 44, the lower ends of which in turn are pivoted to the equalizing or pull-back beam 45, as shown. Secured to the pull-back beam 45 are the pull-back rods 46 and 47, the upper ends of these rods being pivotally secured to the pull-back beam by the bolts 48 and 49 and their lower ends are pivotally secured to the movable head or upper knife holder by means of the bolts 50 and 51. The lower ends of the actuating plungers 11 and 12 may be provided with rounded or spherical surfaces which abut against the upper surfaces near the ends of the knife holder 4 and are adapted to contact therewith and move it downwardly in parallelism, when fluid under pressure is admitted to the actuating cylinders 7 and 8. When fluid under pressure is discharged from the pressure cylinders 7 and 8, the movable jaw or knife holder 4 is automatically withdrawn upwardly by means of the constant but lower unit pressure in the pull-back cylinders 5 and 6, which operates to move the pull-back plungers 9 and 10 upwardly thereby moving the pull-back beam 45 in the same direction, and as the movable head 4 is connected to the pull-back beam by means of the rods 46 and 47, it also moves upwardly, ready for another operation.

The operation of my apparatus in general is as follows:—The shears being in the position shown in Fig. 1, the piece to be sheared is introduced between the lower blade 2 and the upper shear blade 3; the pressure plungers 29 and 30 meanwhile being reciprocated by means of the cranks 35 and 36 and connections. Prior to this a supply of pressure fluid, water, oil or other material, has been admitted to the system and fills the spaces within the pressure cylinders, connecting pipes and the actuating cylinders. Other fluid under less pressure is also connected by means of separate pipes to the actuating cylinders 7 and 8. The pressure plungers 29 and 30 are of much less diameter than the actuating plungers 11 and 12 and are so proportioned that one stroke of the pressure plunger is adapted to move each actuating plunger downwardly to a much less, but sufficient extent, although with very much greater total pressure. By this means the shear blades are forced past each other, thereby shearing anything that may be between them. After the actuating plungers have moved downwardly, the continuation of the reciprocating strokes of the pressure plungers in a backward direction relieves the pressure in the actuating cylinders in such a way that the lower pressures on the pull-back plungers move the upper head and attached shear blade upwardly, ready for another stroke. These strokes may be continued at intervals predetermined by the revolution of the cranks 36 and 37, or if the operator so desires, he may close the valves 19 and 20, whereupon the upper shear blade becomes stationary to permit the delicate adjustment of a piece to be sheared. The shear therefore may be operated by continuous reciprocations or at intervals, as desired.

One of the particular features of the apparatus is the fact that each actuating plunger is provided with a separate pressure plunger, so proportioned that each actuating cylinder is supplied with the same amount of fluid under the same pressure for each stroke, so that each part of the shear blade moves forward to and into its work the same amount at the same time. This obviates the necessity for extra long and carefully fitted mechanical guides to maintain and regulate the alinement of the shear blade.

It should be noted further that the operation of the apparatus is such that an entire stroke of the small pressure plungers acting regularly and reciprocatingly will cause a continuous repetition of strokes of the actuating plungers with much greater force, owing to their larger diameters, but of less amplitude. It will thus be seen that my apparatus is small, compact and effective and without unnecessary complications, such as intensifiers and other appurtenances which have heretofore been customary with this class of tools.

When steam or hydraulic intensifiers are used, the intensifiers have to be of very large capacity and have to be supplied with steam under high pressure, or with fluid which has previously been worked upon to produce the high pressure therein and during the idle part of the stroke when the shear is not working, all this high pressure steam or high pressure water is partly wasted, as it would only take a very small pressure to move the shear blade downwardly until it meets the resistance of the bar, plate or other shape to be cut.

As compared with this, my apparatus is provided with a small separate pressure cylinder directly connected to each actuating cylinder, and during the part of the downward stroke when the shear knife is not cutting, the power required is small and only dependent upon the frictional resistance of the tool. As soon, however, as the shear knife in its downward stroke meets resistance, the pressure is automatically increased by my pressure cylinders and apparatus, and whether the pressure plungers be driven by a line shaft, or other source of power or from an electric motor, the power that will be supplied is directly determined by the resistance. With an electric motor particularly, the amount of current used is directly proportional to the work done, so that during the portion of the stroke when my shears is not cutting, the amount of current is very small and only when it is cutting is the current consumption larger. With other forms of power mechanism, such as steam intensifiers or hydraulic intensifiers, the largest part of the power is wasted, as the high pressure steam or other fluid has to be supplied in large quantities to fill the actuating cylinders even if these are doing no work. My apparatus supplies high pressure only as such is needed when the shears is cutting and is therefore exceedingly small, compact and at the same time economical.

