W. P. KRAUSE.

ENGINE FOR PUNCHING MACHINES.

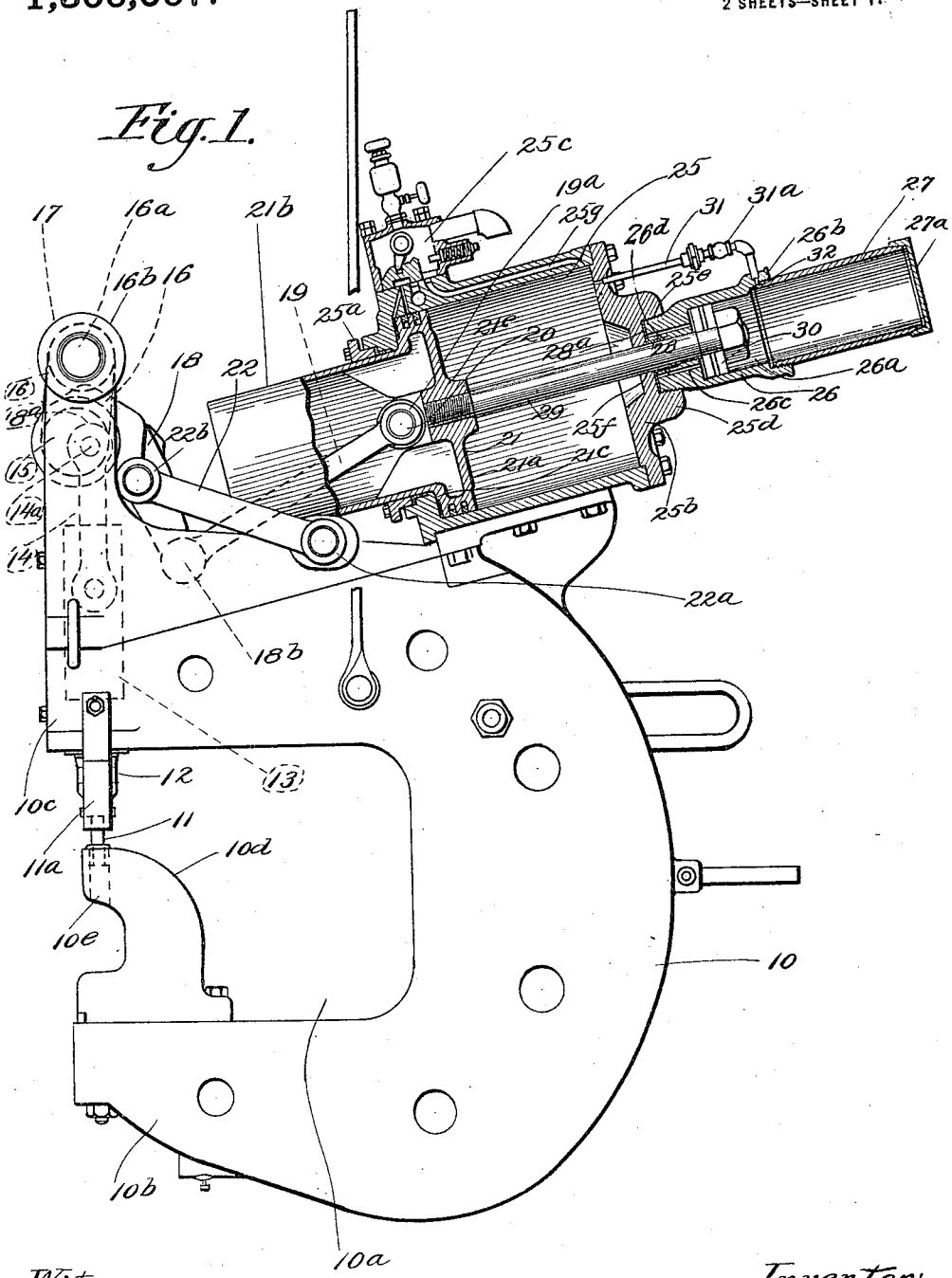
APPLICATION FILED MAY 10, 1915.

1,306,067.

