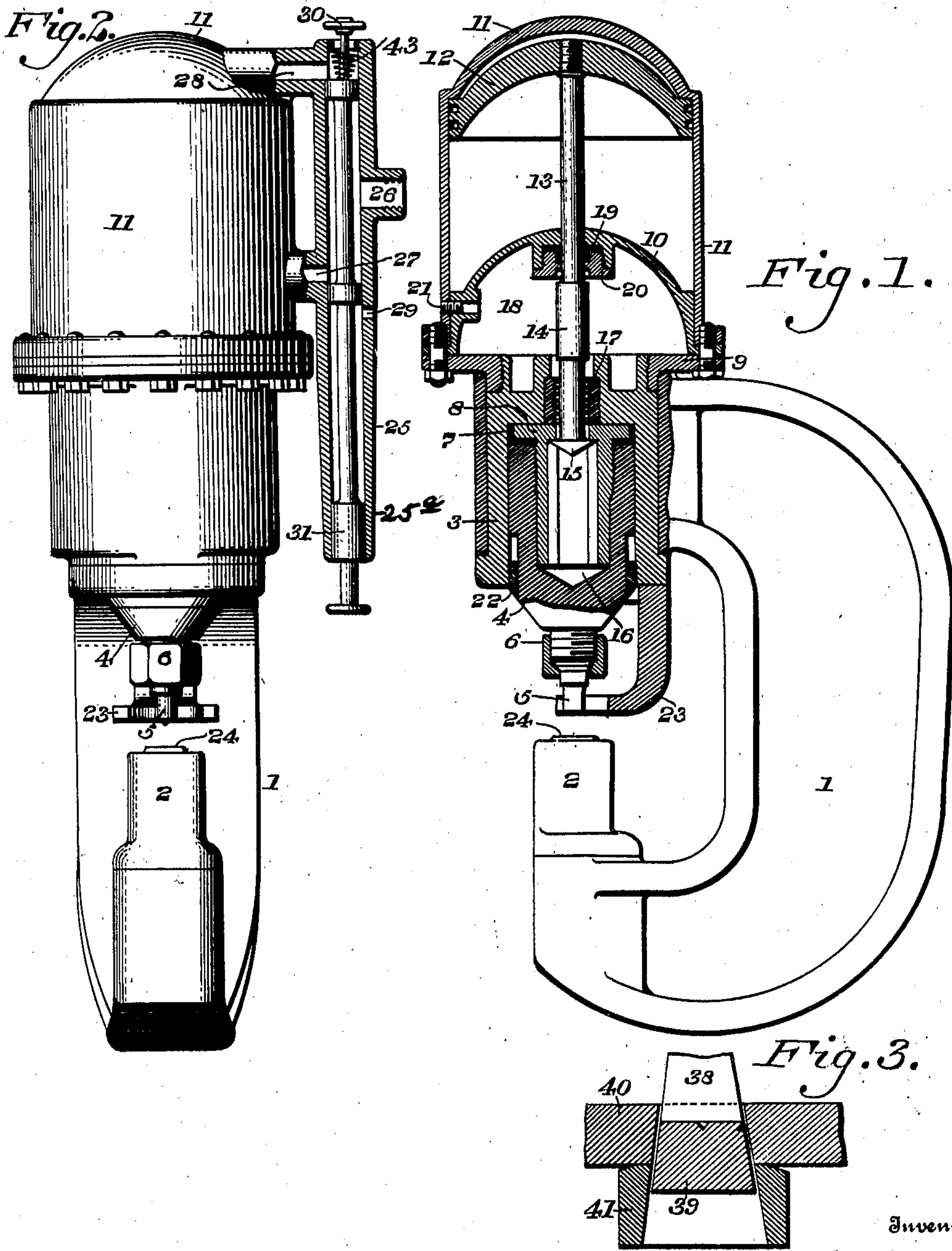


No. 865,857.

PATENTED SEPT. 10, 1907.

S. C. BOND.
MACHINE FOR PUNCHING.
APPLICATION FILED DEC. 23, 1902.



Witnesses:
P. F. Nagle.
L. Bouville.

