No. 612,507. Patented Oct. 18, 1898.

M. ROTHE.

HYDRAULIC RIVETING MACHINE.

(Application filed Dec. 15, 1897.)

(No Model.)

Fig. 1.

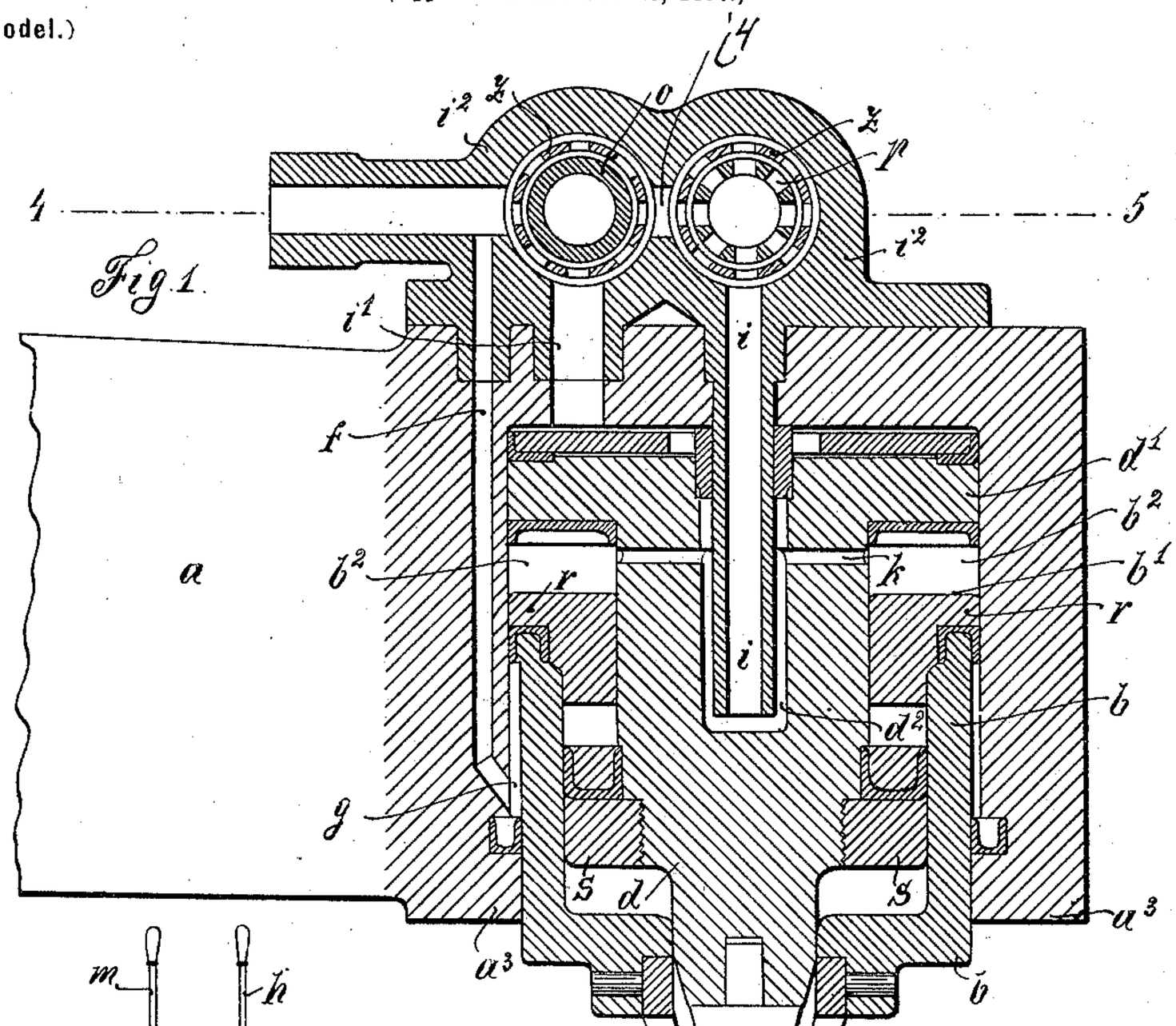


Fig. 3.

