(No Model.) 2 Sheets—Sheet 1.

N. C. STILES.

PUNCHING MACHINE.

No. 297,090. Patented Apr. 15, 1884.

Fig:1.

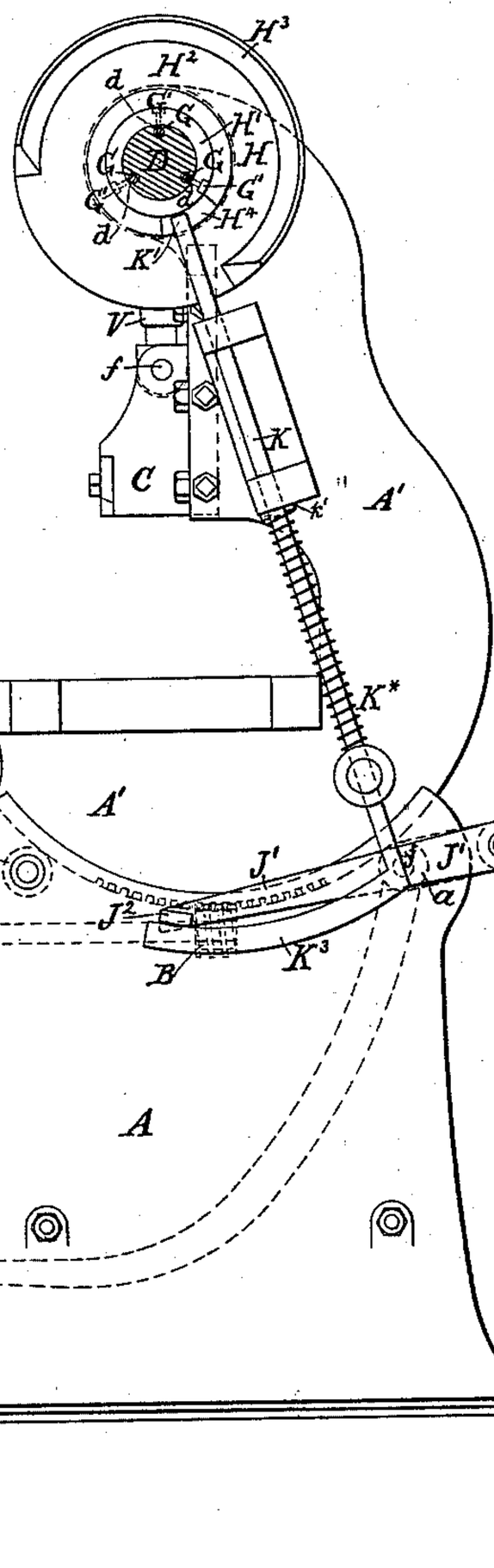


Fig:3.

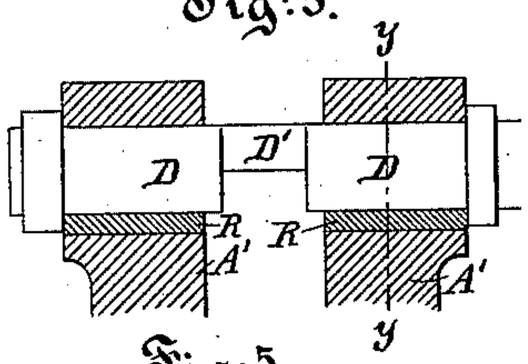


Fig:4.

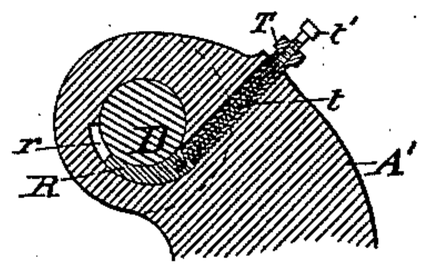


Fig:5.

