Oct. 4, 1932. R. T. HAZELTON 1,881,185

HYDRAULIC HOLD-DOWN

Filed Nov. 23, 1929 3 Sheets-Sheet 1

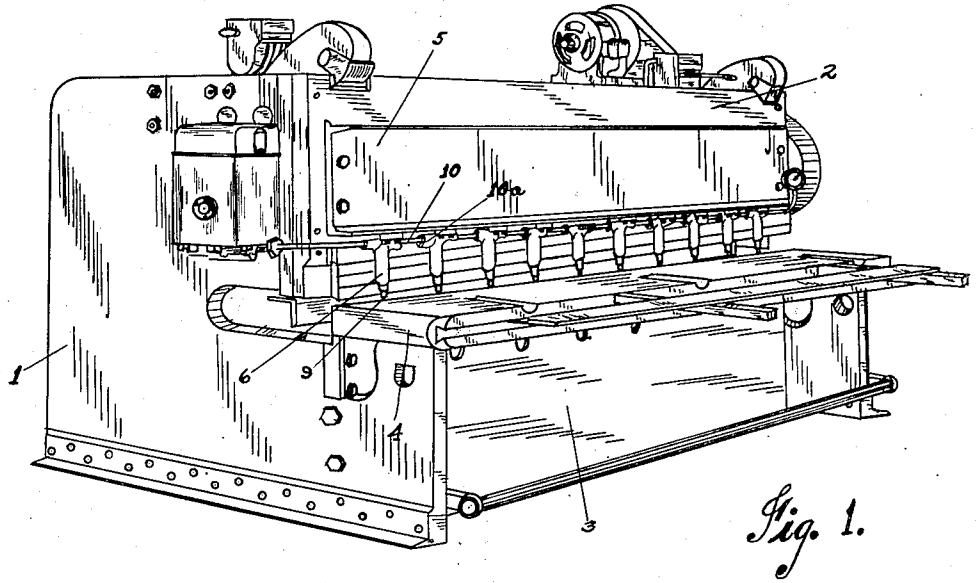


Fig. 1.

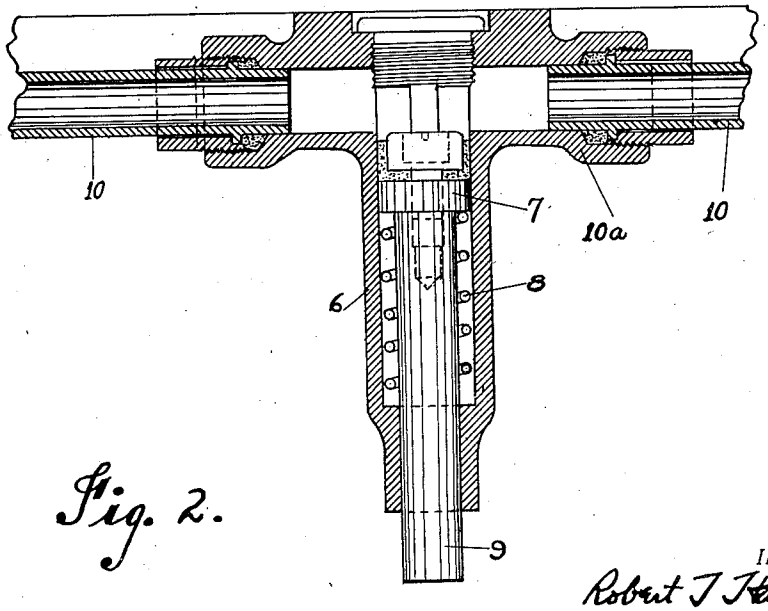


Fig. 2.