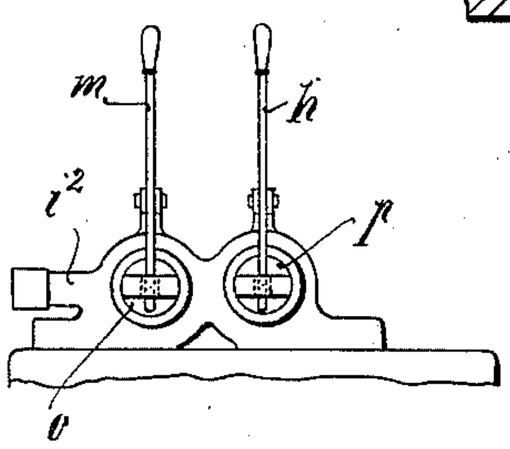
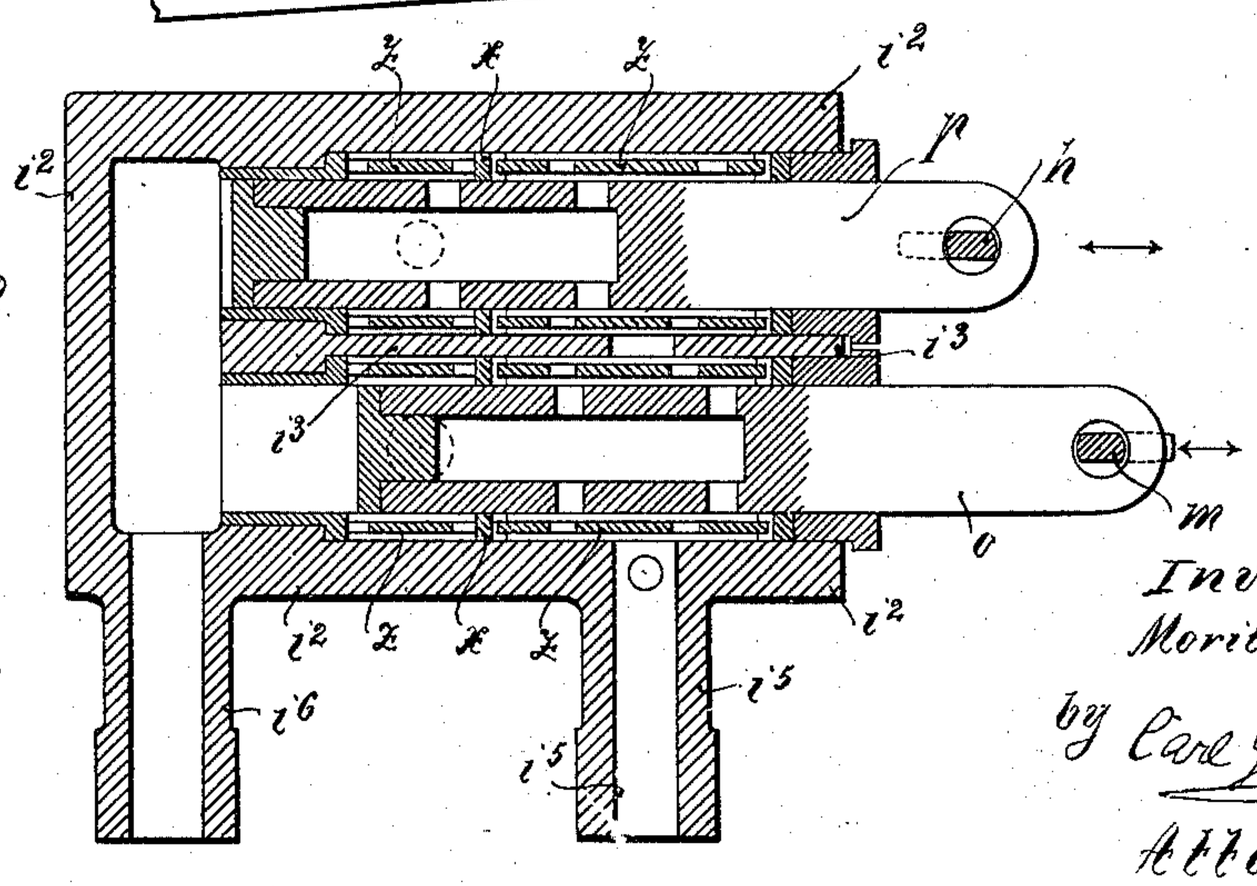


Fig. 2.



