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RIVETER OR PUNCH.

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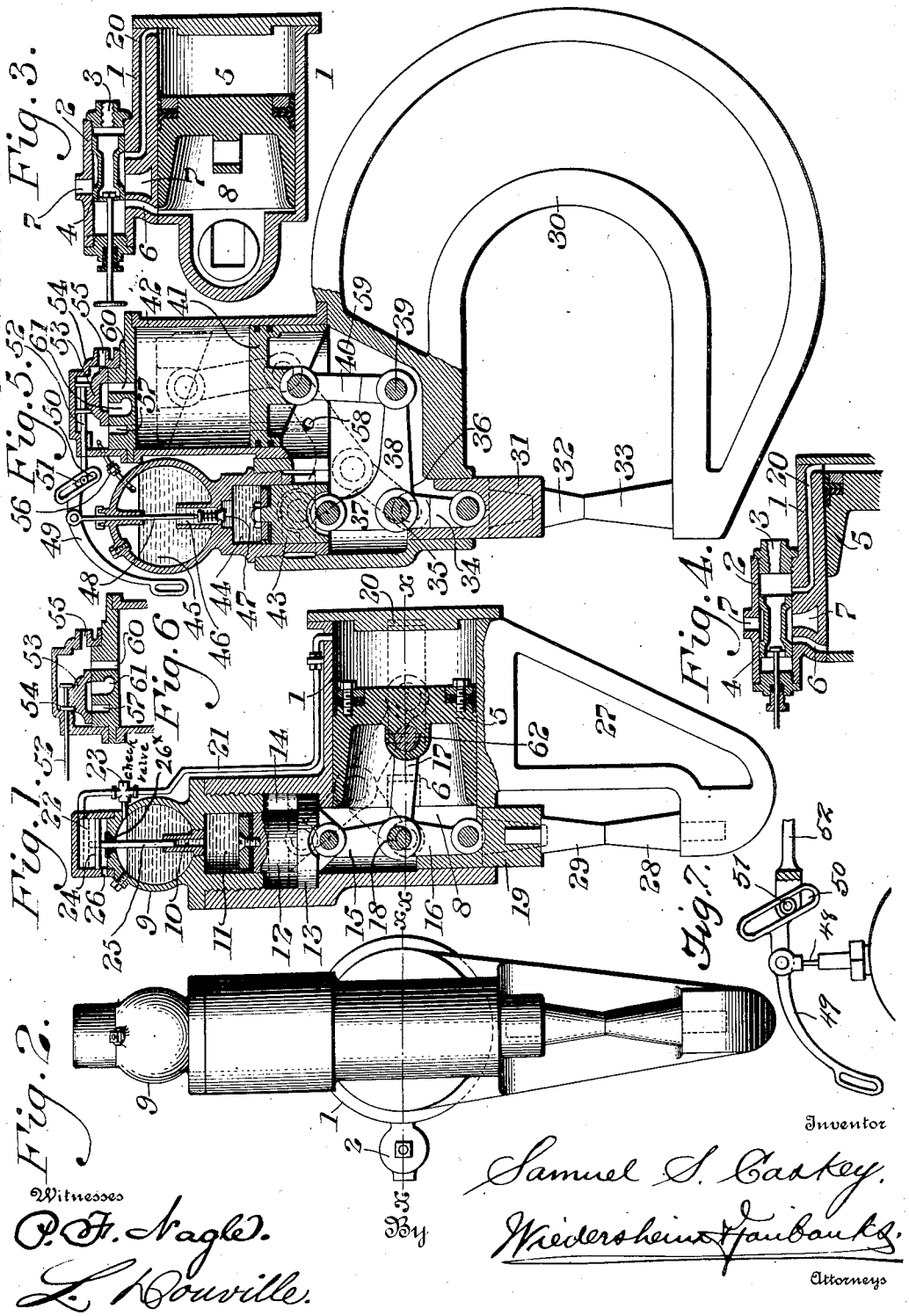

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RIVETER OR PUNCH.

No. 836,301. Specification of Letters Patent. Patented Nov. 20, 1906.

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To all whom it may concern:

Be it known that I, SAMUEL S. CASKEY, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Riveters or Punches, of which the following is a specification.

My invention consists of a novel construction of riveter or punch wherein I employ a novel combination of a toggle mechanism which is operated by a piston moved by compressed air or other motive fluid, the upper portion of said toggle mechanism being adapted to press against a movable abutment of oil or other liquid, as will be hereinafter explained.

