(No Model.) 3 Sheets—Sheet 1.

N. C. STILES.

PRESS FOR HOLDING AND CUTTING SHEET METAL.

No. 299,290. Patented May 27, 1884.

Fig. 1

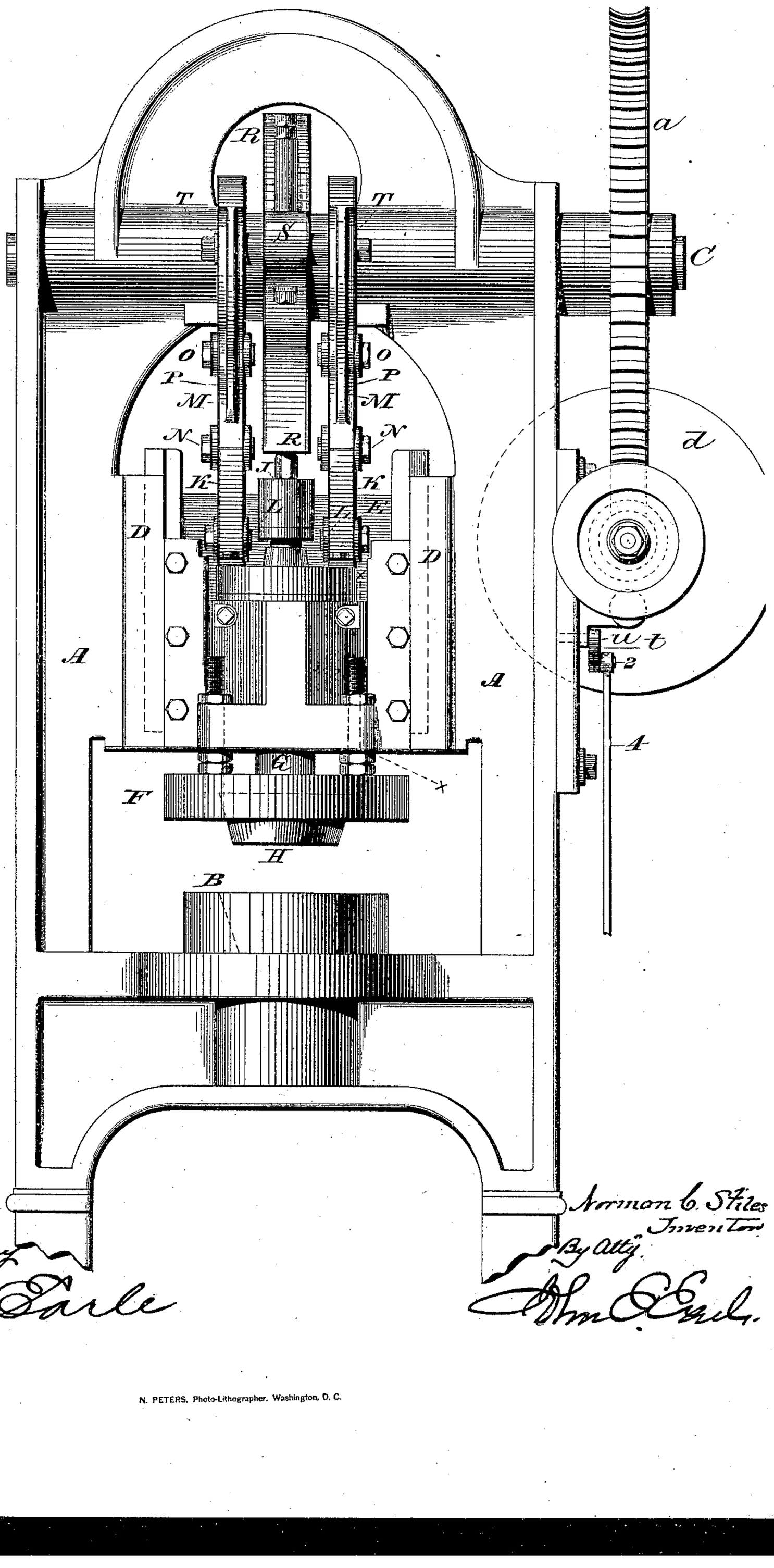

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Fig. 2

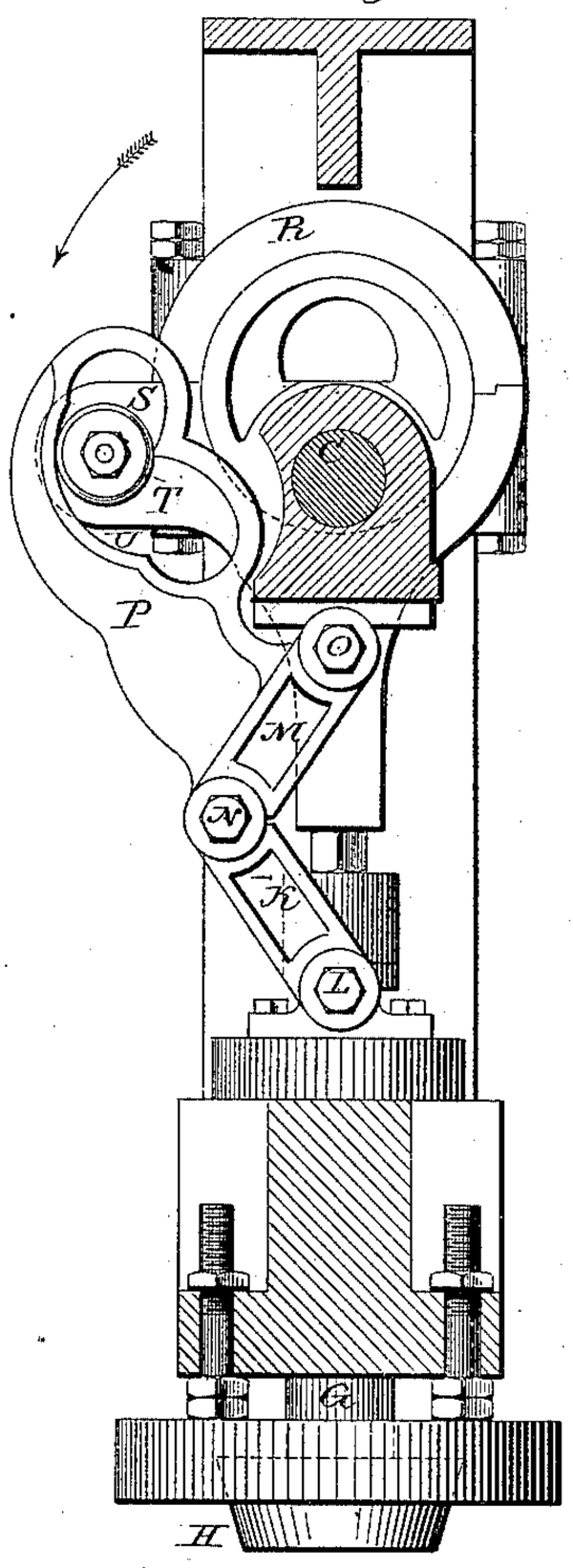


Fig. 3

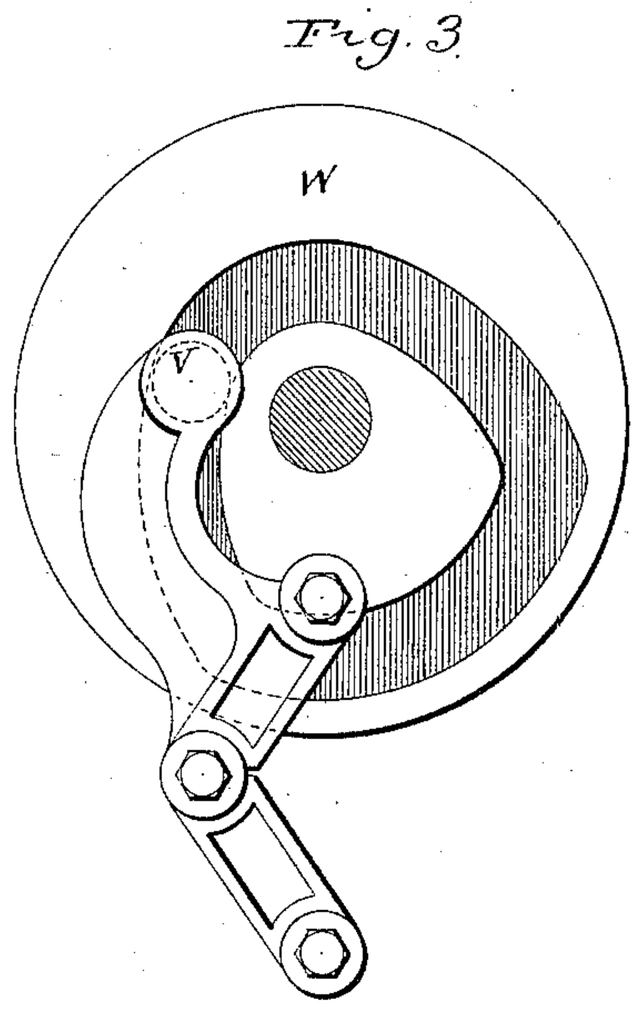