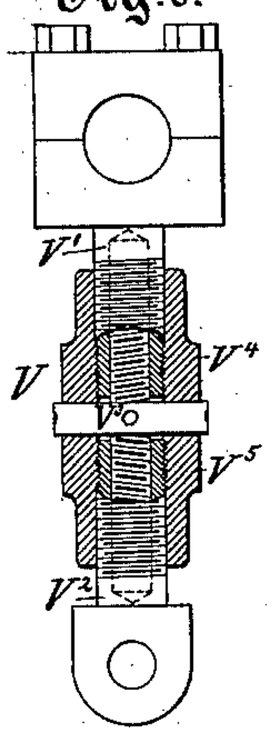
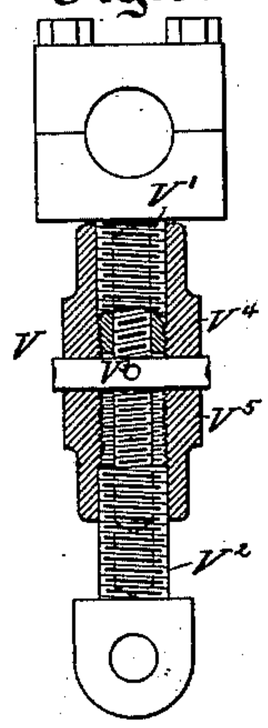


Fig:9.



Witnesses:

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Charles R. Searle.

Inventor:

Norman C. Stiles.

by his attorney

Thomas D. Peters.

(No Model.) 2 Sheets—Sheet 2.

N. C. STILES.

PUNCHING MACHINE.

No. 297,090. Patented Apr. 15, 1884.

Fig: 7.

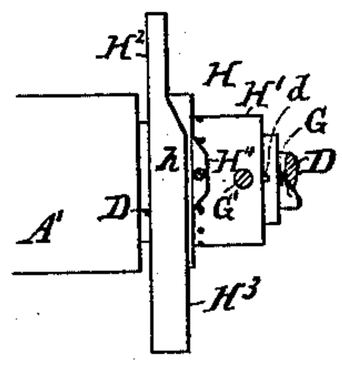


Fig: 2.

