(No Model.) 3 Sheets—Sheet 1.

A. BEAUDRY.

MACHINE FOR PUNCHING AND SHEARING METAL.

No. 421,895. Patented Feb. 25, 1890.

Fig: 1.

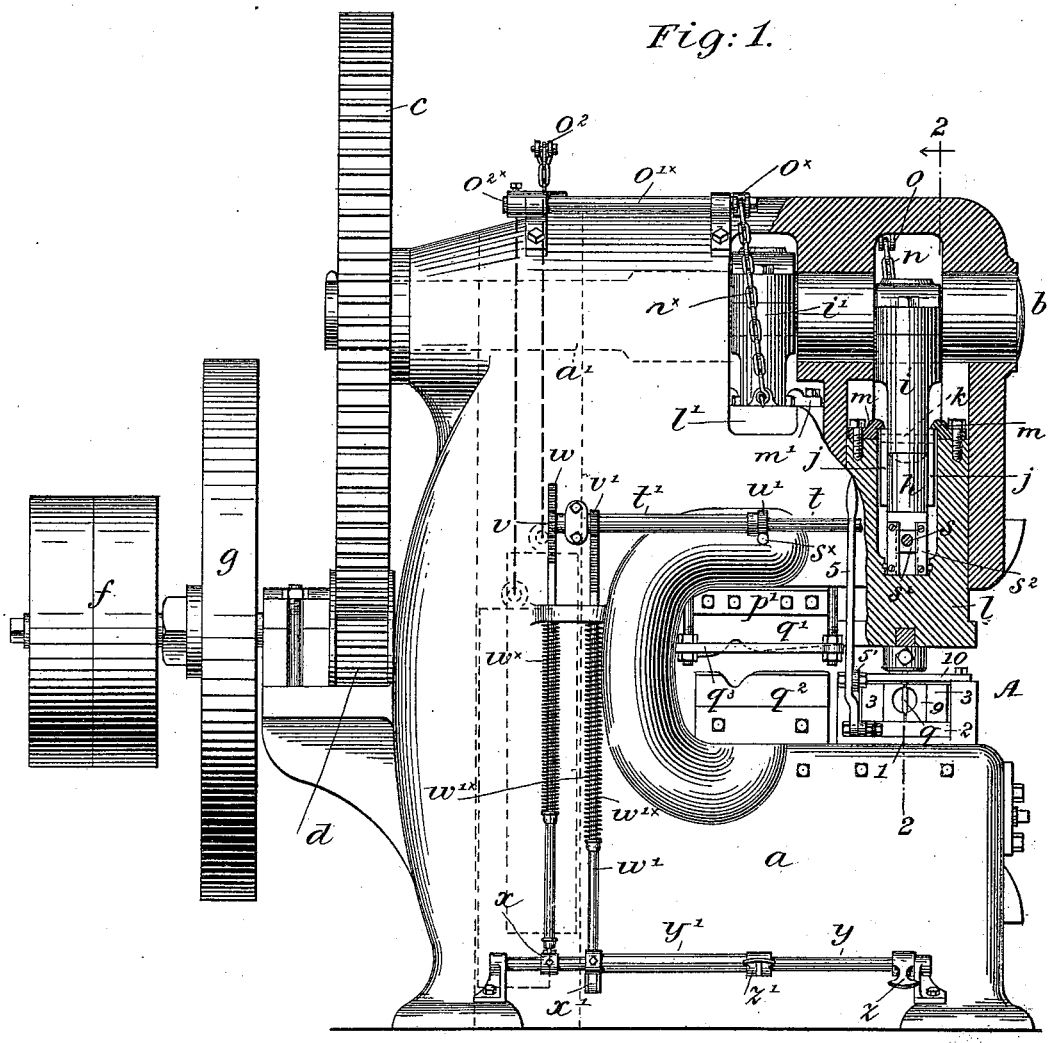

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Fig. 3.