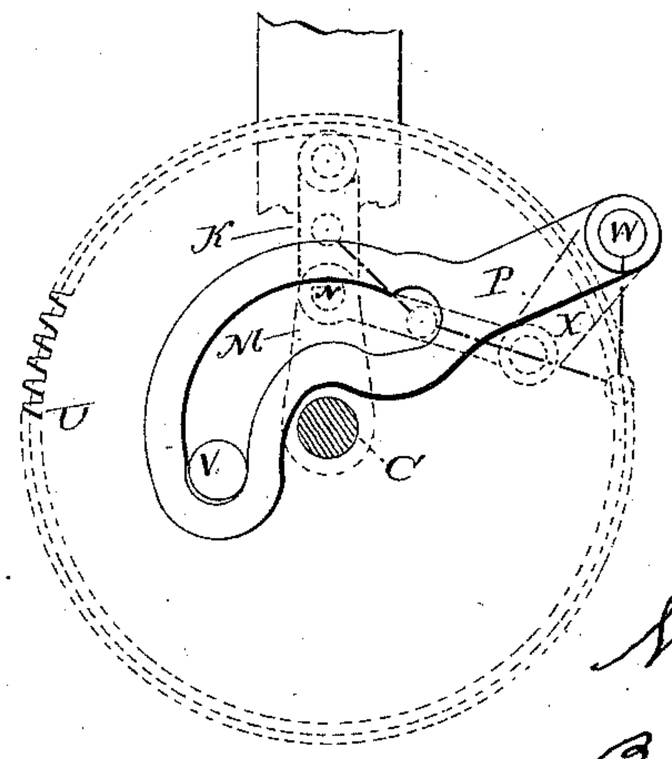


Fig. 4



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(No Model.) 3 Sheets—Sheet 3.