Patented June 10, 1919.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

C. C. Burnap

Inventor:

William P. Krause

By Sheridan, Wilkinson & Scott, Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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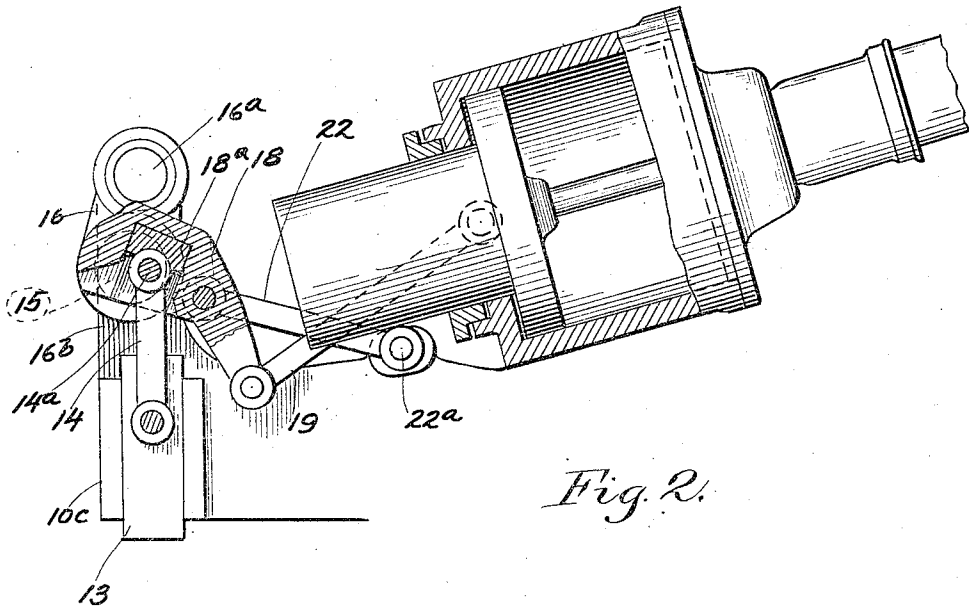


Fig. 2.

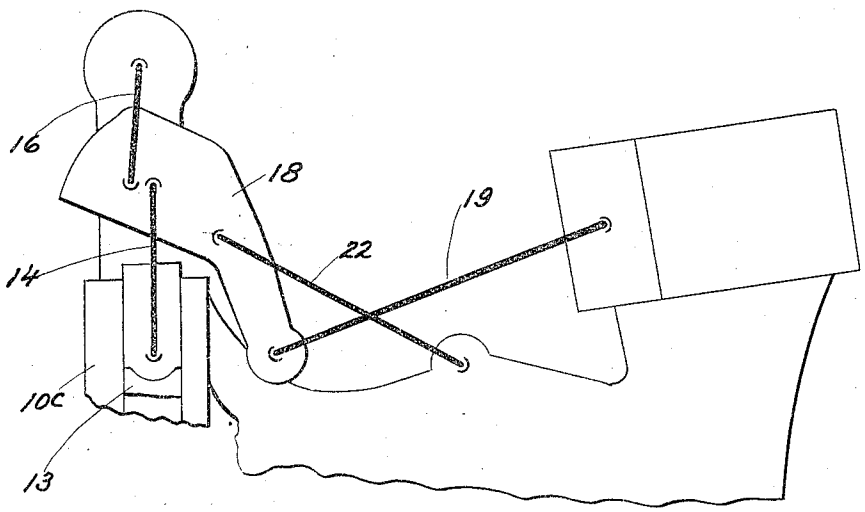


Fig. 3.

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UNITED STATES PATENT OFFICE.

WILLIAM P. KRAUSE, OF CHICAGO, ILLINOIS, ASSIGNOR TO HANNA ENGINEERING WORKS, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ENGINE FOR PUNCHING-MACHINES.

1,306,067. Specification of Letters Patent. Patented June 10, 1919.

Application filed May 10, 1915. Serial No. 27,210.

To all whom it may concern:

Be it known that I, WILLIAM P. KRAUSE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Engines for Punching-Machines, of which the following is a specification.