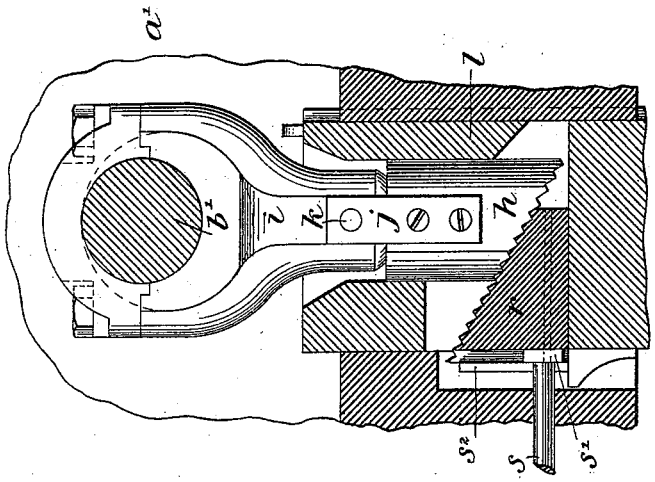


Fig. 3a.

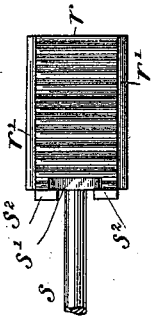
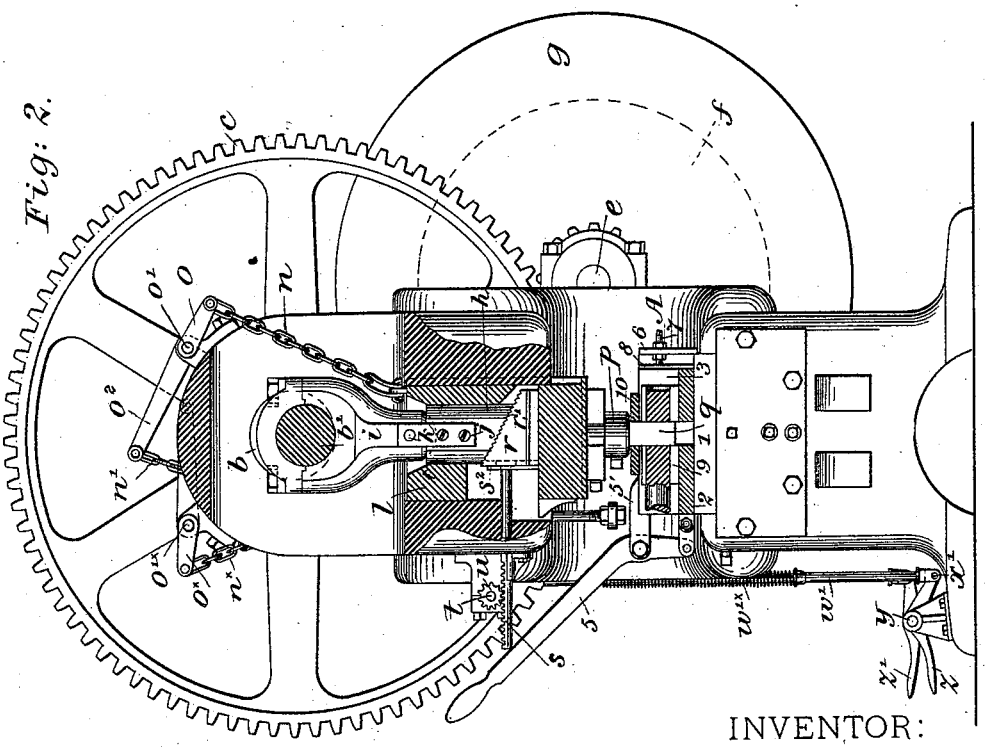


Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

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Fig: 4.