N. C. STILES.

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Fig. 5

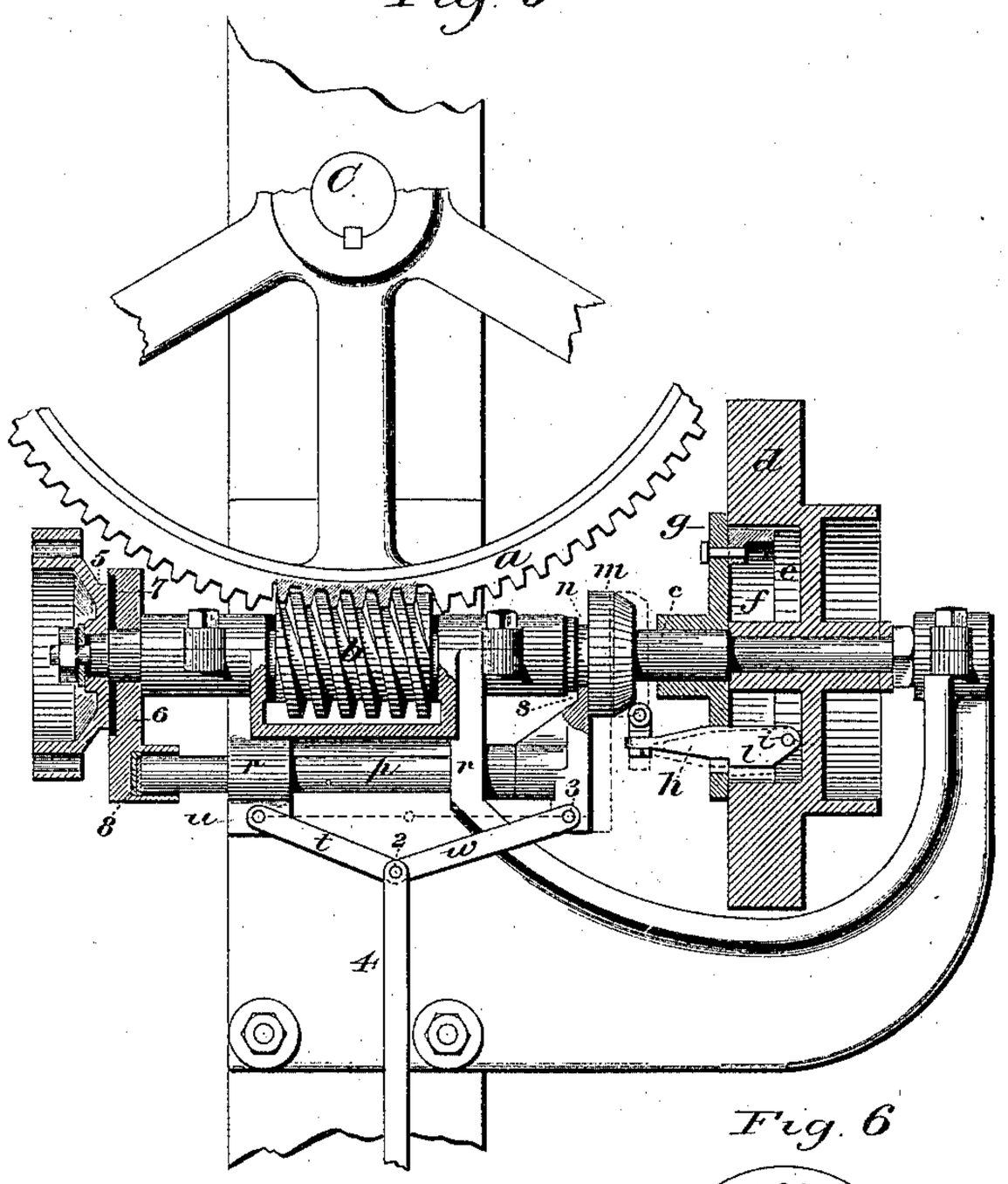
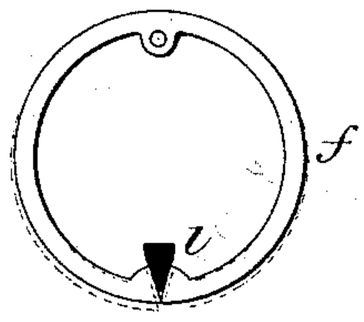


Fig. 6



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UNITED STATES PATENT OFFICE.

NORMAN C. STILES, OF MIDDLETOWN, CONNECTICUT.

PRESS FOR HOLDING AND CUTTING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 299,290, dated May 27, 1884.

Application filed December 10, 1883. (No model.)