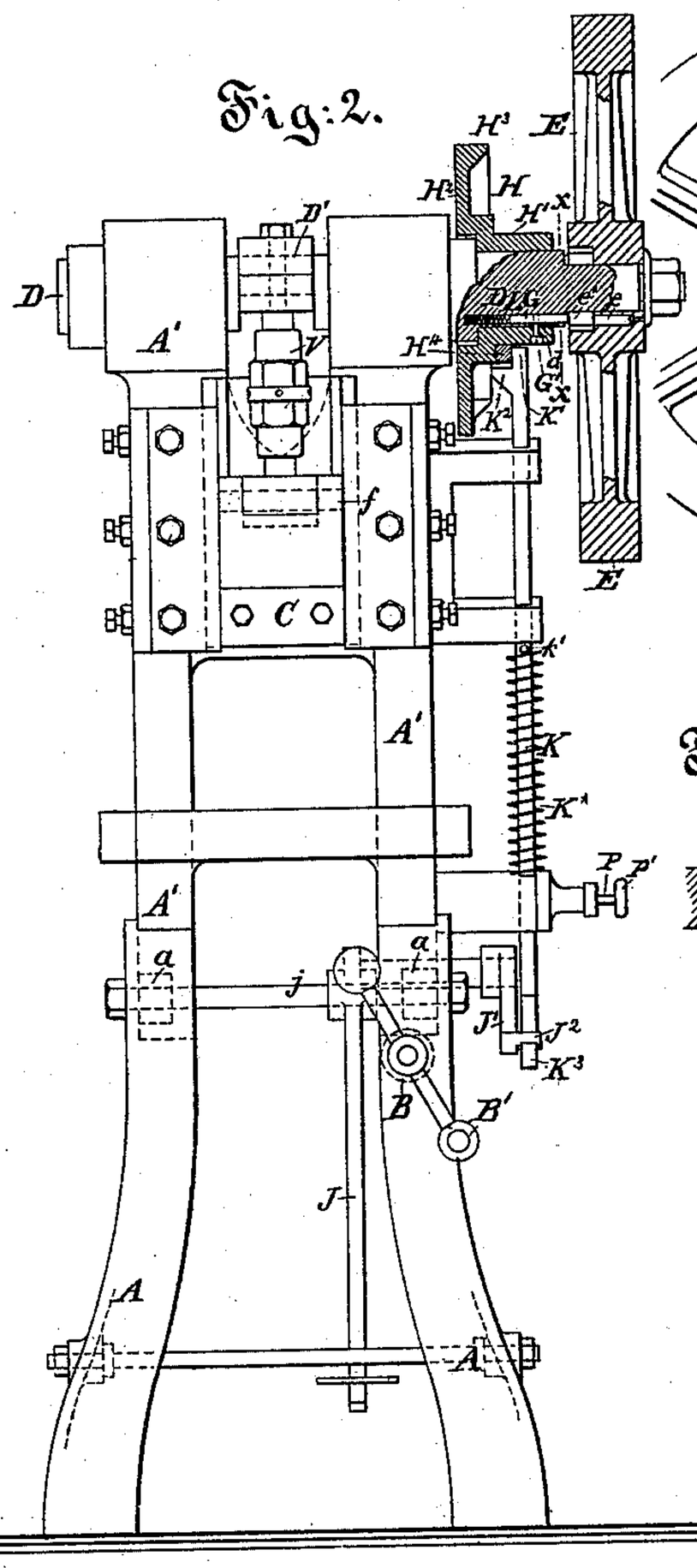


Fig: 6.

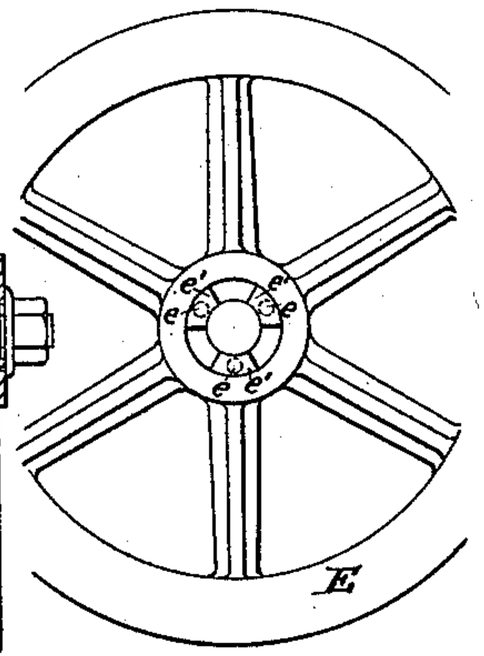
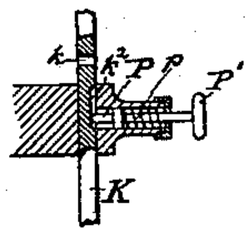


Fig: 8.



Witnesses:

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by his attorney

Thomas D. Stetson.

UNITED STATES PATENT OFFICE.

NORMAN C. STILES, OF MIDDLETOWN, CONNECTICUT.

PUNCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 297,090, dated April 15, 1884.

Application filed January 27, 1883. (No model.)

To all whom it may concern:

Be it known that I, NORMAN C. STILES, of Middletown, Middlesex county, in the State of Connecticut, have invented certain new and useful Improvements in Punching-Presses, of which the following is a specification.

My improved press is adapted for operating punches, stamps, shears, or the like by producing a strong pressure during a brief period by the revolution of a crank. I will describe it as operating a punch.

My press is of the class in which the die-carrier and its connections may stand still for a long period while the fly is revolving continuously. When the material to be treated is properly adjusted in place, the attendant, by a simple movement, engages the mechanism, and the die makes one complete reciprocation, and then stops automatically until another movement is made by the attendant. I have made improvements which add greatly to the convenience and safety of working. I am able to disconnect the mechanism at various periods in the revolution. I can conveniently set the press to work either upright or at various inclinations. I have devised and applied such a connection of the mechanism for stopping and starting that it works equally well and without special adjustment in all positions of the press. I insure just sufficient friction to arrest the motion when the mechanism is disengaged. My form of crank allows of firm bearings unusually close thereto. I make an eminently stiff and conveniently-adjustable connecting-rod or pitman.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention.

Figure 1 is a side elevation, partly in section, the section being through the main shaft and the clutch-pins which slide therein, taken on the line *x x*, in Fig. 2. Fig. 2 is a front elevation, partly in section. Fig. 3 is a section through the upper portion of the press-frame. The shaft and the crank formed therein are in elevation, with the crank in its highest position. Fig. 4 is a section on the line *y y* in Fig. 3. Fig. 5 is a side elevation, on a larger scale, of the pitman which connects the die-carrier with the crank. It is shown partly in section. Fig. 6 is a view of the back face or inner face of the fly-wheel. Fig. 7 is an elevation of those parts which are shown in section in Fig. 2, the parts being turned a quarter around. Fig. 8 is a section through the catch. Fig. 9 represents a modified construction of the pitman or connecting-rod, partly in section. This figure is drawn on the same scale as Fig. 5.

Similar letters of reference indicate corresponding parts in all the figures.