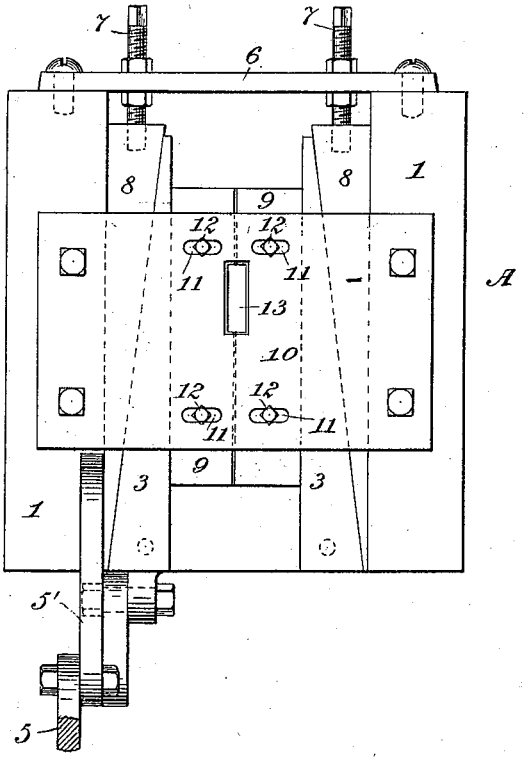
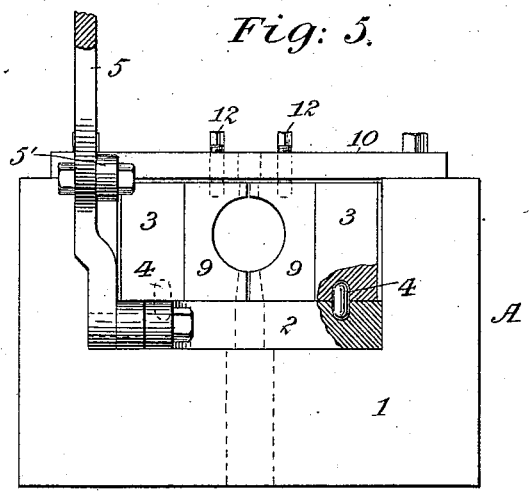


Fig: 5.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR PUNCHING AND SHEARING METAL.

SPECIFICATION forming part of Letters Patent No. 421,895, dated February 25, 1890.

Application filed June 10, 1889. Serial No. 313,805. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER BEAUDRY, a citizen of the United States, and a resident of Boston, Suffolk county, Massachusetts, have invented certain Improvements in Machines for Punching, Shearing, and otherwise Working Metals, of which the following is a specification.

My invention relates to machines for working metals, such as that embodied in my United States Patent No. 362,566, dated May 10, 1887.

In this class of machines the reciprocating plunger or coupling-slide is driven by an eccentric or crank in the main shaft, the extent of its travel being uniform, and the reciprocating tool-carrier or ram, which is counterbalanced by a weight or spring, partakes of the whole or a part only of the movement of said slide, the extent of its movement being controlled by the workman through the medium of suitable mechanism operating in connection with the coupling-slide and with said ram or tool-carrier. My present invention relates in part to improvements in this intermediate controlling mechanism, and in part to the holder for the work that is being punched or otherwise operated on.

In the accompanying drawings, serving to illustrate my invention, I have shown it embodied in a machine provided with two reciprocating rams, one of which is arranged for shearing and the other for punching.

Figure 1 is a side elevation of the machine, a part of the head of the machine and one of the rams being represented in sectional elevation. Fig. 2 is a sectional front elevation of the machine, the plane of the section being indicated by the line 2 2 in Fig. 1. Fig. 3 is a detached fragmentary view, on a larger scale, of a part of the mechanism seen in Fig. 2, but with the parts in different positions. Fig. 3^a is a plan view of the transverse slide detached, on the same scale as Fig. 3. Figs. 4 and 5 are respectively a plan and front view, on a large scale, of the holder for the work.

The heavy frame of the machine may be cast in one piece. *a* represents the base or bed of the machine, and *a'* the overhanging head of the same. In this head is rotatively mounted the main or crank shaft *b*. On this shaft is fixed a spur-wheel *c*, which gears with a pinion *d* on the driving-shaft *e*. On this latter shaft are the driving-pulleys *f* and the fly-wheel *g*. On shaft *b* are set two driving eccentrics or cranks *b'*, Fig. 3, which impart the proper reciprocating motion to two coupling-slides, one of which actuates the punch and the other the shears.