To all whom it may concern:

B it known that I, NORMAN C. STILES, of Middletown, in the county of Middlesex and State of Connecticut, have invented a new Improvement in Power-Presses; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a rear view of the press, the lower part of the base broken away; Fig. 2, a sectional side view on line *x x*, Fig. 1; Figs. 3 and 4, modifications; Fig. 5, a sectional side view showing the clutch mechanism; Fig. 6, the frictional ring detached.

This invention relates to an improvement in that class of power-presses in which two operations are to be performed—as, for instance, one device serves to hold the disk of metal, while the second part forces that metal into a die, gradually drawing it from the holding devices. Such presses usually employ two slides independent the one of the other, and commonly called "double-action presses." In the more general construction of this class of presses the auxiliary or holding slide is moved by a cam or cams acting through direct connecting-rods. The sheet or blank to be operated upon lies upon a flat surface surrounding the die, and so that the punch as it approaches the die will strike the surface of the metal on the side opposite the die and force the sheet or blank down into the die, drawing, contracting, or expanding the metal, so as to bring it to the shape of the space between the punch and the die. To prevent the fulling up or puckering of the blank in such drawing operation, the auxiliary or holding slide is employed to bring a flat surface corresponding to the flat surface surrounding the die down upon the blank which lies upon the die, and so as to grasp the blank or sheet between them; then as the punch advances to force the blank into the die the sheet or blank is gradually drawn outward from between the clamping-surfaces in its flat condition, and because of being held in its flat condition it cannot pucker or wrinkle. The clamping of the blank must be only with sufficient force to prevent the too rapid drawing of the blank from between those clamping-surfaces. A very nice adjustment is therefore necessary between the two holding or gripping surfaces, and in the use of a cam for forcing these surfaces together, as usually employed, acting through direct connections, a very slight wear upon the cam or surface upon which it operates disturbs this proper relation of the two surfaces.

The principal object of this invention is to operate the movable part of the holding device through a toggle-joint, whereby the wear upon the cam will not materially, if at all, affect the relation of the holding devices; and the invention consists in combining with the slide which carries the movable holding-surface a toggle through which from the driving-shaft the reciprocating movement is imparted to said holding-slide, and as more fully hereinafter described.

The second part of this invention relates to the clutch whereby the power is applied or cut off, as occasion may require. The clutch is usually operated by a slide or bar parallel with the shaft, and the clutch of that class known as "friction-clutches." So great power is required to force the clutch into perfect working condition that it is often difficult to make a proper engagement. The object of this part of my invention is to adapt a toggle to the movement of the clutch-bar, whereby a great force or power is easily applied; and in such construction, as more fully hereinafter described, this second part of my invention consists.

I first illustrate my invention as applied to a press in which both the punch and holding-slides are operated from a shaft above.

A represents the uprights of the press, in which, at the base, the die B is arranged in the usual manner; C, the driving-shaft, arranged above in suitable bearings and in substantially the usual manner.

Between vertical guides D D the slide E is arranged. This slide E carries at its lower end a plate, F, of larger extent than the opening in the die, and so that its under face will stand parallel to the upper face surrounding the opening in the die, and so that a blank or sheet laid upon the upper surface of the die, and the plate F brought down thereon, will grip the blank between the die and the holding-plate F.

Through the slide E the punch-carrying slide G is arranged, and so as to be guided in its movement parallel with the said slide E. It is arranged concentrically over the die B, and carries the punch H, corresponding in the usual manner to the cavity in the die B. The punch-slide G is in connection with an eccentric-strap, R, around an eccentric on the driving-shaft C, the connection between the eccentric-strap and the punch-slide, as here represented, being a ball-and-socket joint, J, and so that at each revolution of the shaft C an up-and-down or reciprocating movement is imparted to the punch-carrying slide G in substantially the usual manner for such slides.

To the slide E the toggle arrangement is applied. In the illustration I show two toggles—one each side the center.