INVENTOR.
Robert T. Hazelton

BY
Allen & Allen

ATTORNEYS

Oct. 4, 1932. R. T. HAZELTON 1,881,185

HYDRAULIC HOLD-DOWN

Filed Nov. 23, 1929 3 Sheets-Sheet 2

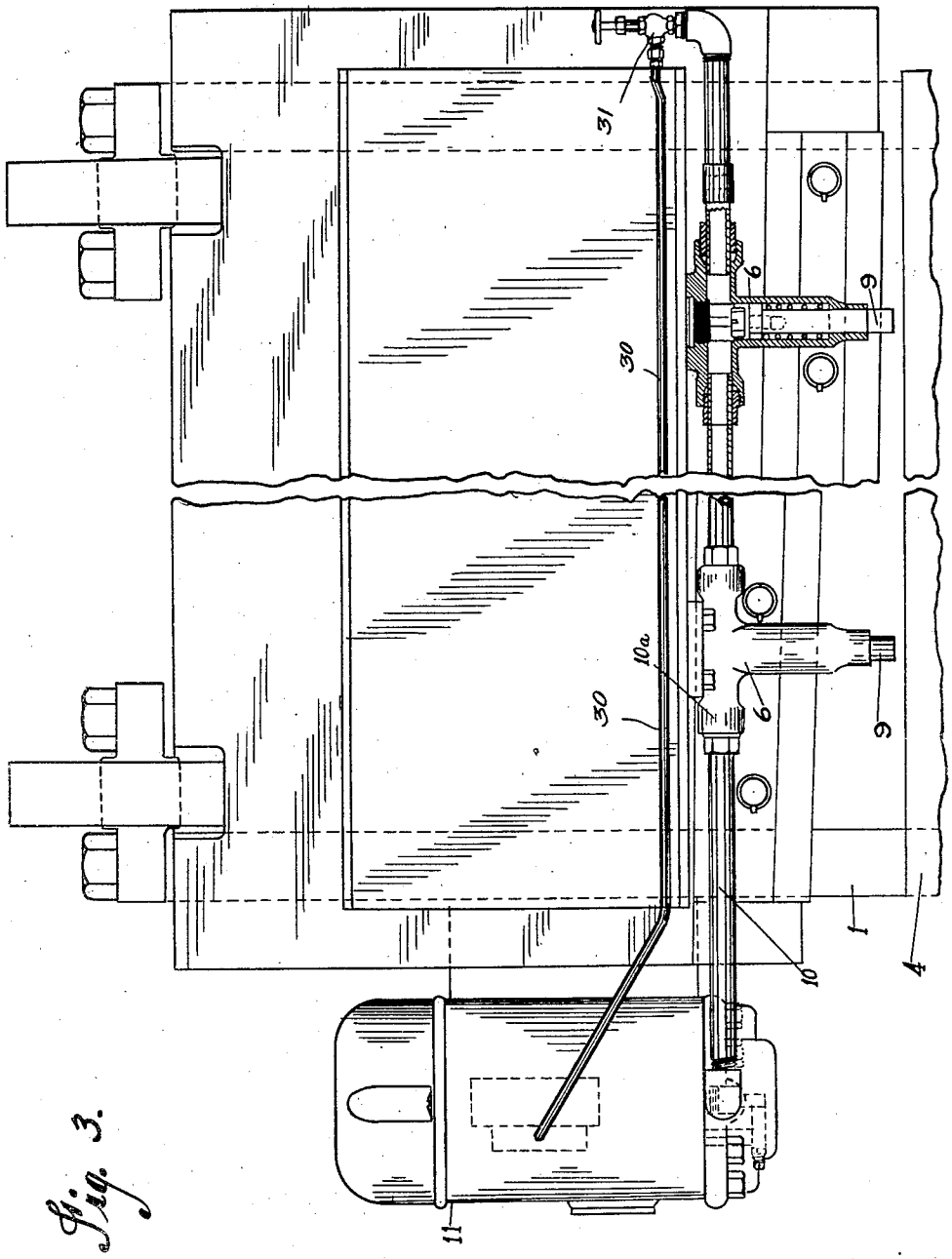


Fig. 3.

INVENTOR.