As the mechanism for operating the punch is the same as that for operating the shears, and as the particular tool mounted in the ram is not material to my invention, it will only be necessary for me to minutely describe the parts connected with the operation of the punch.

The connecting-yoke *i*, which embraces the eccentric or crank at its upper end, is coupled at its lower end to the slide *h* through the medium of two ears *j* on the slide, and a coupling-pin *k*, which passes through said ears and the pendent end of the yoke *i*. The coupling-slide *h* is beveled on its lower end and serrated on that end, as clearly shown in Fig. 3. This slide plays in a bore or slide-bearing in the ram *l*, and the upper ends of the ears *j* thereon form shoulders which take under lugs *m* (seen in Fig. 1) on the ram. The purpose of this construction is to enable the slide in its upward movement to raise the ram in case the tool should stick or bind, and withdraw the tool. The ram *l* is mounted in guides in the head *a'* of the machine, and is counterbalanced, preferably, by a weight. This counterbalancing device consists of a chain or other flexible connector *n*, secured to the upper end of the ram *l* and to an arm *o* on a rock-shaft *o'*, mounted on the machine-head *a'*. On the other end of the shaft *o'* is an arm o^2, from which another chain or connector *n'* extends down to a suitable weight within the hollow of the machine-frame. As such counterbalancing mechanisms are not new of themselves and as weights are common devices, I have not deemed it necessary to show them in the drawings. In the ram *l* is secured a tool-carrier *p*, in which is a punch *q*.

The device whereby the workman controls the movements of the ram and allows it to partake of more or less of the movements of the coupling-slide will now be described.

Mounted in a cross mortise or aperture in the ram and arranged to play transversely

through said mortise is a transverse slide r, (seen detached in Fig. 3ª,) the upper face of which is beveled to correspond with the bevel on the end of the coupling-slide h, and serrated also like the beveled end or face of said slide. The transverse slide r has ribs or flanges r' on its opposite sides, which engage corresponding grooves in the faces of the mortise in which said slide plays. These ribs and grooves serve as keepers or guides to prevent the slide r from rising in its slideway. It will be obvious from what is described in my former patent that the extent to which the ram is to partake of the downward movement of the coupling-slide h will depend on the position of the transverse slide r. If this slide is pushed in to its fullest extent, as represented in Fig. 2, then the ram will partake of the full movement of the coupling-slide; but if the transverse slide be partly withdrawn, as represented in Fig. 3, the ram will partake of only a part of the movement of the coupling-slide. The serrations of the surfaces of the two slides that are in contact prevent the slipping of one beveled face on the other when the pressure is brought to bear, and avoids the lateral or side strain on the coupling-slide which would ensue if the surfaces were smooth.

In order that the workman may move the transverse slide r in more or less, as desired, by means of a treadle, I provide the mechanism I will now describe. A rack s is mounted horizontally in the head of the machine, its inner end projecting into an opening in the side of the ram l. On this inner end of the rack is a cross-head s', which engages cross-head guides or keepers s^2 on the end of the transverse slide r. By moving this rack in or out in its slide-bearing in the head of the machine the transverse slide will be moved in or out with it; but as the transverse slide moves up and down with the ram at right angles to the movement of the rack this cross-head and its guides are necessary to permit of this independent movement of the rack and slide. The rack s is moved in and out by means of the following-described mechanism: On the side of the machine-head a' is rotatively mounted a shaft t, on which is secured a pinion u, (seen in Fig. 2,) which gears with the rack s. On the other end of the shaft t is secured a pinion v, which gears with an upright rack w, the lower end of which is coupled to an arm x on a treadle-shaft y, mounted in bearings on the bed a. On this shaft is a treadle z. By pressing on the treadle z with his foot the workman drives up the rack w, rotates the shaft t, and thus pushes in the rack s and transverse slide r. When he removes his foot, a spring $w^\times$ on the rack w reverses the movement and automatically withdraws the transverse slide, thus rendering the ram l inoperative.