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UNITED STATES PATENT OFFICE.

MORITZ ROTHE, OF KALK, GERMANY, ASSIGNOR TO THE KALKER WERKZEUGMASCHINEN-FABRIK, L. W. BREUER, SCHUMACHER & CO., OF SAME PLACE.

HYDRAULIC RIVETING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 612,507, dated October 18, 1898.

Application filed December 15, 1897. Serial No. 662,079. (No model.) Patented in Germany December 24, 1895, No. 89,298.

To all whom it may concern:

Be it known that I, MORITZ ROTHE, hydraulic engineer, a subject of the King of Prussia, German Emperor, residing at Kalk, near Cologne-on-the-Rhine, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Portable Hydraulic Riveting-Machines, of which the following is a specification, and for which I have obtained a German patent, numbered 89,298, dated December 24, 1895.

This invention refers to portable hydraulic riveting-machines of the kind in which there are two pistons arranged concentrically or one within the other, respectively. In machines of this kind it has always been felt a drawback that there was no possibility of concentrating the whole power or pressure of the water upon the rivet, and, furthermore, a great quantity of water under pressure was consumed for working a rivet.

My improvements in machines of the kind in question allow of filling the pressure-space of the large piston with waste water and of using the whole active surface of the piston or pistons for the working of the rivet. This is attained in general by leading through the large piston a packed supply-pipe for the small piston or for the smaller pressure-surface, respectively, and by controlling each of the two pressure-spaces by a separate or special valve.

In order to make my invention more clear, I refer to the accompanying drawings, in which similar letters denote similar parts throughout the several views, and in which—

Figure 1 is a vertical section through the working parts of a hydraulic riveting-machine constructed according to my invention. Fig. 2 is a horizontal section through the valves for the inlet and outlet of the water, the section being taken in line 4 5 of Fig. 1. Fig. 3 is a front view of the valve-casing, together with the hand-levers for operating the valves, these parts being drawn on a reduced scale.

My improved portable hydraulic riveting-machine is constructed as follows:

The arm a of the frame (the latter being of usual construction) forms in its end part a^3 a cylinder and contains within the same the two pistons mentioned, the former, b, being hollow and the latter consisting of a smaller part d, taking into the piston b, and of a larger part d', located above this piston.

The plates to be connected by rivets are supported by the upwardly-projecting end or anvil a^2 of the arm or counter-holder a'. Said plates are pressed upon each other by the hollow pressing-die c, secured to the lower end of the piston b. The rivet passed through the holes of the said plates and resting upon the projection or anvil a^2 is worked by the solid die or riveting-die proper, e, secured to the reduced lower end of the piston $d\,d'$. The latter is provided with a longish cavity d^2, extending vertically downward in the central part of the piston, and a pipe i, secured to or forming part of a valve-casing i^2, reaches down into said cavity d^2. Channels k connect the latter with the annular space b^2 between the annular surfaces of the piston b and the piston part d'. The space above the part d' is connected with the casing i^2 by the pipe i', and another pipe or channel f connects said casing with a small annular space g, formed between the upper half of the piston b and the opposite or neighboring part of the cylinder a^3. The pipe i is controlled by a valve p, operated by a hand-lever h, and the pipe i' is controlled by a valve o, operated by a hand-lever m. The valves o and p are piston-valves arranged side by side in the valve-casing i^2. The latter is divided into two parts by means of a partition-wall i^3, Fig. 2, or, in other words, the valve-casing is provided with two bores, either of which is adapted to receive one of the two piston-valves in question. The partition-wall i^3 or the wall between the two bores, respectively, is provided with an aperture i^4, Fig. 1.