K K represent one link of each toggle hinged to the slide E, as at L; M M, the corresponding toggle-links, their lower ends hinged to the upper ends of the links K, as at N, their upper ends hinged to the frame of the machine, as at O. The toggles are arranged to work in a plane at right angles to the axis of the shaft C and parallel with the plane of the eccentric on the driving-shaft.

From each of the upper links, M, an arm, P, extends outward in substantially the same plane as the link, and through which the vibratory movement is imparted to the toggles. As represented, the vibratory movement is imparted from the eccentric-strap R. On this strap a radial projection, S, is made, carrying a friction-roll, T, upon each side, and stands between the two arms P. The arms P are constructed with a cam-shaped slot, U, within which the rolls T work, the shape of the slot being as shown, so that as the eccentric starts from its up position and descends, revolving in the direction indicated by the arrow, the rolls T on the strap force the arm P downward, turning upon the center O, which will correspondingly throw the center joint, N, of the toggles rearward and force the holding-slide E downward a little in advance of the punch-slide, and so that when the toggles come into vertical line the holding-plate which the slide E carries will have come upon the surface of the blank resting on the die, and so as to grip that blank between those two surfaces. Then the toggle stands, holding the slide in that position until the punch descends to force the blank into the die, and in such forcing the punch gradually draws the blank from between the holding-surfaces into the die. Then, as the eccentric continues its revolution to withdraw the punch, the rolls operate within the slot upon the opposite side to turn the arm P upward and open the toggles, thereby raising the holding-slide E to its first position.

I illustrate the adjustment between the toggles and the holding-slide, whereby the holding-surface may be set with relation to the surface of the die according to the thickness of the metal; but this is a device well known, and requires no particular description. So far as the present invention is concerned, it is only necessary to state that the toggles are connected to the slide which carries the movable holding-surface.

While I prefer to operate the toggles by a projection from the eccentric-ring, which is in connection with the punch-slide, the arms may be acted upon by independent cams arranged on the driving-shaft, as seen in Fig. 3, the arm provided with a stud, V, to work in the groove of the cam W, the shape of the groove being such as to give the required movement to the toggle to bring the holding-surface onto the blank and retain its hold during the operation of drawing out.

In case of the use of the grooved cam W, other known mechanism—such as a crank—may be substituted for the eccentric to impart reciprocating movement to the punch-bearing slide.

Instead of anti-friction rolls T, it will be readily understood that there may be substituted therefor a fixed stud, the rolls being preferable for obvious reasons.

In the larger classes of presses the mechanism for operating the slides is arranged below. In that case it is inconvenient to operate the toggles directly from the same eccentric which operates the punch.

I illustrate in Fig. 4 a modification of my invention adapted to this class of presses, C being the driving-shaft, but arranged below, instead of above, as in the first illustration. In this illustration I show the arm P in full lines. The toggles and their connections are shown in broken lines, as they would not appear in full lines in such a figure. The toggles are shown as in their extreme closing movement, the open position being shown by single broken radial lines. The shaft C carries a gear, U, to which power is applied for driving the press. One link, K, of the toggle is hinged to the slide which carries the holding-plate. The other link, M, is hinged by one end to the link K, the other end of the link hung upon the shaft C.

Instead of making the arm P a part of the link M, I make it in the form of a lever, as seen in Fig. 4, and construct it with a slot in which a crank-pin, V, on the wheel U works, and travels through the slot in the arm P, so as to impart a vibratory movement to that arm, that arm being hung upon a rock-shaft, W, at one side, and from the rock-shaft an arm, X, extends, and to that arm a connecting-rod is hinged, which extends into connection with the joint N of the toggles, and so that as the vibratory movement is imparted to the lever P in one direction it will bring the toggles into the vertical central line, as shown, or in the opposite direction will open the toggles, as indicated in broken radial lines. This movement of the toggles imparts the same reciprocating movement to the holding-slide as described in the first illustration, the shape of the slot in the arm P as in the first

illustration is such as to give movement to the holding-slide a little in advance of the punch, and when the blank is properly gripped it stands until the punch has ceased its operation upon the blank. By thus arranging the toggles so that they are brought into a direct line through their hinging-points a positive fixed position is determined for the holding-surface. The wear of the cam by which the toggles are operated does not materially effect their position, as it must do in presses where the connection is direct from the acting-cam to the slide. The wear upon the joints of the eccentric is so slight as not to require consideration.

