No. 855,821. PATENTED JUNE 4, 1907.

E. W. SUMMERS.

METAL PUNCHING MACHINE.

APPLICATION FILED FEB. 1, 1907.

2 SHEETS—SHEET 1.

Fig. 3.

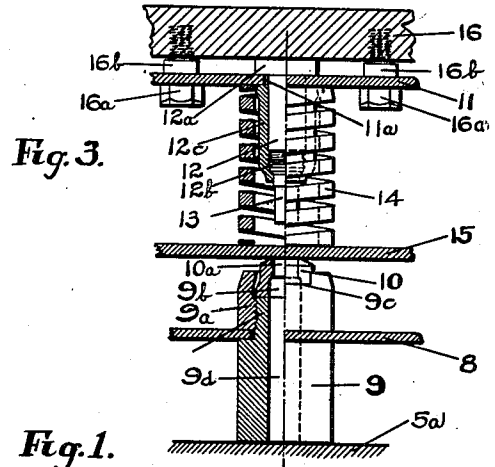
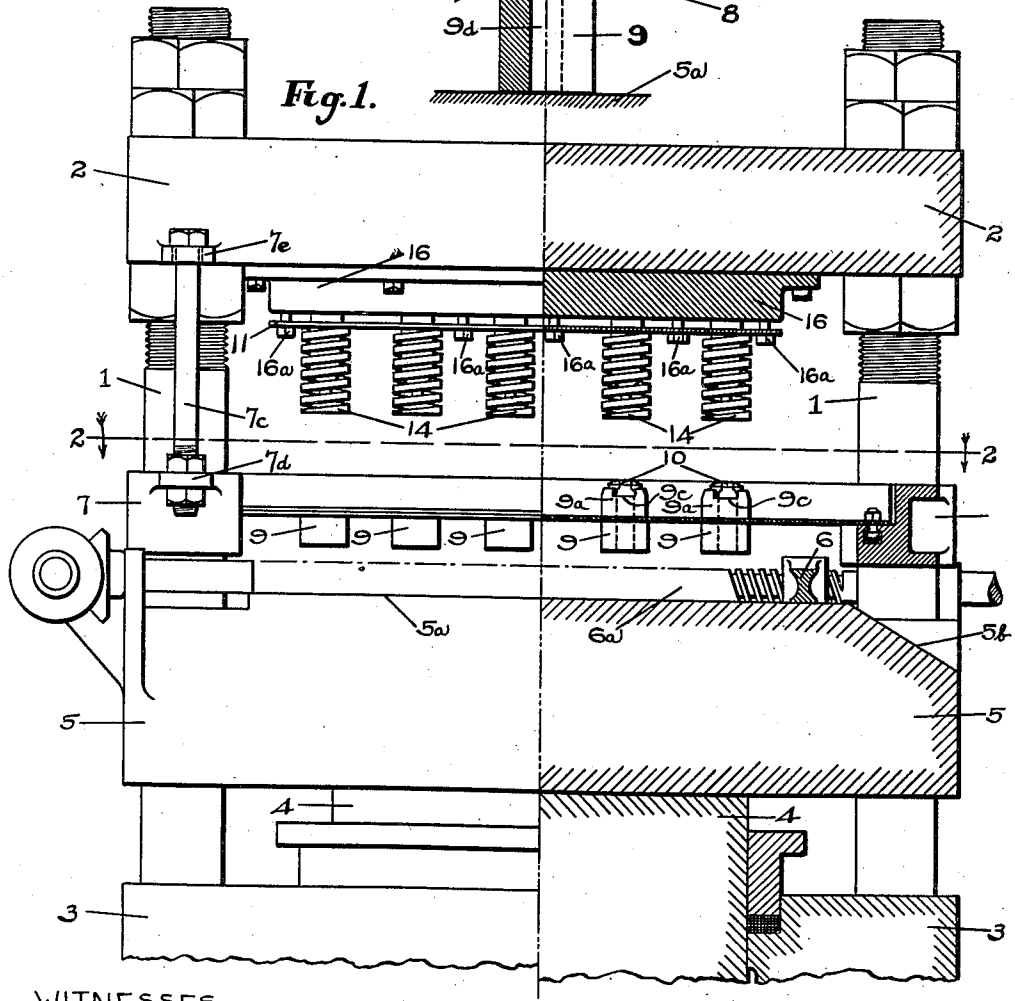


Fig. 1.