It should be further noted that my shears may work in a continuous reciprocating manner by operating the pressure cylinders continuously and the valves are so arranged in the pressure supply pipes as to open between the actuating cylinders and the pressure cylinders or close as regards the exhaust when desired. I may also open the exhaust to allow some of the water to escape or I may also supply more water to the pressure cylinders and system by the cocks and pipes arranged for that purpose.

Although I have described and illustrated my invention in considerable detail, I do not wish to be limited to the exact and specific details thereof as shown and described, but may use such modifications in, substitutions for, or equivalents thereof, as are embraced within the scope of my invention, or as pointed out in the claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. A fluid pressure shears provided with a plurality of actuating plungers, separate pressure plungers connected with each actuating plunger, rotating means for simultaneously operating said pressure plungers, whereby each actuating plunger is operatively moved to the same extent, and means for withdrawing the shear blade.

2. A fluid pressure shears provided with a fixed blade and a movable blade, a plurality of actuating plungers adapted to operate the movable blade during its working stroke, a separate pressure plunger adapted to supply fluid under pressure to each actuating plunger, rotating means for simultaneously operating said pressure plungers, and fluid pressure means for automatically returning the movable blade on its idle stroke.

3. A fluid pressure shears provided with a fixed blade and a movable blade, a plurality of actuating cylinders provided with plungers adapted to operate said blade during its working stroke, a separate pressure cylinder and plunger with fluid pressure connections to each of the actuating cylinders aforesaid, rotating means for operating said pressure plungers simultaneously, whereby each of the actuating plungers is moved to the same extent in a given time, and means for moving the movable shear blade on its return stroke.

4. A fluid pressure shears provided with a movable shear blade mounted on a knife holder, a plurality of fluid pressure actuating plungers adapted to actuate said knife holder during its operating stroke, a separate fluid pressure plunger adapted to operate each of the actuated plungers aforesaid, rotating means for simultaneously operating said pressure plungers, fluid pressure connections from said pressure plungers to said actuating plungers, whereby the same amount of fluid under pressure is delivered to each actuating cylinder in a given time, thereby causing a uniform movement of said knife holder, and means for returning said knife holder during its idle stroke.

5. A fluid pressure shears provided with a fixed blade and a movable blade, a plurality of actuating cylinders, each provided with a plunger connected with the movable blade, a separate pressure cylinder provided with a pressure plunger connected to each of the actuating cylinders, and rotary means for simultaneously driving said pressure plungers, whereby an equal amount of pressure fluid is supplied to each actuating cylinder in a given time.

6. A fluid actuated shears comprising a plurality of actuating cylinders and plungers connected with a movable blade, a smaller pressure plunger and cylinder connected to each of the actuating cylinders aforesaid, and rotary means for simultaneously reciprocating said pressure plungers, whereby said actuating plungers automatically reciprocate the movable blade.

7. A fluid actuated shears comprising a movable knife holder, a plurality of actuating plungers adapted to reciprocate said knife holder during its working stroke, a plurality of smaller pressure cylinders and plungers, separate fluid pressure connections between each pressure cylinder and one of the actuating cylinders and rotary means for

simultaneously reciprocating said pressure plungers, whereby the knife holder is uniformly reciprocated.

8. A fluid actuated shears comprising a movable knife holder, a plurality of actuating plungers connected with and adapted to reciprocate said knife holder during its working stroke, a plurality of smaller pressure cylinders and plungers, separate fluid pressure connections between each pressure cylinder and one of the actuating cylinders, rotary means for reciprocating said pressure plungers; and pull-back plungers and connections connected with said knife holder, whereby the knife holder is reciprocated.

9. A fluid pressure shears comprising a movable blade and holder therefor, a plurality of actuating cylinders provided with plungers adapted to reciprocate said blade and holder, a plurality of pressure cylinders and plungers, each provided with separate fluid pressure connections to one of said actuating cylinders, rotary means for reciprocating said pressure plungers, and means for returning said blade and blade holder during its idle stroke.

10. A fluid pressure shears provided with a movable blade and holder, a plurality of fluid actuating cylinders, each provided with a plunger adapted to reciprocate said blade and holder, a separate fluid pressure cylinder and plunger provided with fluid pressure connections to each of said actuating cylinders, rotary means for reciprocating said pressure plungers, whereby each actuating cylinder is supplied with the same amount of pressure fluid in a given time, pull-back cylinders provided with plungers connected to said knife holder and having fluid pressure connections adapted to withdraw said knife and holder during its idle stroke.

11. A fluid pressure shears with a movable blade adapted to be operated by a plurality of actuating plungers mounted in actuating cylinders, a separate pressure cylinder having a reciprocating pressure plunger with fluid pressure connections to and from each of the cylinders aforesaid, said pressure plungers being simultaneously operated from the same crank shaft, and pull-back cylinders provided with plungers connected to said blade and having fluid pressure connections adapted to withdraw said knife during its idle stroke.

In testimony whereof I hereunto affix my signature.

EDWIN E. SLICK.