A is a fixed portion of the frame-work. A′ is a movable portion thereof. Both parts A and A′ are strong and rigid constructions, of cast-iron or other suitable material. The base of A′ is accurately finished, and as it changes its inclination its curved surfaces traverse on the rollers *a*, mounted in the part A. One rocker or curved base is provided with a series of indentations which receive the threads of an endless screw, B, fixed in proper supports in the part A, and capable of being turned by the attendant through the medium of a crank, B′. It follows that the inclination of the upper part, A′, of the framing is changed at will by turning the crank B′ in one direction or the other.

D is the main shaft. It is formed with a crank, D′, which, through a peculiar connecting-rod, V, to be described further on, gives by its revolution the required reciprocating motion to the die-carrier C.

E is a fly-wheel or heavy pulley turning loosely on the shaft D, and guarded against end motion by a suitable offset and collar or nut. This fly E is turned continuously and with the proper rapidity by a belt from any suitable power. (Not represented.) The hub or central boss of the fly-wheel E is formed with an annular recess on the side toward the press, and a number of holes—say three—opening into the inner face of said recess are drilled into the hub, as shown. Clutch-pins *e* are set in the holes in the fly-wheel hub, with their heads *e′* projecting into the annular recess, and practically dividing the same into three segmental recesses (see Fig. 6) adapted to receive the ends of longitudinally-sliding pins G, which are seated in holes formed in the enlarged portion of the shaft D, the coiled springs L tending to hold the pins G constantly en-

gaged in the recesses between the heads *e'*. The shaft D, immediately over the holes for the pins G, is formed with longitudinal slots *d*, which open into said holes, and through which screw-pins G' are screwed transversely into the pins G. The outer ends of the screws G' are received in radial holes formed in a sleeve or slide on the shaft D. It will now be seen that the several pins G are all controlled by the single sleeve in consequence of their rigid connection therewith formed by the transverse screws G', said sleeve being capable of longitudinal motion on the shaft D to the limited extent allowed by the slots *d*. I will designate this movable piece or sleeve as a whole by the single letter H, using additional marks of reference when necessary, as H' H², to indicate special parts thereof. H' is the body of the slide or sleeve, through which the screws G' extend inward; H², a broad flange or small wheel fixed thereto or formed in one therewith; and H³ is a lip or crown-flange extending a large part of the way around its periphery, having a beveled inner face, as represented. H⁴ is a face-cam carried on the sleeve H'. It is secured by a screw, *h*, which may be inserted in any one of a series of holes, as shown in Fig. 7, so that by adjusting its position it may cause the shaft to stop in various positions. The shape of this face-cam H⁴ is peculiar, inasmuch as it is formed with two inclines in opposite directions, instead of having only one incline terminating at its rear end with an abrupt square face. The construction of this cam with two inclines, as shown in Fig. 7, has the important advantage of allowing the fly-wheel or pulley to be run in either direction without interfering with the proper operation of the stopping mechanism, as will be more fully explained hereinafter.

J is the treadle operated by the attendant. It turns on a fixed center, *j*, and controls a vertical slide, K, portions of which are designated by additional marks, K', &c. This slide K is guided in the framing A', or in parts rigidly attached thereto, so that it can only move longitudinally, controlled by the treadle.

The springs L, recessed into D, act to press the pins G into engagement with the clutch-pin heads *e'* in the wheel E. When the treadle is released and the slide K rises through the force of the spring K* to its highest position, its upper end, K', is at each revolution of the shaft struck by the cam H⁴, and as K is stiffly supported and cannot yield laterally, the contact has the effect to press the slide H and its connected pins G to the left, so as to liberate the wheel E. In this condition the shaft D and its connections stand still. On depressing the treadle, and consequently the slide K, just sufficiently to carry the latter out of contact with the cam H⁴, the entire slide H is moved axially by the force of the springs L, and the connected pins G promptly engage in the recesses between the pin-heads *e'* and remain thus engaged, compelling the revolution of the shaft D and the corresponding reciprocations of the punch-carrier C so long as the treadle remains in that position.