WITNESSES:-

R. N. Lowry.

Charles Barnett.

INVENTOR:-

E. W. Summers.

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2 SHEETS—SHEET 2.

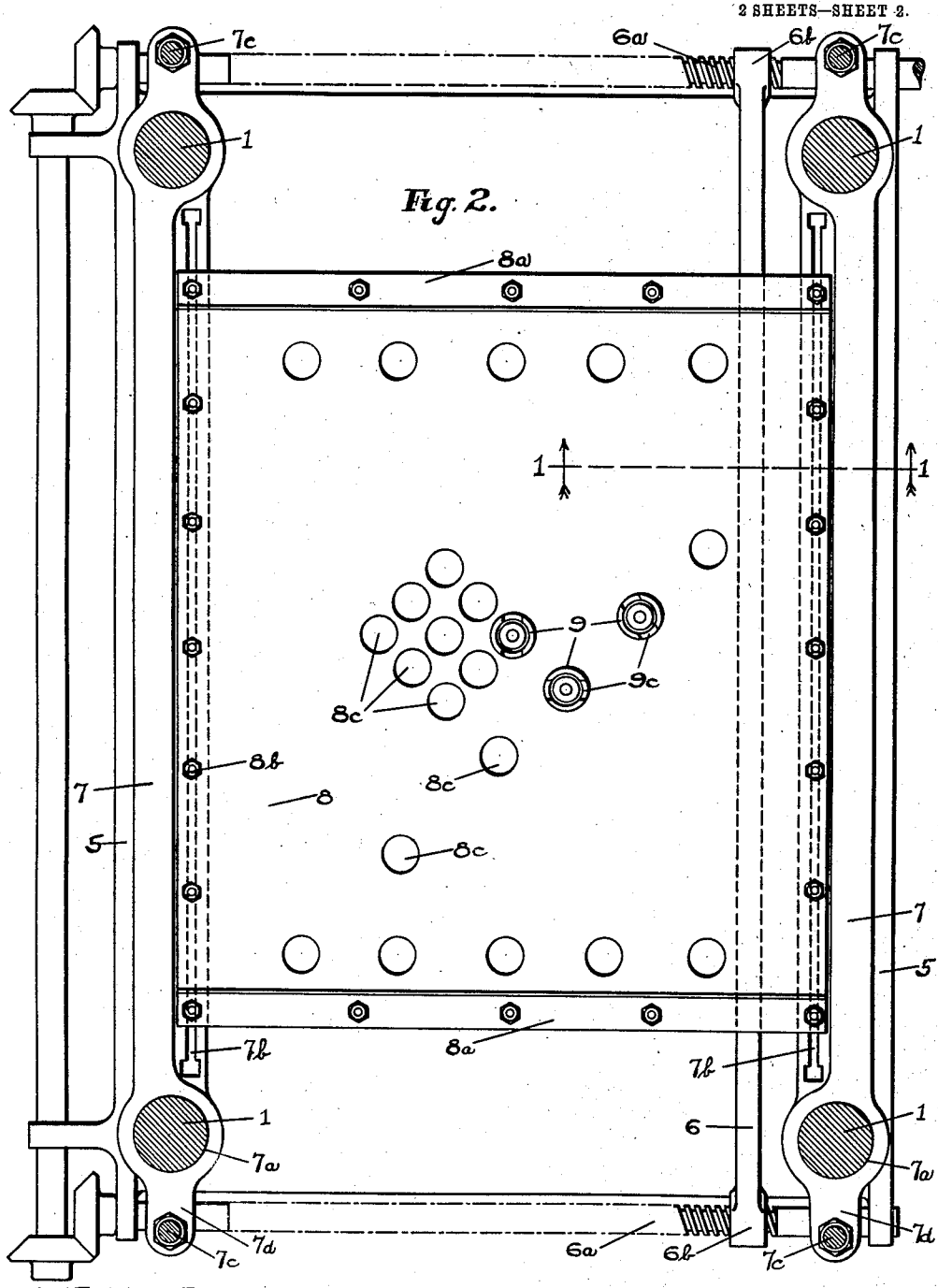


Fig. 2.

WITNESSES:-

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UNITED STATES PATENT OFFICE.

EDGAR WEBSTER SUMMERS, OF WILKINSBURG, PENNSYLVANIA.

METAL-PUNCHING MACHINE.

No. 855,821. Specification of Letters Patent. Patented June 4, 1907.