To the above ends my invention consists of novel features of construction, all as will be hereinafter fully set forth.

Figure 1 represents a vertical sectional view of a punch or riveter embodying my invention. Fig. 2 represents a front elevation of Fig. 1. Fig. 3 represents a section on line *x x*, Figs. 1 and 2. Fig. 4 represents a sectional view similar to Fig. 3, but showing the valve in reversed position. Fig. 5 represents a vertical sectional view of another embodiment of my invention. Fig. 6 represents a vertical sectional view through the valve-chest seen in Fig. 5, showing the valve in reversed position. Fig. 7 is an enlarged detail of the operating-lever and its connection with the slide-valve.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, (referring first to Fig. 4,) 1 designates the laterally-extending main cylinder having the valve-chest 2, provided with the live-air inlet 3, and the valve 4, which is shown as being a hollow balanced valve, although it is apparent that other forms of valve may be employed. When the valve 4 is in the position seen in Fig. 4, the piston 5 is about to move to the left from its extreme right-hand position, as seen in Fig. 4, and the port 6 is open to the exhaust-passages 7, whereby the air is exhausted from the toggle-chamber 8. During the act of exhausting the air from the toggle-chamber the oil in the stationary reservoir 9 is forced through the passage 10 into the chamber 11, in which reciprocates the piston 12, which has the pull-back head 13, which moves in the pull-back chamber 14. 15 designates a link having its upper end pivoted to the lower portion of the piston 12, the lower end of said link being connected to the contiguous ends of the links 16 and 17 by means of the pin or floating center 18, the opposite end of the like 16 being pivotally connected to the riveting-ram 19, while the opposite end of the link 17 is pivotally connected to the piston 5. While the piston 5 is moving from the position seen in Fig. 4 to the position seen in Fig. 1 live air is acting on said piston through the port 20, and a portion of said live air flows through the pipe 21 into the chamber 22, a part of said live air passing through the check-valve 23 into the upper portion of the chamber 9, thereby exerting a direct pressure upon the oil therein. 24 designates a piston having the piston-rod 25 depending therefrom and passing through the chamber 9, it being apparent that when said piston 24 is in its lowest position the end of the rod 25 enters the passage 10, said rod being wholly exterior to said passage when said piston 24 is in its uppermost position. The piston is held in its uppermost position when the air is exhausted from chamber 22 by the friction of the stuffing-box 26× on the rod 25. The port 26 admits air to prevent a vacuum beneath the piston 24. The cylinder 1 may or may not be integral with the hook 27, whose lower portion carries the lower die 28, the upper die 29 being connected to the ram 19.

In Figs. 5 and 6 I have shown a construction of punch or riveter wherein the broad principle embodied in Figs. 1 to 4, inclusive, is employed, the only structural differences being that the main cylinder stands in an upright instead of a horizontal position, as seen in Fig. 1, and I have also employed a slightly-different form of slide-valve and its adjuncts from that seen in Figs. 1, 3, and 4. In Figs. 5 and 6, 30 designates the hook, having the riveting-ram 31 mounted therein, which carries the upper die 32, the lower die 33 being carried on the lower portion of said hook. The riveting-ram 31 is actuated by a toggle mechanism consisting of a link 34, which is pivotally attached at 35 to the elbow-lever 36, consisting of the members 37 and 38. The member 38 is pivotally attached at 39 to the link 40, which is pivotally connected to the piston 41 in the main cylinder 42, which corresponds to the main cylinder hereinbefore referred to, except that said main cylinder 42 stands in an upright position instead of a lateral position, as seen in Fig. 1. 43 designates a piston pivotally connected to the member 37 of the elbow-lever, said pis-

ton being adapted to press against the oil-abutment contained in the chamber 44, the latter communicating with the reservoir 45 by means of the passage 46, which is controlled by the check-valve 47, said check-valve seating upwardly and being held against its seat by a suitable spring and being adapted to be depressed or unseated by means of the rod 48, which is movable in the reservoir 45, the upper end of said rod being pivotally attached to the operating-lever 49, which has at one end a member having an elongated slot 50, in which is received a pin 51, attached to the valve-rod 52, whereby the slide or other valve 53 is operated. Live air is led into the valve-chest 54 through the inlet 55, it being seen that a communication is had between said valve-chest and the reservoir 45 by means of the connection 56. When the parts are in the position seen in Fig. 5, it will be apparent that live air is entering the passage 57 and passing through the port 58 into the chamber 59 beneath the piston 41, whereby the latter is about to be raised from the position seen in full lines in Fig. 5 to the position seen in dotted lines therein, the exhaust taking place through the passage 60 and main exhaust-port 61 to the atmosphere. When the piston 41 is in the position seen in dotted lines in Fig. 5, it will be apparent that to move the same to the position seen in full lines in said figure the valve 53 must be moved to the position seen in Fig. 6, whereby live air passing through the passage 60 acts on the piston 41, which moves downwardly to the position seen in full lines in Fig. 5, the exhaust taking place through port 58, passage 57, and main exhaust-port 61 to the atmosphere when the valve 53 is in the position seen in Fig. 6.