This invention relates to improvements in engines for punching machines, and has for its object to provide a machine of that nature in which the punching die is actuated by a fluid actuated piston, my improved machine being provided with means to check the movement of the piston and die at the completion of its punching operation without jar or shock to the allied structure. The main object of my invention is to provide such a punching machine to which I have applied mechanism of the nature of a dash cup coacting with the piston to check its movement at the completion of the punching stroke.

These and other objects I accomplish by the structure and mechanism described in the following specification and shown in the accompanying drawings, in which—

Figure 1 is a side elevation partially in section of my improved machine;

Fig. 2 is a vertical section through the cylinder and toggle mechanism;

Fig. 3 is a diagrammatic view of the lever mechanism.

Like numerals refer to like elements throughout the drawings.

10 indicates a frame similar in its construction to a riveter frame having the opening 10^a between its jaws 10^b and 10^c. To the jaw 10^b is attached the anvil or block 10^d extending upwardly into the opening 10^a and provided with an aperture or recess 10^e, to be hereinafter described.

The general nature of the punching die and actuating mechanism is well known to those familiar with this art, and does not need detailed explanation herein. The punch proper is indicated by the numeral 11, and is carried in a chuck member 12, in turn threadedly or otherwise engaging the reciprocating block 13 mounted in a suitable recess or guide-way in the jaw 10^c, as indicated in dotted lines. Strippers 11^a are attached to the jaw 10^c on each side of the punch 11, as shown in the drawing. Upper toggles 16 are pivoted upon pins or trunnions 16^a carried in jaws 16^b of the main frame, as shown in the drawing, these upper toggles 16 depending downwardly between said jaws. These upper toggles 16 are apertured at their lower ends and fit over and around gudgeons 15 formed on the main lever 18. This lever 18 is apertured or recessed between the gudgeons and provided with a curved bearing surface in block 18^a which rests upon the upper head of lower toggle 14, the latter being attached to the lever 18 by means of the pin 14^a extending through the gudgeons of the lever 18. The upper end of the lower toggle 14 is eccentrically located with respect to the gudgeons 15. This lower toggle 14 is operatively attached to block 13 and is arranged to reciprocate the same, as will be more fully described below. The main lever 18 is pivotally attached at its lower extremity at 18^b to a piston rod 19, in turn pivotally attached at its extremity 19^a to a wrist pin 20 carried by the piston 21. This piston is provided with the enlarged head 21^a carrying the usual piston rings and is formed with the outwardly extending hollow trunk portion 21^b reduced in diameter to form with the enlarged head 21 the shoulder 21^c. The piston rod 19 extends through the hollow trunk portion 21^b, as is clearly shown. Radius rods 22 are provided having one extremity pivotally attached to the punch frame at 22^a and the other extremity pivotally attached to the lever 18 at 22^b. The above described toggle and lever structure is similar in construction and operation to that shown and described in the patent to Hanna, No. 823,273, dated June 12, 1906, and forms no part of the present invention. The piston 21 is mounted in a cylinder 25, the same being provided with one end apertured to permit reciprocation therethrough of the trunk portion 21^b of the piston, this end being provided with a shoulder to prevent the piston 21 from moving entirely out of the cylinder, as will be obvious. A pack-

ing head 25^a is attached to this end of the cylinder and coacts therewith to form a gland or stuffing box to prevent leakage of actuating fluid therethrough. The piston rings perform their usual function, as will be apparent. A cylinder head 25^b is secured by bolts, or the like, to the other end of the cylinder 25. The piston 21 is constructed to provide a clearance space at either end of the cylinder 25 and a valve chest 25^c is provided, together with well known valve mechanism and ports to control the movement of the piston 21, all of a well known manner. The cylinder head 25^b is provided with the enlarged thickened portion 25^d which is provided with a cup or recess 25^e, internally threaded. A dash pot 26 having a threaded reduced end is provided, the reduced end thereof being threaded into engagement with the recess 25^e. This dash pot 26 is provided with the cup portion 26^a and the outwardly extended upper periphery 26^b, internally threaded to permit engagement thereof by the tube or cylinder 27 of slightly larger interior diameter than that of the cup 26^a proper. This tube or cylinder 27 is normally sealed or closed at its open end by the cap 27^a secured thereto. The enlarged portion 25^d of the cylinder head 25^b is centrally apertured at 25^f and a similar alining aperture extends through the end of the cup member 26, this aperture therein being slightly enlarged adjacent its outer end to permit projection thereinto of a packing sheet or cup 28 of leather or the like, the same having its outer periphery 28^a angularly disposed with respect to the other portion which projects into the aperture in the end of cup member 26 and fitting between the end of the cup member 26 and the bottom of recess 25^e, as clearly shown, this cup being tightly maintained between the two members by means of the cup member 26.