BY Robert T. Hazelton

Allen Allen

ATTORNEYS

Oct. 4, 1932. R. T. HAZELTON 1,881,185

HYDRAULIC HOLD-DOWN

Filed Nov. 23, 1929 3 Sheets-Sheet 3

Fig. 4

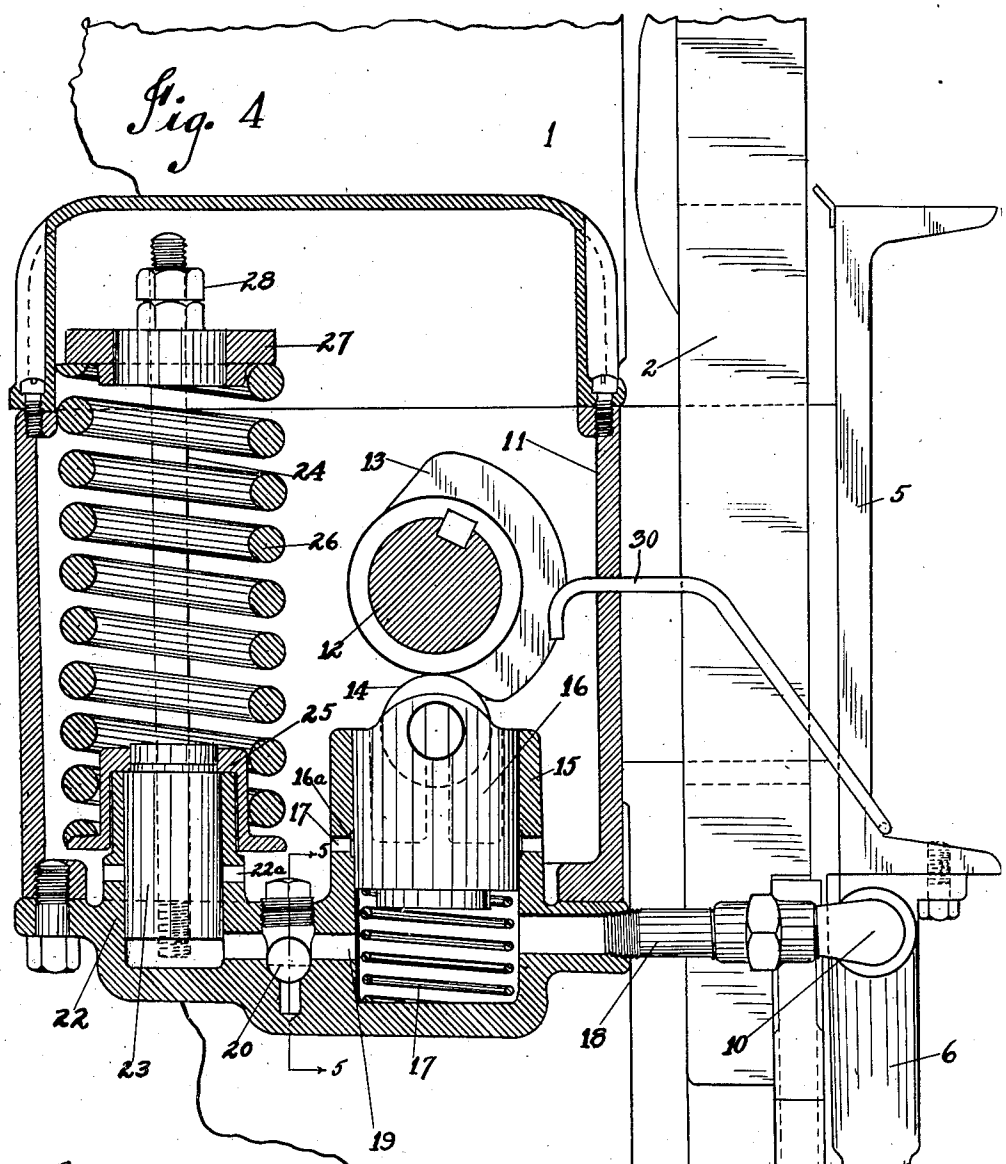
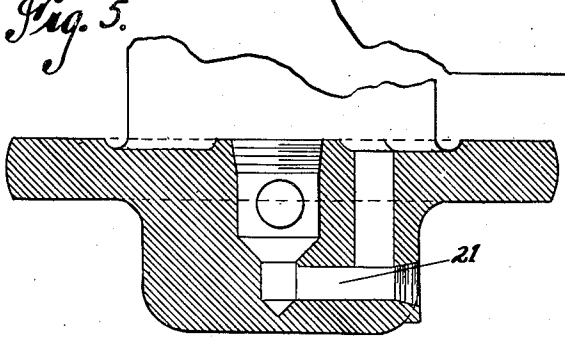


Fig. 5.



INVENTOR.

BY Robert T. Hazelton

Allen & Allen

ATTORNEYS

Patented Oct. 4, 1932 1,881,185

UNITED STATES PATENT OFFICE

ROBERT T. HAZELTON, OF CINCINNATI, OHIO, ASSIGNOR TO THE CINCINNATI SHAPER COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO

HYDRAULIC HOLD-DOWN

Application filed November 23, 1929. Serial No. 409,381.

My invention relates to hold-downs or clamping devices, for use in retaining the work particularly in metal shears, but which will also be useful in other machine tools.