In the ordinary working of the press the attendant, so soon as the parts are engaged, relaxes his pressure on the treadle, and the latter is immediately released and allowed to rise again, so that the upper end, K', of the slide K comes within the sweep of the cam H⁴. This motion is effected by the force of the spring K* acting on the pin *k'* in the slide K, as is easily understood. Then the slide K stands there without producing any effect until the shaft D has performed a complete revolution, and consequently has caused one complete reciprocation of the die-carrier C. When this round of operations has been completed, the cam H⁴ will strike the slide K, and in passing the latter will move the sleeve H and its connected pins G again to the left against the force of the springs L, so as to disconnect the parts. In this condition the shaft D instantly stops and remains stopped until the treadle is again depressed. It follows that each partial depression and liberation of the treadle J effects one complete reciprocation of the die-carrier, and no more. The device will usually be operated in this manner; but when, for any reason—such as the accidental introduction of two thicknesses of material to be treated instead of one, or the accidental holding of the hand in the press, where it will be injured—the attendant wishes to stop the movement of the die after it has commenced, he has simply to depress farther the treadle, instead of liberating it. The slide K has a lateral projection, K², with its under side beveled to match the beveled inner face of the lip H³. The extreme depression of the treadle carries the slide K down so far that the beveled face of the projection K² is brought into forcible contact with the beveled inner face of the lip H³, and by this action gives the required end movement to the sleeve H, sufficient to effect the liberation of the parts. It, in short, induces the same movement of the slide H and its connected pins G as would be ultimately induced by the passage of the cam H⁴. The difference in the action is that the cam H⁴ only withdraws the pins G at a certain period after the stroke of the die-carrier and die is completed—as, for example, when the die-carrier is in its highest position, or in some partially-elevated or partially-depressed position—while the liberation effected by the projection K² may occur at various earlier periods in the revolution. It will usually occur only in case of a real or supposed mistake in the rapid operating of the machine. It requires a considerable force applied to the treadle to effect this movement of the pins G by the means just explained. I have gone a step farther and introduced a provision by which the power of the machine itself is made to effect the withdrawal of the pins G at a certain predetermined

early period. To effect this I remove a portion of the lip H^3, the space thus provided being represented somewhat exaggerated in Fig. 1. If the treadle is depressed to its full extent while this opening in the lip H^3 is passing, it can be depressed easily. Then so soon as the gap is passed the beveled side of the notch in the lip H^3 acts on the projection K^2 and forces the slide H and its attached pins G to the left and arrests the motion.

It will thus be seen that the beveled lip H^3 may serve in two different ways to effect the withdrawal of the pins G from the fly E, and consequently to arrest the motion of the die-carrier earlier than it is arrested by the action of the cam H^4. In both ways it is effected by depressing the treadle to its full extent, or to an extent beyond the depression of the treadle for ordinary work. If this extreme depression of the treadle is effected at the moment that the gap in the lip H^3 is passing the slide K, the depression will be effected easily; but the stopping of the die will not follow immediately. It will follow when the gap in the rim or lip H^3 has passed, and the rim H^3 will effect the desired movement by means of its beveled end. If the extreme depression of the treadle is effected before or after the notch in the lip H^3 has passed the slide K, it will be more difficult to effect the depression of the treadle, and the withdrawal of the pins G will be effected in a different manner. It will be effected in this case by the contact of the projection K^2 with the beveled inner face, instead of the end of the lip H^3. The operator need not concern himself with regard to which of these modes is to be availed of. The moment he discovers that for any reason he wishes to arrest the action after he has depressed the treadle enough to start the machine, he instantly, with all his might, depresses the treadle to its full extent. In effecting this movement and the immediately-succeeding operations an inexperienced attendant is liable to become disconcerted. I provide an automatic catch, which, so soon as the treadle is depressed to its extreme position, holds it there. After the attendant has removed the material, and is prepared to again coolly resume the rapid feeding of the machine, he liberates the catch, the slide K K′ rises past the middle position to its position of engagement with the cam H^4, and the work may be again resumed under the same conditions as at first.