The piston 21 is provided with the central boss or enlarged portion 21^e, apertured and threaded for insertion thereinto of the rod 29 which extends therefrom through aperture 25^f and the corresponding aperture in the cup member 26 into which it projects. This rod carries a leather packed piston 30 arranged to closely fit the cup 26^a of slightly less diameter than that of interior of cylinder 27. A pipe or duct 31 leads from and communicates with the interior of cylinder 25, to and communicates with the interior of cylinder 27 and cup 26. This pipe or duct 31 is provided with a check valve 31^a to permit the actuating fluid to flow from cylinder 25 to cylinder 27 and cup 26^a, as will be more fully explained.

The operation of the punching machine itself is as follows:—Assuming that metal to be punched is placed upon the block or anvil 10^d and steam or compressed air is admitted into the cylinder 25 through port 25^g, whereupon the piston 21 will be moved toward the opposite end of the cylinder and toward the position in which it is shown in the drawings. The piston rod, toggles and links will operate, as will be apparent, to force the punch 11 downwardly toward the block 10^d until punching of the metal is completed, after which the lower end of punch 11 will move downwardly in the recess or aperture 10^e. In the ordinary operation of these machines great pressure is required to properly actuate the piston 21 to overcome the resistance of the metal to the passage of the punch therethrough, and it has been found that when the punch has passed through the metal, this pressure and the cessation of the resistance of the metal cause the piston 21 to be driven with great violence against the shoulder 21^c of the cylinder, whereby a jar or shock is transmitted to the whole mechanism to the detriment thereof.

I have eliminated this objection by the construction shown and described above. It will be apparent that when the piston 21 is at the opposite end of the cylinder from that shown in the drawing, previous to the commencing of a punching operation, the piston 30 carried by rod 29 will be adjacent the outer end of the tube or cylinder 27. Steam or compressed air from the cylinder 25 will flow through the duct 31 into the cylinder 27 and cup 26^a at the pressure at which it is admitted to cylinder 25. It will continue to flow until the small piston 30 reaches the inlet duct 32 at the comparatively great pressure necessary to perform the punching operation. As the piston 30 reaches the point mentioned at its entrance into cup 26^a, the further flow of steam through pipe 31 beneath the piston 30 will be cut off and the previously admitted actuating fluid beneath the piston 30 will be confined thereby in the cup 26^a at its initial high pressure. Further movement of the piston 30 in unison with piston 21 results in this confined fluid being compressed to a very great pressure, as will be apparent, as the piston 30 reaches the end of its stroke. This pressure gradually becomes so enormous that acting in resistance to the movement of piston 30, serves to balance the actuating pressure on piston 21 and the latter, together with the punching mechanism is brought to a rest just after the punch breaks through the metal and just previous to the completion of its stroke, without jar or injurious shock to the machine. It will be apparent that by varying the dimensions of cup 26, piston 30 and the allied elements, this checking effect may be controlled to produce the desired effect, namely, the checking of the mechanism described above at approximately the instant after the punching is completed.