The first part of my invention is not to be understood as limited to operating the toggles directly from the same eccentric which carries the punch-slide.

The second part of my invention, which relates to the clutch mechanism, is shown in Figs. 5 and 6. The power as here represented is applied to the press through a gear, *a*. This gear is driven by a worm, *b*, on a transverse shaft, *c*, on which the driving-pulleys *d* are loosely arranged. The pulleys are constructed with a concentric chamber, *e*, within which a divided ring, *f*, is arranged. This ring fits loosely within the chamber *e*. On the shaft *c*, outside this chamber, a plate, *g*, is made fast, and so as to revolve with the shaft. A lever, *h*, is hung upon a fulcrum, *i*, on the plate, and so that the lever becomes a fixture upon the plate to stand or revolve with it, as the case may be, the nose *l* of the lever extending within the chamber, and between the two ends of the divided ring, as seen in Fig. 6. The divided ring is also hung to the plate diametrically opposite the division, as seen in Figs. 5 and 6, and so that the ring revolves or stands with the plate *g* and the shaft, as the case may be. The nose *l* is wedge shape, as seen in Fig. 6, and so that if the lever be turned to force the nose *l* between the two ends, the result will be the expansion of the ring to the extent of the wedge-like action of the nose, and this expansion is sufficient to bring the outer surface of the ring into close contact with the inner surface of the chamber *e* in the pulleys. The ring is fixed to the plate *g* and the shaft; hence the pulleys, being revolved by power whenever the ring is thus expanded, the revolution of the pulleys is communicated to the shaft *c*. This is a common construction of clutch, and constitutes no part of my invention.

On the shaft *c* is a conical-shaped collar, *m*, free for longitudinal movement, and in the collar is an annular groove, *n*.

Parallel with the shaft *c* is a sliding bar, *p*, arranged in suitable guides, *r*, and which carries a fork, *s*, standing in the annular groove *n* on the collar *m*. The collar *m* is arranged to bear against the outer end or longer arm of the lever *h;* hence by forcing the collar *m* toward the pulley its conical surface will act like a cam upon the longer arm of the lever *h* and turn that arm outward and force the nose *l* between the ends of the divided ring and cause its expansion, as seen in broken lines, and as before described. Withdrawing the collar releases the lever *h* and permits it to escape from its wedging position between the ends of the ring, as shown, to disengage the pulley from the shaft.

To move the bar *p* and easily apply a strong force thereto, I hinge one link, *t*, of a toggle to the frame, as at *u*. The other link, *w*, I hinge by one end to the free end of the other link, as at 2. The other end of the link *w*, I hinge to the bar *p*, or some projection therefrom, as at 3.

From the central joint, 2, I extend a rod, 4, to any convenient pedal, so that the operator, applying his foot to the pedal, will raise the toggle, as seen in broken lines, and thereby force the slide *p* and the collar *m* into the engaging position seen in broken lines, or to draw the slide from that position whenever it shall be desired to disengage the power. When the power is disengaged from the press, it is desirable that the movement of the slides shall be quickly stopped and not permitted to continue their movement under the momentum of the fly-wheel. To accomplish this, I fix a plate, 5, to the shaft, and on the shaft I arrange a corresponding plate, 6, which is free or loose upon the shaft—that is, so that the shaft may revolve without imparting revolution to the shaft. The face of this plate is provided with leather or any suitable material, 7, which will produce great friction between the two surfaces; and I arrange this plate in relation to the bar *p*, so that as the bar *p* is drawn backward to disconnect the power it will be brought to bear upon the plate 6, as at 8, under the force applied to the toggle through the disengaging-pedal, and this operation will force the plate 6 against the plate 5, bringing their frictional surfaces together, so as to create sufficient friction to produce almost an instantaneous stopping of the machine. The plate 6 is prevented from rotation by the end of the slide 5 entering or standing in a recess in that plate, or it may be otherwise prevented from rotation.