I will now briefly enumerate the corresponding parts of the shears (at the left in Fig. 1) so far as they appear on the drawings.

I prefer to set the cranks or eccentrics b' in shaft b opposite, so that one ram will be elevated when the other is lowered, and this position is seen in Fig. 1. The connecting-yoke i' of the shears is coupled to a coupling-slide like slide h; but this slide does not appear in the drawings. l' is the ram of the shears, and m' the lugs thereon. p' is the tool-holder in this ram, and q' the upper or moving blade of the shears secured in said holder. q^2 is the lower or fixed blade of the shears, and q^3 is the stripper-bar. The counter-balance for the ram l' comprises a rock-shaft $o'^\times$, having arms $o^\times$ and $o^{2\times}$, to which are attached, respectively, the chain or connector $n^\times$ and the chain leading to the weight. The weights are represented in dotted lines in Fig. 1. To operate the transverse slide in the ram l', I employ a horizontal rack $s^\times$, like rack s, a sleeve t' on shaft t carrying a pinion u', which gears with rack $s^\times$, and a pinion v', which gears with an upright rack w'. This rack is coupled at its lower end to an arm x' on a sleeve y' on shaft y, said sleeve having an operating-treadle z'. On the rack w' is a retracting-spring $w'^\times$.

The serrations on the beveled faces of the slides h and r are not in the form of steps—that is, they do not have their respective faces arranged perpendicular to and parallel with the axis of the slide h. On the contrary, the planes of these faces stand at less than a right angle with the axis of the slide, and at right angles, or nearly so, with each other. The object of this construction is to prevent any lateral slip of one beveled face on the other when the pressure is brought to bear.

I will now describe the construction of the holder for the article being punched or operated on, and will refer specially to Figs. 4 and 5 for a fuller understanding of this device.

A is the holder as a whole. This holder, as here represented, is designed for gripping, steadying, and centering a cylindrical bar or shaft while a hole is being punched diametrically through the same.

1 is the base or shoe of the holder, which will be secured to the bed a of the machine in the position represented in Figs. 1 and 2. In the upper face of this shoe is a slideway or recess, in which rests a slide-plate 2, on which are mounted two wedges 3 3, which are pivotally secured to the said slide-plate at their broader ends by vertical pins or studs 4 4. In Fig. 5 portions of the wedge and plate are broken away to show the stud 4. By means of a lever 5, pivotally fulcrumed on the fixed shoe 1 and coupled at 5′ to an arm on the slide-plate 2, the workman may slide said plate to and fro in the slideway in the shoe. The plate carries the wedges 3 3 with it, by reason of the pivotal attachment of the latter to said plate, but the wedges are free to play or swing laterally. At the back of the shoe is secured a bar 6, through which pass adjusting-screws 7 7, which screw into the ends, re-

spectively, of two wedges 8 8, which stand in the slideway in the shoe, between the lateral walls of the slideway and the inclined faces of the wedges 3 3. The screws 7, which are provided with lock-nuts, enable the wedges 8 to be set in or out, as required. These wedges 8 rest on the slide-plate 2. Between the inner (and parallel) faces of the wedges 3 3 are placed two clamp-jaws 9 9, in the juxtaposed faces of which are formed the grooves which fit the bar to be punched. In the present case each jaw 9 has a half-round groove in its face, and the two jaws are thus adapted to embrace a cylindrical bar. These jaws rest on the slide-plate 2, and to prevent them from moving to and fro with said plate I mount on the shoe 1 a stripper 10, which extends over the slideway therein; and I form in this plate laterally-extended slots 11, through which pass pins or screws 12, that are fixed in the jaws 9. The slots allow the jaws to open and close to a sufficient extent, but do not allow them to move endwise. In the stripper-plate, the jaws, the slide-plate, and the shoe are formed the necessary coinciding apertures for the passage of the punch. These are indicated in Fig. 4 by the numeral 13.