The valve-casing i^2 is provided with a piece of tube i^5 for the entrance of the pressure-water, the latter being produced by a force-pump, an accumulator, or the like. The casing i^2 is further provided with a piece of tube i^6, through which the waste water may pass away. The water is hindered from immediately flowing from the inlet i^5 to the outlet i^6 by means of packing-rings x, Fig. 2,

encompassing the piston-valves *o* and *p* or being located between these valves and the wall of the valve-casing, respectively. Said packing-rings are held in place by pieces of tube *z*, the latter being provided with apertures, so that the water may pass freely into and through said tubes. The sole purpose of these tubes *z* is to hold the packing-rings *x* in place. They have nothing to do with the distribution of the water.

The pipes or channels *i* and *i'* communicate with the annular spaces between the valves and the casing. There are, however, not only two, but four such annular spaces, which are separated from each other by the partition-wall i^3, as well as by the packing-rings *x*. The pipes or channels *i* and *i'* communicate with those of said spaces which are located next to the outlet-pipe i^6.

The two annular spaces which coöperate with one and the same valve are separated from each other when the respective valve has such a position as the valve *o* in Fig. 2; but said spaces are put into communication with each other when the position of the valve is such as that of the valve *p*. Each of these valves has a hollow part and is in that part provided with lateral apertures, through which the water may pass into and through the hollow part of the valve. In the position shown in Fig. 2 the valve *o* has interrupted the communication between the inlet-pipe i^5 and the channel *i'*; but this channel is now in communication with the outlet-pipe i^6. The valve *p*, however, has established a communication between the inlet-pipe i^5 and the channel *i*, the pressure-water passing first around and through the valve *o*, and then through the valve *p*. Therefore in this case the pressure-water is led through the channel or pipe *i* and through the radial channels of the piston *d* into the annular space b^2, whereas the space above the piston part *d'* fills with waste water through the channel or pipe *i'*.

In their normal position the pistons *b* and *d d'* are in their highest position. When a rivet is to be worked, the valve *p* is so moved by the lever *h* that water under pressure enters the pipe *i*, whence it flows through the cavity d^2 and the channels *k* into the space b^2, thus driving the piston *b* downward. The latter is at its upper end provided with a ring *r*, and the piston part *d* is provided with a ring *s*, located below said ring *r*, the two rings being so arranged with regard to each other that the ring *r* pushes upon the ring *s* after the piston *b* has covered a certain part of its path. From that moment the piston *d d'* is driven by the piston *b*; but the power with which both pistons are moved is comparatively small in that it is determined by or corresponds to the diameter of the pipe *i*. The position of the valve *o* during this time is such that waste water may enter the pipe *i'*, so that the space above the larger part *d'* of the piston *d d'* is filled with such water. When the hollow die *c* has reached the plates to be connected, it presses upon the latter with such a power as has been active during the time in which both pistons were moved. The latter then come to a standstill; but now the valve *o* is so displaced that water under pressure can pass into the space above the piston part *d'*. This results in, first, the piston *d d'* being forced upon the rivet with a power determined by or depending on the diameter of the piston part *d*, and, second, the piston *b* being forced upon the plates with a power determined by or depending on the size of the annular surface *b'* of the same. The plates are thus riveted under the influence of said two pressures; but shortly before the work is finished the pipe *i* is connected with the outlet, so that the piston part *d'* receives the full pressure of the water. The whole power or pressure of the water is thus then concentrated upon the rivet and the work is finished under this pressure. To move the pistons back into their former or original positions, water under pressure is introduced into the small annular space *g* through the channel *f*.

Having thus described my invention, what I desire to secure by Letters Patent of the United States is—

In a hydraulic riveting-machine, the combination with a cylinder closed at one end, of a plate-clamping piston and a riveting-piston working therein arranged concentrically, the outer piston fitting said cylinder and provided with an internal bore, the inner piston having two diameters, one to fit said bore and the other to fit said cylinder, said pistons having a limited movement independent of each other, whereby there is formed a pressure-space between the two pistons and a pressure-space behind the inner piston, said inner piston being provided with a central cavity and with channels connecting said cavity with the space between the two pistons, a valve-controlled supply-conduit entering said cavity, and a valve-controlled supply-conduit entering the pressure-space behind the inner piston, substantially as described.

MORITZ ROTHE.

Witnesses:
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