It is my object to provide a clamp for the work in shears and the like which will engage the work at a series of points, and in which the pressure against the work will be substantially uniform in spite of differences in thickness of the work, or in spite of variations in thickness when several kinds of work are being held down simultaneously.

It is my object to so provide that the hydraulic system is operated by suitable master means such as a cam, in a prearranged timed relation to the operation of the tool. I also provide for a spring controlled relief and accumulator for the hydraulic system which is adjustable to control and maintain the desired pressure on the work, and I further so connect the pump which applies the pressure with the accumulator and the housing in which it is located that the said pump will be effective as long as any substantial amount of oil is left in the housing.

The mechanism itself which is employed has novel features in simplicity and foolproofness which will be evident as the description proceeds.

I have illustrated my invention as applied to a wide shears, and will describe in full this one embodiment of my invention, the novelty wherein I will set forth in the appended claims.

In the drawings:

Figure 1 is a perspective view of a shears showing the clamping elements.

Figure 2 is a detail section through one of the clamping elements.

Figure 3 is a detail elevation partly in section of two of the clamping devices and the connections therewith.

Figure 4 is a detail section of the pump and relief chamber.

Figure 5 is a detail section on the line 5—5 of Figure 4.

It being understood that the particular type of shear is not of importance in connection with my invention, I have shown a shear having housings 1, 1, a ram 2, and a bed 3. There is a bed plate 4 extending horizontally from the top of the bed 3, on which the work is supported when being acted upon by the blade of the shear.

A suitable support such as a metal channel 5, is supported from the housings of the machine, on lugs which in this case pass through slots in the ram, although this is not of importance.

This channel serves to support a series of cylinders 6, in which are located the pistons 7, said pistons held normally upward in the cylinders by means of springs 8.

The rods 9 of the pistons are extended through the lower ends of the cylinders, and serve as clamping or hold down elements to engage work located upon the bed plate 4. In the shear it is advisable to have the hold downs or clamping elements close to the cutting line of the shear blades.

The cylinders are connected at their upper ends to a common oil line formed of a pipe 10, together with the fittings 10*a* connected thereto and to the upper ends of the cylinders. This line is kept full of oil, and pressure is applied by means of a pump to the oil to force the pistons to descend in the cylinders whereupon the piston rods will engage and hold down the work on the bed.

At the end of the channel is mounted a closed chamber 11, which serves as an oil reservoir for the pump and in addition contains the pump and relief valve mechanism.

A shaft 12 extends into this chamber, said shaft being driven in synchronism with the shaft which operates the shear ram. On this shaft is a cam 13, which engages a roller 14, mounted on the top of the pump piston.

The pump consists of a cylinder 15, which is part of the pump and relief valve casting, in which cylinder is the piston 16 (normally forced upward by a spring 17, so that the roller on the upper end thereof follows the cam, which actuates the piston. The cylinder 15 has a channel 16*a* on its interior, located above the base of the housing 11, with ports 17 therefrom into the cylinder, so as to supply oil to the walls of the cylinder, and seal the pump against air, as long as the oil level remains above the said ports. Nor-

mally the oil in the chamber will be held at or above the level of the top of the pump cylinder.

The pump cylinder is connected at 18 with the oil line pipe 10, and is also connected through the passage 19 with a check valve 20. This check valve consists of a ball marked 20, which closes a passage 21, said passage communicating with the bottom of the chamber reservoir 11. When the piston in the pump moves upwardly it can withdraw oil from the reservoir, but when the piston moves down the ball serves to check the passage of oil.

The passage 19 connects with the cylinder 22 of the relief and accumulator mechanism which has exhaust ports 22*a* into the main reservoir. In this cylinder is a piston 23. There are two supporting rods 24 in the main chamber. A cap 25 mounted over the cylindrical part 22, serves as a receiver for a spring 26, the said cap engaging the top of the piston. The spring receiver 27 is held in place in the chamber by means of the rods 24 and is held down by nuts 28 threaded on the rods, said nuts being adjustable to control the force of the spring on the piston. Thus when the nuts are turned down the receiver 27 is forced down, thus placing the piston under greater tension.

The vent pipe 30 permits accumulated air together with some oil to seep back from the hold down system to the reservoir. The needle valve 31 controls this air vent.

In the particular machine the timing of the cam which operates the pump piston is such that the clamping or hold down rods come into contact with the work before the shear blade becomes operative on the work.