It will be apparent from the foregoing that when the toggle mechanism and the pistons are in the position seen dotted in Fig. 1 and the valve 4 is in the position shown in Fig. 4 the dies are open and ready to force the die 29 and ram 19 down on the rivet to be headed. Air having been exhausted from the toggle-chamber and relieving the left-hand side of the piston 5 from pressure, the air in direct contact with the oil in the chamber 9 forces the oil in said chamber through the passage 10 and upon the top of the ram 12, causing said ram to move downwardly, pushing the toggle mechanism and ram 19, with its die 29, until said die comes in contact with the rivet to be headed. During this movement the toggle remains in a bent position, as shown by dotted lines in Fig. 1, and swings from the pin 62 as a pivot. The length of the rivet to be headed may be long or short as compared with the last one headed, and yet the die will come upon it without materially changing the position of the toggle. It is also to be noted that this movement is obtained with a comparatively small expenditure of air or motive fluid and that this movement is non-effective in making the rivet-head. The large expenditure of motive fluid is reserved in this and all other of my pending applications until the die is on the rivet to be headed, and in this case I further save air by applying the toggle mechanism at the last movement, which is when air enters the passage 20, Fig. 4, and forces the piston 5 to the left, causing the toggle to straighten out and give a constantly-increasing pressure on the rivet-head until it is a maximum, when the toggles are shown in full lines and straightened out, as in Fig. 1. It is further to be noted that in all toggle mechanisms this maximum pressure theoretically becomes infinite, and where adjusting-screws are used to take up the variation of grip of the dies 28 and 29 it is possible to break the hooks. To prevent this objection to toggle-machines, I place a small intensifying device, which acts as a relief-valve to the oil in chamber 11. This intensifying device consists of the piston 24 and rod 25, above referred to, and the pressure in the chamber 11 is due to the ratio of areas in the rod 25 and piston 24 when the rod 25 is forced into the passage 10 by the air on the piston 24, which air acts simultaneously on said pistons 24 and 5. To open the dies it is only necessary to put the valve 4 into the position shown in Fig. 3. Air then enters the passage 6, as above explained, and forces the piston 5 back to the right to the position in Fig. 4, breaking the toggle-lock and simultaneously forcing the pull-back piston 13 upwardly, overcoming the pressure on the oil and intensifying-rod, and the oil flows back into the chamber 9. While air is entering the passage 6 the air which was in the chamber back of the piston 5 and above the piston 24 is simultaneously exhausted through the passages 20 and 7 to the atmosphere, the parts being then in the positions shown in dotted lines in Fig. 1. In Fig. 5 the operations are the same except that instead of an automatic relief I have applied the above-described manual positive means for opening the check-valve 47 to control the fluid in the chamber 44, and instead of a pull-back piston, as 13 in Fig. 1, the arrangement and alinement of the main piston pulls the whole mechanism, piston included, upwardly and parallel with said main piston after the check-valve 47 releases the oil in the chamber 44.

It will be apparent from the foregoing that this riveter is built for very hard usage and there is very little liability of breakage. The packings are easy of examination, and the construction of the machine secures the maximum pressure on a rivet, with as little weight in the machine as is possible. It works rapidly without shock or jar, is easy to handle, and gives a uniform pressure on every rivet. No blow is given when using this machine,

and therefore no crystallization takes place upon the rivet when being driven.

The riveter is suspended by a bail, (not shown,) which allows it to be moved and operated in either a vertical or horizontal position. By changing the bail it can be moved sidewise with equal facility. The operating mechanism is so constructed and connected that the operator can control all movements of the riveter, whether standing at the side, back, or front of the machine.

By the use of the hydrocarbon fluid in the oil chambers and cylinders the operation of the machine in very cold weather and in other places is permitted with no danger of freezing, which is not the case in riveters of hydraulic pressure alone.