The operation is as follows: Suppose a mortise or aperture is to be formed by punching in a cylindrical bar of the proper size to fit the space between the jaws. The workman draws back the slide-plate 2, carrying the wedges 3, by means of the lever 5, and this frees the jaws 9, so that they can separate a little laterally. He now inserts the bar between the jaws and forces the wedges 3 in again with the lever. This causes the wedges to drive the jaws inward equally, so that they will "center" the bar and clamp it firmly. The punch now descends and punches a hole diametrically through the bar. After the punch withdraws the workman again draws back the slide-plate and wedges to an extent sufficient to free the jaws, when the bar may be drawn out. The construction of the jaws is such as to preserve the normal cylindrical form of the bar at the point where the punch passes through. The jaws may be made to fit and clamp a bar or piece of metal of any form, size, or contour.

The wedges 8 are fixed while the punching is going on, and they might be fixed permanently to the shoe 1. I make these wedges 8 adjustable in order to adapt them for clamping jaws 9 of different widths. I have for simplicity denominated the parts s, $s^{\times}$, w, and $w^{\times}$ "racks," although each has teeth for a portion of its length only.

Having thus described my invention, I claim—

1. The combination, with the ram mounted in guides, of the coupling-slide mounted in guides in said ram and provided with a beveled and serrated face, means for imparting a reciprocating motion to said slide, means for balancing said ram and its attachments, the transverse slide mounted in and carried by said ram and having a beveled and serrated face, and means for imparting an in-and-out movement to said transverse slide, as set forth.

2. The combination, with the ram l and the transverse slide r mounted therein, and provided with keepers s^2, of the mechanism for actuating said slide, said mechanism comprising a rack s, mounted in sliding bearings in the head of the machine and provided with a head s', engaging the keepers on the slide, the upright rack w, the shaft t, the pinions u and v thereon, gearing, respectively, with the racks s and w, the treadle and its shaft, whereby the rack w is operated, and the retracting-spring connected with said rack w, all operating substantially as set forth.

3. The combination, with the two rams arranged abreast and the transverse slides arranged therein, of the mechanism for actuating said slides, comprising the two racks s and $s^{\times}$, the shaft t, and the pinions u and v thereon, the tubular shaft, the former gearing with the rack $s^{\times}$, the upright racks w and w', gearing, respectively, with the pinions v and v', the treadle-shaft y, provided with a treadle z, and an arm x, to which the rack w is coupled, the tubular treadle-shaft y' on the shaft y, and provided with a treadle z' and with an arm x', to which the rack w' is coupled, and the retracting-springs on the said upright racks, as set forth.

4. A holder for the piece being operated on, comprising the shoe 1, having a slideway, the slide-plate mounted therein, the operating-lever coupled to said slide-plate, the wedges 3 3, pivotally attached to the slide-plate and embracing the clamping-jaws, the said clamping-jaws furnished with stops to prevent their endwise movement, and the wedges 8 8, arranged between the walls of the slideway and the movable wedges, all combined and arranged substantially as described.

5. A holder for the piece being operated on, comprising the shoe 1, having a slideway, the slide-plate in said slideway and its operating-lever, the movable wedges pivotally connected at their broader ends to the slide-plate and resting thereon, the jaws 9, embraced between said movable wedges, the wedges 8, arranged between the movable wedges and the walls of the slideway, and the screws for adjusting said wedges 8, all combined and arranged substantially as set forth.

6. A holder for the piece being operated on, consisting of the shoe 1, having a recessed slideway, the stripper-plate 10, mounted on said shoe and bridging said slideway, the clamping-jaws arranged in said slideway under the stripper-plate, the studs 12, fixed in said jaws, respectively, and projecting through slots 11 in the stripper-plate, the slide-plate and its operating-lever, the movable wedges

carried by the slide-plate and embracing the clamping-jaws, and the non-moving wedges arranged, respectively, between the movable wedges and the walls of the recessed slide-way, all combined and arranged substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ALEXANDER BEAUDRY.

Witnesses:
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R. A. SEARS.