It is necessary, for the proper functioning of this checking means, to provide a packing around rod 29 where it passes through the cylinder head 25 and cup member 26 which will substantially prevent leakage of the fluid therearound. To attain this end I have provided the leather or other packing cup 28, described above, having its central portion extending into the aperture in cup 26, closely fitting around the rod 29. To increase the contact of this cup 28 with rod 29, I provide small ducts or passages 26^c leading from the lower portion of cup 26^a to the peripheral groove 26^d, around the packing cup 28, as is clearly shown in the drawings. It will be apparent that as the pressure of the fluid trapped beneath the piston 30 increases, this pressure will be transmitted through the ducts 26^c to groove 26^d whereby the packing cup 28 under the pressure of the fluid transmitted through said ducts will be more and more tightly pressed around and held against the rod 29, thereby increasing the prevention of leakage of the fluid which would ordinarily interfere with the proper functioning of the checking member.

It will be apparent that my invention is susceptible of many modifications and improvements, and I do not wish to be restricted to the form shown or described beyond the scope of the appended claims.

What I claim is:

1. In combination with a cylinder having a reciprocable piston, means to check the movement of said piston adjacent one limit of its travel, said means comprising a dash pot and a piston member coacting therewith, and means to introduce fluid under pressure to said dash pot intermediate the limits of travel of said piston member.

2. In combination with a cylinder having a reciprocable piston, means to check the movement of said piston adjacent one limit of its travel, said means comprising a dash pot and a piston member coacting therewith, and means to introduce fluid under pressure from said cylinder to said dash pot intermediate the limits of travel of said piston member.

3. In combination with a cylinder having a reciprocable piston, means to check the movement of said piston adjacent one limit of its travel, said means comprising a dash pot, a piston member coacting therewith and reciprocably mounted therein, a rod operatively connecting said piston member with said piston, means to prevent leakage of fluid around said rod, said means comprising a packing member, and means to provide fluid under pressure to coact with said packing member and increase its contact with said rod.

4. In combination with a cylinder having a reciprocable piston, means to check the movement of said piston adjacent one limit of its travel, said means comprising a dash pot, a piston member coacting therewith and reciprocably mounted therein, a rod operatively connecting said piston member with said piston, and means to provide fluid under pressure from said cylinder to said dash pot intermediate the limits of travel of said piston member.

5. In combination, a cylinder having a head, a piston mounted in said cylinder, a rod extending through said head and attached to said piston, a cup member attached to said head, said rod being also extended through said cup member, a piston member carried by said rod and arranged to fit and coact with said cup member to check the movement of said piston adjacent one limit of its travel, and means to introduce fluid under pressure from said cylinder to said cup member beneath said piston member intermediate the limits of travel of said piston member.

6. In combination, a cylinder having a head, a piston mounted in said cylinder, a rod extending through said head and attached to said piston, a cup member attached to said head, said rod being also extended through said cup member, a piston member carried by said rod and arranged to fit and coact with said cup member to check the movement of said piston adjacent one limit of its travel, means to introduce fluid under pressure from said cylinder to said cup member beneath said piston member and intermediate its limits of travel, a packing member having a portion fitting around said rod, and means to supply fluid under pressure from said cup member to said packing member to increase its contact with said rod.

7. In combination with a cylinder having a reciprocable piston and a head, an auxiliary cylinder carried by said first-named cylinder head, a piston member mounted in said auxiliary cylinder, a piston rod extending between and connected to said piston and said piston member, said cylinder head and auxiliary cylinder being apertured to permit passage therethrough of said piston rod, a packing member having a flanged portion surrounding said piston rod between said cylinder and auxiliary cylinder, and ducts extending from said auxiliary cylinder to supply fluid under pressure to the outer periphery of said packing flange whereby the latter will be closely pressed against said piston rod.

8. In combination with a cylinder having a reciprocal piston and a head, an auxiliary cylinder carried by said first-named cylinder head, a piston member mounted in said auxiliary cylinder, a piston rod extending between and connected to said piston and said

piston member, said piston head and auxiliary cylinder being apertured to permit passage therethrough of said piston rod, and a duct leading from said main cylinder to said auxiliary cylinder at a point intermediate the limits of travel of said piston member whereby fluid under pressure will be transmitted from said main cylinder to said auxiliary cylinder during a portion of the stroke of said piston member.

In testimony whereof, I have subscribed my name.

WILLIAM P. KRAUSE.

Witnesses:
ARTHUR I. JENSEN,
PHILETUS W. GATES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."