It will be evident that various changes may be made by those skilled in the art which may come within the scope of my invention, and I do not, therefore, desire to be limited in every instance to the exact construction herein shown and described.

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

1. A punch or riveter comprising a ram, a movable abutment held from retraction by a substantially incompressible liquid for advancing said ram during a portion of its stroke, coacting pneumatic means operatively connected with said abutment and ram for completing the stroke, an intensifying device, and means permitting compressed air to act upon said liquid, said means and intensifying device arranged to act in unison.

2. A punch or riveter comprising a ram, a movable abutment separated from the ram and held from retraction by a substantially incompressible liquid for advancing said ram during a portion of its stroke, coacting pneumatic means operatively connected with said abutment and ram for completing the stroke and adapted to constantly increase the force exerted upon said ram during its stroke, an intensifying device, and means permitting compressed air to act upon said liquid, said means and intensifying device arranged to act in unison.

3. In a punch or riveter, a ram, a movable abutment substantially in line with and separated from said ram, an oil-chamber behind said abutment, means for the admission of oil to said oil-chamber, means for permitting compressed air to act upon said oil for advancing the ram through the first part of its stroke, an intensifying device having a portion movable through the oil, a main piston, a toggle-joint connecting said ram and said abutment and operatively connected with said piston.

4. In a punch or riveter, a ram, a movable abutment substantially in line with and connected to said ram, an oil-chamber behind said abutment, means operative through the oil in said chamber for advancing said ram through the first part of its stroke and an actuating-piston operative through a toggle-joint connecting said ram and said abutment by means of which the effective force of said ram is increased through the latter part of its stroke.

5. In a punch or riveter, a ram, a movable abutment substantially in line with and connected to said ram, an oil-chamber behind said abutment, means operative through the oil in said chamber for advancing said ram through the first part of its stroke, and an actuating-piston operative through a toggle-joint connecting said ram and said abutment by means of which the effective force of said ram is increased through the latter part of its stroke, and relievable means for preventing the outflow of oil from said abutment-chamber during the advancement of said ram.

6. In a punch or riveter, a ram, a movable abutment substantially in line with and connected to said ram, an oil-chamber behind said abutment, means operative through the oil in said chamber for advancing said ram through the first part of its stroke and an actuating-piston operative through a toggle-joint connecting said ram and said abutment by means of which the effective force of said ram is increased through the latter part of its stroke, and automatically relievable means for preventing the outflow of oil from said abutment-chamber during the advancement of said ram.

7. In a punch or riveter, a ram, a movable abutment substantially in line with said ram, an oil-chamber behind said abutment, a main cylinder, an actuating-piston in said cylinder, a toggle-joint connecting said ram and said abutment and operatively connected with said piston, passages for supplying air to reciprocate said actuating-piston and said abutment and unitary means for controlling all said passages.

8. A punch or riveter comprising a hook, a ram, a movable abutment substantially in line with said ram, an oil-chamber behind said abutment, an oil-reservoir, a passage between said reservoir and said chamber, an air-chamber, a piston movable in said air-chamber its rod passing into said reservoir and adapted to enter said passage, a main cylinder, an actuating-piston in said cylinder and means for the simultaneous admission of air to said main cylinder, said reservoir and said air-chamber.

9. A punch or riveter, comprising a hook, a ram, a movable abutment substantially in line with said ram, an oil-chamber behind said abutment, an oil-reservoir, a passage between said reservoir and said chamber, an air-chamber, a piston movable in said air-chamber its rod passing into said reservoir and adapted to enter said passage, a main

cylinder, an actuating-piston in said cylinder, means for the simultaneous admission of air to said main cylinder, said reservoir and said chamber, and an exhaust from said air-chamber beneath its piston.

10. In a punch or riveter, a ram, a movable abutment connected with said ram, an oil-chamber behind said abutment, an actuating-piston also connected with said ram, an air-chamber, an oil-reservoir, a valve-controlled connection with an air-supply for said reservoir and air-chamber, a piston in said air-chamber and an intensifier carried by said piston and movable through said reservoir adapted by its retraction under excessive pressure to permit the retraction of said abutment

11. In a punch or riveter, a main cylinder, a piston therein, a riveting-ram, a piston above said ram, an oil-abutment for said piston, toggle mechanism intermediate the piston, said riveting-ram and the piston coacting with said oil-abutment, means for admitting air-pressure upon said oil-abutment, and a valve mechanism for controlling the movement of the piston in said main cylinder.

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