Application filed February 1, 1907. Serial No. 355,219.

To all whom it may concern:

Be it known that I, EDGAR WEBSTER SUMMERS, of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Metal-Punching Machines, of which improvement the following is a specification, reference being had to the accompanyng drawings, forming part of this specification, in which—

Fig. 1 is an elevation, showing half in section, taken in line 1—1 in Fig. 2., and half in outside elevation of an ordinary hydraulic press, with special features added as hereafter described.

Fig. 2. is a plan view taken in line 2—2 in Fig. 1., showing the top view of a die-holding templet.

Fig. 3. is a large sized detail, taken partly in section and partly in outside elevation of the punch, punch-holder, die, and die-holder.

In the drawings I show an ordinary hydraulic press with its upright columns or bolts 1, its fixed head or cap 2 at the top, its fixed head or base 3 at the bottom, its ram-plunger 4, its ram-head or cap 5, which for convenience I will hereafter in this specification call both the parts 4 and 5 the ram. I show the ram-top-surface 5^a with its end sloping portion 5^b, which sloping portion is also on the opposite side of the ram-head but is not shown in the drawing on account of the outer portion where the column 1 passes through, obstructing the view of the sloping portion. I show the punching-scraper 6 which rests on the surface 5^a and is caused to move along this surface from 5^b on one side to 5^b on the other side by means of the screw-shaft 6^a which engages a corresponding thread in the part 6^b which is on each end of the scraper 6. The purpose of this punching-scraper 6 will be hereafter explained. I show the die-templet-carrier-beams 7 which are provided with working fit holes 7^a at each end for the purpose of guiding their movement up and down on the columns 1. I show the T slot-bolt-holes 7^b, the stop-bolts 7^c, which are fixed to lugs 7^d, and which have a loose sliding fit in lugs 7^e at their top ends. I show any die-templet-plate 8, which may be of a comparatively thin sheet of metal, and may be stiffened to prevent sagging by any number of cross-beams 8^a, which cross-beams may be located in any convenient location across the surface of 8. I show the connecting-bolts 8^b, for attaching the plate 8 to the beam 7. I show the die-connecting-holes 8^c which may be located in any position over the surface of the plate 8, as may be required for punching any combination of punch-holes required. I show the die-holder 9, its clamping-nut 9^a, which is screw connected to the die-holder 9 and which connection clamps the die-holder 9 and 9^a to templet-plate 8, giving a precise location for the die-holder in the templet by means of the turned down portion 9^b of the die-holder 9 which is close fitting in hole 8^c. I show the die 10, which rests on top of the portion 9^b and is held in position by the clamping nut 9^a, and which is smaller in diameter at its top portion than at its bottom portion, which corresponds with the restricted opening in the top of the clamping-nut 9^a, which is for the purpose of preventing the removal of the die 10 through the top of the clamping-nut 9^a, as might be the case when using an electro-magnet for handling metallic plates to and from their position on the dies: Broadly considered, the parts 9 and 10 constitute together the die, the part 10 being the hard wearing face, and the part 9 being the supporting body portion. Without positively holding the dies in the die holder they might all be lifted out and carried away with the metal operated upon. The notched-down portion 9^c in the top of the clamping nut 9^a is for the purpose of applying a wrench for the purpose of turning the clamping nut 9^a on and off the threaded portion of the die-holder 9, avoiding the necessity of using a wrench larger in diameter than the clamping nut 9^a, making it possible to locate die-holders adjacent to each other with their sides touching. The die 10 has the common die-hole 10^a in its top with the enlarged hole 10^b in its bottom, which hole is located over a similarly enlarged hole 9^d which extends though die-holder 9. I show any punch-templet-plate 11, which has punch-connecting-holes 11^a located in exact duplication of the holes 8^c in the plate 8. That is if the plate 11 were superimposed on the plate 8, the center of holes 11^a would coincide with the center of holes 8^c, their outside diameters may differ but their circumferences will be concentric. I show the punch-shank 12 with its enlarged-top-end