Inventor
Samuel C. Bond.
By Wiedersheim & Finkbeiner.
Attorneys

UNITED STATES PATENT OFFICE.

SAMUEL C. BOND, OF WILMINGTON, DELAWARE.

MACHINE FOR PUNCHING.

No. 865,857.

Specification of Letters Patent.

Patented Sept. 10, 1907.

Application filed December 23, 1902. Serial No. 136,391.

To all whom it may concern:

Be it known that I, SAMUEL C. BOND, a citizen of the United States, residing at Wilmington, in the county of Newcastle, State of Delaware, have invented a new and useful Improvement in Machines for Punching, of which the following is a specification.

My invention relates to a machine for punching, which will supply the pressure to the punch plunger only in such amounts as will be required to remove the required amount of material from the article to be punched.

It further consists of novel details of construction, all as will be hereinafter set forth.

Figure 1 represents a sectional view and partial side elevation of a punching machine embodying my invention. Fig. 2 represents a front view with valves and ports shown in section. Fig. 3 represents a sectional view of the punch showing the relative position of the punch, slug, plate and die after the material has been sheared.

Referring to the drawings: 1 designates the hook or frame to which is secured the die block 2 and the high pressure cylinder 3, in which reciprocates the punch plunger 4 carrying with it the punch 5, the punch nut 6 and the packing leather 7 and the pull-back gland 8, said packing being situated between the gland 8 and the plunger 4.

To the high pressure cylinder 3 is secured the diaphragm 9 which has secured thereto the cylinder head 10 and cylinder or casing 11.

12 is the piston which reciprocates in the cylinder 11 and to which is secured the rod 13, which passes through the cylinder head 10 and has the enlarged portion 14 and on one end the head 15, which is adapted to engage with the pull-back gland 8 and the end of the chamber 16 respectively, at or near the end of the stroke of the piston 12.

17 is the high pressure packing which is situated between the gland 8 and the reservoir 18 and in conjunction with the enlarged portion 14 of the rod 13, forms a closure for the communication between the high pressure cylinder 3 and the said low pressure reservoir 18, which is formed by the diaphragm 9 and the cylinder head 10.

19 is the low pressure packing which with the low pressure gland 20 around the rod 13 prevents all flow from the reservoir 18 to the cylinder 11 but permits a flow to take place in the reverse direction.

21 is the filling plug by which a liquid is admitted to the reservoir 18.

22 is a stop ring which limits the travel of the punch plunger 4, through the stripper 23 and the die 24.

25 represents the valve chamber, the projecting end 25^a of which serves as a grip for the hand, said valve 31 being readily operated by the thumb of the hand holding the grip 25^a and as will readily be seen the reaction

due to the operation of said valve is absorbed between the valve 31 and the grip 25^a instead of the valve and the inertia of the machine, as in machines constructed heretofore; this feature enables the operator to operate the valve without disturbing the relation of the machine to the work. This chamber contains the admission port 26 and has the controlling ports 27 and 28, one of which communicates with the upper portion of the interior of the cylinder 11 while the other communicates with the lower portion, said chamber 25 having also the exhaust ports 29 and 30.

31 is the balanced controlling valve operated by the thumb or finger said valve 31 being readily operated by the thumb of the hand holding the shell forming the valve chamber 25.

38 represents the punch in the act of pushing the slug 39 from the plate 40 through the die 41.

The operation is as follows:—The reservoir 18 is filled with a suitable liquid, the hose or other fluid conveyer is attached to the admission port 26 with the controlling valve 31 in the position shown, the motive fluid passing from the port 26 through the port 27 and packing 19 to the reservoir 18 and between the piston 12 and the cylinder head 10 thereby holding the punch plunger 4 at one end of its travel by the head 15 and the gland 8 against the pressure of the motive fluid on the liquid in the reservoir 18, which liquid will be readily seen, exerts a pressure on the punch plunger 4 by passing between the high pressure packing 17 and the shaft 13. The material to be operated upon is then placed on the die 24 and the valve is then moved connecting the port 27 with the exhaust port 29 exhausting the motive fluid from between the cylinder head 10 and the piston 12 but not from the reservoir 18, the pressure on the fluid being retained by the packing 19, the valve, at the same time, admits the motive fluid through the ports 26 and 28 between the piston 12 and the cylinder 11, causing the piston 12 and the rod 13 to move towards the head 10, the punch plunger 4 at the same time moves toward the die 24, which action is due to the pressure of the motive fluid in the reservoir 18 being exerted upon the liquid in the same and ceases when the punch comes in contact with the material to be punched. The piston 12 in the meantime has been moving towards the head 10 but keeping in the same relative position with respect to the punch plunger 4 and as it continues to move in the same direction it closes communication between the high pressure cylinder 3 and the reservoir 18 by the enlarged portion 14 of the rod 13 entering the high pressure packing 17 and forming an effective closure. This action causes the pressure in the high pressure cylinder 3 to become intensified due to the difference in area of the piston 12 and the enlarged portion 14 of the rod 13. The intensified pressure is exerted on the punch plunger 4 until