Normally the reservoir will be filled with oil to at least the top of the pump piston. When the cam is rotated, and the pump piston thrust down, oil is placed under pressure in the several hold down or clamp cylinders, and as in hydraulic systems, there will be equal pressure of oil against the pistons in each of these cylinders irrespective of how far down the piston rods are permitted to go due to the thickness of the work beneath them. The oil under pressure is also present in the accumulator or relief cylinder, and forces the piston therein upwardly against the compression of the spring. Thus the pressure will not be any greater than sufficient to raise the piston in the accumulator enough to open the ports in the accumulator cylinder wall.

Moreover when the pump piston is released by the cam, which will normally be a short period prior to the raising of the shear blade, the accumulator piston is well forced down by the spring supplying, in case of leakage in the clamping mechanism, additional oil under the prevailing pressure to maintain the clamping relation.

Should oil be required to keep the lines full at all times, this will be withdrawn by the pump piston from the main reservoir through the check valve mechanism described.

It will be evident that the arrangement of a hydraulic hold down or clamping mechanism in which a series of elements are used to engage the work, all under common control, is a very useful device in wide metal shears, and that the particular mechanism shown and described will adequately serve the purposes required. Such a mechanism will be of use also in other machines particularly where a wide bed is provided, and on which work of differing thicknesses, and requiring varying pressures is to be employed.

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

1. In a machine tool the combination with a bed of means to hold work down on the bed comprising a series of interspaced hydraulic cylinders with pistons, members operated by the pistons for engaging the work on the bed, and a pump for placing the fluid in said cylinders under pressure, and means operated in timed relation with the machine tool mechanism for operating said pump.

2. In a metal shears, the combination with a bed of means to hold work down on said bed comprising a series of hydraulic hold down members spaced from each other, and common means for placing said hold down means into movement and under pressure, comprising a master cylinder and piston, the system so arranged that movement of the piston in one direction moves the hold down members to work holding position, and movement of the piston in the opposite direction releases said members.

3. In a metal shears, the combination with a bed of means to hold work down on the bed comprising a series of interspaced hydraulic cylinders with pistons, members operated by the pistons for engaging the work on the bed, and a pump for placing the fluid in said cylinders under pressure, comprising a master cylinder and piston, the system so arranged that movement of the piston in one direction moves the hold down members to work holding position, and movement of the piston in the opposite direction releases said members.

4. In a hydraulic hold down mechanism for machine tools the combination with a series of hydraulic clamping members of a device for placing said members under compression comprising a pump, an accumulator connected to said pump and having sufficient power to maintain the maximum required compression on said clamping members.

5. In a machine tool the combination with a bed of means to hold work down on the bed comprising a hydraulic cylinder having a piston, means operated by the piston for

engaging work on the bed, a pump for compressing the fluid in said cylinder and means operated in timed relation with the machine tool mechanism for operating said pump.

6. In a hydraulic hold-down mechanism the combination with a series of hydraulic clamping members, a pump for operating the same having a reciprocating piston arranged so that movement in one direction will apply the clamps and a reverse movement will release the clamps, an accumulator connected to said pump and having a port disclosed when the hydraulic pressure created by the pump reaches the required value.

7. In a machine tool the combination with a bed, of means to hold work down on the bed comprising a series of interspaced hydraulic cylinders with pistons, members operated by the pistons for engaging the work on the bed, a pump for placing fluid in said cylinders under pressure, comprising a piston so arranged as to place said cylinders under pressure to make an application of work engaging members upon the movement of said piston in one direction and to release the said members upon movement of the piston in the opposite direction, means operated in timed relation with the machine tool mechanism for operating said piston, and a relief valve in said system for the purpose described.

8. In a machine tool the combination with a bed, of means to hold work down on the bed comprising a series of interspaced hydraulic cylinders with pistons, members operated by the pistons for engaging the work on the bed, a pump for placing fluid in said cylinders under pressure, comprising a piston so arranged as to place said cylinders under pressure to make an application of work engaging members upon the movement of said piston in one direction and to release the said members upon movement of the piston in the opposite direction, means operated in timed relation with the machine tool mechanism for operating said piston, and a combined accumulator and relief valve in said system.

9. In a machine tool, the combination with a bed, of means to hold work down on said bed comprising a series of hydraulic hold-down members spaced from each other, a pump for placing the fluid in said hydraulic hold-down members under pressure, and means operated in timed relation with the machine tool mechanism for operating said pump.

ROBERT T. HAZELTON.