In illustrating the frictional clutch which engages the driving-pulley, I have employed a clutch of common and well-known construction; but it will be understood that any of the well-known clutches operated by a longitudinally-moving collar on the shaft may be substituted therefor. This part of my invention, therefore, is not to be limited to the particular frictional mechanism shown.

I claim—

1. In a double-action power-press, the combination of the vertical slide carrying the movable holding-surface, a vertical movable slide carrying the punch, mechanism, substantially such as described, to impart reciprocating movement to the punch-slide, a toggle or toggles, one link of which is hinged to the slide which carries the holding-surface, the other link hinged to a fixed point in the frame, and

mechanism, substantially such as described, between the links and the driving-shaft, whereby said links are forced into line to bring the holding-slide to its grasping position in advance of the punch, and retain said links in line during the operation of the punch, and then to turn said links out of line to withdraw the holding-slide, substantially as described.

2. In a double-action power-press, the combination of the vertical slide carrying the movable holding-surface, a vertical movable slide carrying the punch, mechanism, substantially such as described, to impart reciprocating movement to the punch-carrying slide, a toggle or toggles, one link of which is hinged to the slide which carries the holding-surface, the other link hinged to the frame, an arm extending from one of the links, and mechanism, substantially such as described, to operate upon said arm, whereby the reciprocating movement is imparted to said holding device, substantially as described.

3. In a double-action power-press, the combination of the two vertical reciprocating slides, the one carrying the blank-holding device, the other the punch, a revolving driving-shaft, an eccentric thereon, a ring upon said eccentric and within which the eccentric revolves, the said ring in connection with the punch-carrying slide, whereby in the rotation of the eccentric a reciprocating movement is imparted to said punch-carrying slide, and a toggle or toggles, one link of which is hinged to the blank-holding slide, the other link hinged to the frame, one of said links provided with an arm extending therefrom toward the eccentric-ring, the said ring provided with a stud arranged to operate upon said arm to impart to it a swinging movement; whereby the eccentric-ring in imparting reciprocating movement to the punch-carrying slide also imparts a vibratory movement through said arm to the toggles, and thence a reciprocating movement to the blank-holding slide, substantially as described.

4. In a double-action power-press, the combination of the two vertical reciprocating slides, the one carrying the blank-holding device and the other the punch, a revolving driving-shaft, an eccentric thereon, a ring on said eccentric and within which said eccentric revolves, said eccentric-ring connected to the punch-carrying slide, and whereby reciprocating movement is imparted to said punch-carrying slide, a toggle or toggles, one link of which is hinged to the blank-holding slide, the other to the frame, one of the links constructed with an arm extending therefrom toward the eccentric, and constructed with a cam-shaped slot, and a stud on the eccentric-ring working in said cam-shaped slot, whereby through said arm and toggles reciprocating movement is imparted to said blank-holding slide, substantially as described.

5. The combination of the shaft *c*, the driving-pulleys loose thereon, a frictional clutch between said pulleys and shaft, the collar *m*, longitudinally movable on said shaft, the sliding bar *p*, in connection with said collar, and the toggle *t w*, one link hinged to the frame, the other to the bar *p*, and a connection from the toggle, whereby reciprocating movement may be imparted to said slide, substantially as described.

6. The combination of the shaft *c*, the driving-pulleys loose thereon, a frictional clutch between said pulleys and shaft, the collar *m*, longitudinally movable on said shaft, the sliding bar *p*, in connection with said collar, and the toggle *t w*, one link hinged to the frame, the other to the bar *p*, and a connection from the toggle, whereby reciprocating movement may be imparted to said slide, the frictional plate 5, fixed to the shaft, and the frictional plate 6, loose upon the shaft, but prevented from rotation, substantially as described.

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