12[a] and its threaded-bottom-end 12[b], its clamping-nut 12[c]. I show the ordinary punch 13 which is clamped in position against the lower end of punch-shank 12 by means of the clamping-nut 12[c], which 12[c] may also contact with the under side of the plate 11, gripping such plate 11 between the parts 12[a] and 12[c]. The part 12[c] may be made in two parts dividing the upper part from the lower part if desired, with both parts threaded to the punch-shank 12. I show the push-off-spring 14, which spring 14 has an opening of smaller diameter at the top than farther down, which smaller opening is fitted to the slightly tapered upper portion of the clamping-nut 12[c], and thereby causes such clamping-nut 12[c] to carry or support the spring 14 when it is not otherwise supported. I show between the spring 14 and die 10 a portion of a metallic plate 15, which is shown here for the purpose of illustrating the punch and die in their working position. The push-off-spring 14 is for the purpose of holding the work 15 down on the die during the process of the removal of the punch from the hole it punched. I show the wearing-pad 16 which is bolted or otherwise attached to cap 2. In the wearing-pad 16 a number of holes are tapped for connecting-bolts 16[a], which bolts are used for the purpose of carrying templet 11, and its punches and push-off-springs. Since the punches, the same as the dies may be located in any position over the surface of the templet, it may occur that punch-shank-head 12[a] will cover or partly cover some of the tap-holes for bolts 16[a]. It is proposed to have enough of these tap-holes, located at regular intervals over the surface of the wearing-pad 16, to be able to apply a sufficient number of bolts 16[a] to support the templet and its load, escaping the position occupied by the punches. These tap-holes must therefore be enough smaller in diameter than the part 12[a] to still leave sufficient bearing surface between such part 12[a] and the wearing-pad 16 when tap-holes come within the area of the part 12[a]. I show washers 16[b] which are used to prevent buckling the templet 11 when clamping it to the wearing pad 16. Since in practice a punch will often wedge and stick in the metal which it has punctured and it is required that force be used in withdrawing the punch, I have for convenience used the spring 14, which when the operation of pushing the punch through the metal from the position as shown in Fig. 3, the spring 14 will be compressed and therefore acts in place of the ordinary pull-off which is now commonly in use. With the spring 14 I am enabled to locate a push-off, as I call it, at each punch and thereby prevent lifting the work or metallic plate punched at any point and causing it to buckle and bind on some of the punches as would be the case were the ordinary pull-off located at some point away from the punch and to one side. There is still another advantage; since it is my purpose to use a separate templet for each combination of punch-holes, the expense would be prohibitive if I were to make the templets 11 of sufficient strength to withstand the force necessary to withdraw a number of punches from their wedged position in the material punched, the material 15 being held down from the punch by some external application of force so as to require the punch attachment to the wearing-pad 16 with sufficient rigidity to withstand the pull. In my improved arrangement the operation of forcing the punch through the material causes by its movement the compression of spring 14 and thereby stores up the energy which acts as a push-off and does not depend upon the attachment of the punch-shank 12 to the wearing-pad 16 to perform this holding: I am thereby enabled to locate punches in any position for any assemblage of holes at a much smaller cost than in punching machines heretofore in use.

The operation of punching a hole through steel plates, as is the purpose of this improvement, and through other steel shapes, requires a large force, as for example to punch a 3/4″ hole through a 3/8″ plate, will require a force approximating 5,000 pounds. This force must tend to hold or resist the approach of the punch and die, and therefore requires rigid support backing up these parts, which is in this case supplied by the ram-head 5 and the cap 2. In operation the ram is forced upward by any power selected, preferably hydraulic power. The ram 5 engages the bottom of die-holders 9, contacting the surface 5[a], the die-holders 9 are carried upward taking with them the templet 8, the carrier-beams 7, and sliding step bolts 7[c] up through the lugs 7[e]. Previous to this operation the plate or other material to be punched is placed on top of the dies 10, this is carried upward contacting with the spring 14 as shown in Fig. 3, the springs 14 are compressed, the punches are forced through the plate, the punching or material which is punched from the plate dropping down in the hole 9[b]. The ram then descends, the springs pushing the plate off from the punches, the plate follows the templet downward resting on the dies, the templet and beams 7 are arrested in their downward travel by the bolts 7[c], the ram travels away from die-holders 9, the punchings are resting on the surface 5[a], and then by any application of power the screw-shafts 6[a] are caused to revolve, and by the action of the shaft 6[a] in the part 6[b], the scraper 6 is caused to move across the surface 5[a] and scrape the punchings to either sloping portion 5[b], which is of sufficient inclination to cause the punchings to slide off into any receptacle provided therefor. The