the enlarged portion 14 of the rod 13 has passed entirely through the high pressure packing 17, the punch 5 and slug 39 are then in the position shown in Fig. 3 and communication is again established between the reservoir 18 and the high pressure cylinder 3, causing the punch plunger 4 to continue its travel under direct pressure until arrested by the stop ring 22. This continuation of the travel is due partly to the direct action of the motive fluid on the piston 12 through the rod 13 and head 15 on the end of the chamber 16 and partly to the pressure of the motive fluid on the liquid in the reservoir 18 acting on the plunger 4. The valve is then returned by a spring 43 to the position shown in Fig. 2 which admits the motive fluid between the head 10 and the piston 12 causing the piston 12 to return to its original position and to carry with it the punch plunger 4 compressing the motive fluid in the reservoir 18, which is accomplished by the head 15 engaging with the gland 8. This completes the cycle.

It will be evident that various changes may be made by those skilled in the art, which will 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. In a punching machine, a punch plunger and means for operating the same, said means comprising provision for a maximum pressure and for automatically reducing that pressure, the maximum pressure being exerted during the performance of the work and the reduced pressure during the expulsion of the slug.

2. In a punching machine, a punch and die and means for operating the same, said means comprising provision for a maximum pressure for shearing the material and for automatically reducing such pressure and a reservoir of power for storing sufficient pressure to expel the material sheared.

3. In a punching machine, a high pressure cylinder, a low pressure reservoir, a plunger, a rod therefor adapted

to reciprocate in said cylinder and reservoir, and means for exerting a low pressure at the beginning and ending of the stroke of the plunger and for exerting a maximum pressure.

4. In a punching machine, a high pressure cylinder, a low pressure reservoir in communication with said cylinder, a piston, a rod for said piston and an enlarged portion on said rod, and packing which is adapted to closely fit said enlarged portion when the same passes thereinto to prevent communication between the high pressure cylinder and low pressure reservoir; said enlarged portion passing completely through said packing thereby again establishing communication between said high pressure cylinder and low pressure reservoir.

5. In a punching machine, a cylinder, a punch plunger adapted to reciprocate in said cylinder, a reservoir in communication with said cylinder means for intensifying pressure within said cylinder, a closure for said communication while intensifying the pressure in said cylinder and means of again establishing said communication during the travel of said punch plunger in same direction.

6. In a punching machine, a high pressure cylinder, a low pressure reservoir, a rod having a head which is adapted to reciprocate in said cylinder, a plunger, a gland secured thereto with which said head is adapted to engage on the return stroke, a packing between said cylinder and said reservoir, an enlarged portion of said rod adapted to form a closure with said packing between said cylinder and said reservoir, a second cylinder, a piston connected with said rod and adapted to reciprocate in said cylinder, and means for contacting the motive fluid on either side of said piston as required.

7. In a punching machine, a high pressure cylinder, a plunger adapted to reciprocate in said cylinder and means comprising a low pressure reservoir for exerting a low pressure at the beginning and ending of the stroke of the plunger and for exerting a maximum pressure.

8. In a punching machine, a punch and die and means for operating the same, said means comprising provision for a maximum pressure for shearing the material and for reducing such pressure, and a reservoir of power for storing sufficient pressure to expel the material sheared.

SAML. C. BOND.

Witnesses:

GEORGE ARMOR,
W. V. BOND.