screw-shafts 6^a have their screw-threads continuous from side to side of the surface 5^a, but are only shown in the drawing for a small portion of this distance. Any other scraping device, or even compressed air or other fluid may be used to remove these punchings. It is evident that if the punchings were allowed to remain in the part 9^d and the surface 5^a were to keep in contact with such part 9^d, the continuous operation of punching plates would fill in the part 9^d and prevent further operation. It is also evident that with the great resistance required under the end of the die-holder 9, to withstand the action of punching, it would not be possible to have holes so located in the surface 5^a as to permit the discharge of the punchings, when it is desired to locate dies and die-holders in any position over the surface of the templet or of the surface 5^a. It is further evident that with groups of holes located closely as shown in the center of templet 8 in Fig. 2, it will not be possible to have a side exit for the punchings, I have therefore provided this means of separating the die-holders from their rigid supporting means and have provided a means whereby the punchings can easily be removed.

While I have described an ordinary press in an upright position with the ram at the bottom, and believe this to be a good arrangement, it is evident that the machine might rest in a horizontal position with the top of the machine being the face exposed or shown as in Fig. 1. The punchings in that case would drop away of themselves without the use of the scraper. Many arrangements may be used in assembling this combination without departing from this invention.

I claim:—

1. In a metal punching machine, a supporting means, a thin sheet metal templet plate secured detachably thereto, a plurality of punches carried by the templet plate, and a plurality of compressible members interposed between the templet plate and the article punched, and so arranged as to be compressed during the punching action and adapted on the withdrawing action to support the thin templet plate.

2. In a metal punching machine, a removable sheet-metal templet, combined with a plurality of punches, which punches are held in position on the machine by means of the sheet-metal templet by the attachment of the sheet-metal templet to the machine.

3. In a metal punching machine, a vertically acting ram, a die-supporting-frame above the ram, a punch-supporting-frame above the die, the die-supporting-frame being adapted to move upward with the ram until the punch enters the die, to recede with the ram for a part of its travel, the ram continuing its downward movement away from the die-supporting-frame.

4. In a metal punching machine, a die, a ram, and a punch, the said die being movably supported in an intermediate position between the said punch and ram, the ram being adapted to move toward the punch, engaging the die and moving it to engagement with the punch, and to back off, leaving the die in the intermediate position, the ram moving away from the die, for the purpose set forth.

5. In a metal punching machine, a die, a ram and a punch, the said die being movably supported in an intermediate position above the ram and below the punch, the said ram being adapted to move upward, picking up the die and carrying it to engagement with the punch and back again to its intermediate position, the ram leaving the die; for the purpose set forth.

6. In a punching machine, a plurality of dies, a means of resistance backing-up the dies against the force caused by the action of punching through metal into the die, and provision for separating the dies from the backing-up means for the purpose of removing the punchings.

7. In a metal punching machine, a sheet-metal templet for supporting a plurality of dies on the machine, a ram or head for backing up the dies against the action of punching through metal into the dies, and provision for separating or drawing away the ram or head from the backs of the dies for the purpose of removing the punchings.

8. In a metal punching machine, a sheet-metal templet for supporting and locating a plurality of dies on the machine, a ram for backing up the dies against the action of punching, a scraper which is adapted to pass over the surface of the ram for the purpose of removing the punchings.

9. In a metal punching machine, a sheet-metal templet for holding a plurality of dies on the machine, a backing up device for the dies, the said sheet-metal templet being adapted to suspend the dies in an intermediate position in the machine during the operation of removing the punchings from between the dies and the backing up device.

10. In combination, a punch carrying member, an opposing die carrying sheet metal templet plate movably and adjustably mounted, and a backing up means adapted to engage and support the backs of the dies during the punching action and to be disengaged therefrom to permit of a removal of the punchings behind the dies.

11. In a metal punching machine, a thin sheet-metal templet which is adapted to hold a plurality of dies by means of inserting the said plurality of dies through a corresponding plurality of holes in the said sheet-metal templet, means for clamping the dies in position, and means for securing the templet plate removably in the machine.

12. In a metal punching machine, a sheet-metal templet, combined with a plurality of dies and die-holders, which dies and die-holders are held in position on the machine by means of the sheet-metal templet, and with a backing up device which intermittently supports the dies against the action of punching the metal, and at other times is separated from the dies to permit of the removal of the punchings.

In testimony whereof, I have hereunto set my hand.

EDGAR WEBSTER SUMMERS.

Witnesses:

R. N. LOWRY,

CHARLES BARNETT.