P is the catch. It is housed in a space provided, and actuated in one direction by a coiled spring, *p*, and in the other by the hand of the attendant applied to the knob P′. It engages with a hole, *k*, in the slide K whenever the latter is depressed to its extreme position. It remains thus engaged and holds the machine out of action until the attendant liberates the catch. This catch also serves a useful purpose under different conditions. It is of service to prevent the locking of the pins G with the clutch-pins *e* in the wheel in turning the crank-shaft by hand as many times as may be desired in one direction and the other in the act of setting the dies. All that is necessary is to depress the treadle to the full extent and allow the catch P to become engaged in the hole *k*. Then the shaft may be turned or partially turned as many times as may be required until the dies are set satisfactorily. Then the catch P is disengaged, and the machine instantly assumes the ordinary condition, ready for work. At the point where the catch P will rest against the slide K when the latter is depressed just sufficiently for ordinary work is a shallow recess, k^2. The catch P enters this recess at each ordinary operation of the press, and the attendant knows when it is depressed to the right point by feeling the change in the action when the catch thus engages in this shallow recess. The end of the catch P is beveled and the recess k^2 is beveled, so that the partial engagement offers little resistance to the turning of the treadle in ordinary action or to the further depression of the treadle in emergencies. The treadle is connected in such a manner that as the upper portion, A′, of the framing is rocked or inclined forward or backward the same motion of the treadle will produce the required movement of the slide K in all positions. The center *j*, on which the treadle J turns, is at the back of the machine, near the top of the fixed portion A. An arm, J′, extends forward, and carries a lug or claw, J^2, smoothly rounded on its under face.

The slide K is carried in bearings on the upper and adjustable portion of the framing A′. Its lower end is provided with a rigid curved arm, K^3, smoothly finished on its upper face in an arc coinciding with the rocking motion of the part A′. I make the rigid arm J′, which extends forward from the rocking shaft of the treadle, in a greatly crooked form. It extends from the center of motion first backward a little, then outward past the frame, and thence forward. The slide K is depressed by the action of the treadle J through the medium of the claw J^2. The curvature of the arm K^3 is such that the movement given to the slide K by a given motion of the treadle J is the same or very nearly the same in all positions of A′.

It is important to apply sufficient friction to the shaft D to prevent its running by its momentum or by the gravity of any parts much past the position in which it is when liberated by the withdrawal of the pins G. It is also important to be able to compensate for any wear. I effect both these ends by a curved wedge-shaped box or shoe, mounted in a similar but somewhat longer recess in the under side of each bearing for the shaft D, and actuated by a delicately-adjustable screw, or by an adjustable spring, or both. I will show it with both.

R is the shoe mounted in a recess, *r*.

T is a hollow screw, and *t* a spring housed

therein. *t'* is a smaller screw tapped into the upper part of the screw T, by which the pressure of the spring *t* upon the shoe R may be adjusted with great delicacy to present a larger thickness of the wedge-shaped bearing, and thus produce a tighter grip on the shaft. When it is desired to jam the shoe R very hard, so as to produce a very considerable friction on the shaft D, it is only necessary to screw the hollow bolt T inward, so as to cause its end to bear directly upon the rear face of the shoe R. The pitman or connecting-rod between the crank D' and the die-carrier C is easily and delicately adjustable in length, to compel the die-carrier to traverse lower or higher within considerable limits.

V' is a hollow cylinder, screw-threaded both on the exterior and interior, and provided with an eye which embraces the crank D', with suitable provisions for opening and closing, which need not be particularly described.

V^2 is a corresponding hollow cylinder, screw-threaded both on the exterior and interior, and having an eye at its lower end, which engages a transverse pin, *f*, in the die-carrier C.

V^3 is a right-and-left-hand screw engaging by its ends, respectively, in the interiors of V' and V^2. In its center is a broad collar with its faces evenly finished.

V^4 is a thick nut or stout threaded sleeve engaging with the screw-threads on the exterior of V', and adapted to bear fairly on one face of said collar. V^5 is a corresponding threaded sleeve engaged with the screw-threads on the exterior of V^2, and adapted to bear fairly against the opposite face of the collar on V^3. The threaded sleeves V^4 and V^5 are hexagonal on a portion of their exteriors to allow of their being strongly turned. A short lever or handle (not represented) set in holes in the collar of V^3 allows these to be turned. When the parts are in condition for work, the threaded sleeves V^4 and V^5 take each a strong hold on the exterior of their respective hollow screws V' and V^2, and also bear very firmly against the finished faces of the intermediate collar on V^3. The compressive strain due to the punching is transmitted from the eye in V' to the eye in V^2 through the strong shell or hollow pitman thus presented. The less, but sometimes considerable, tensile strain required to overcome the gravity of the parts and to withdraw the punch from the material treated is transmitted centrally through the central screw, V^3. My peculiarity of construction gives great strength and rigidity, with great facility for easily and rapidly changing the length within wide limits and adjusting with any required degree of delicacy. To change the length, the collar of V^3 is held and the threaded sleeves V^4 and V^5 are turned in the direction to relax their pressure thereon. Then the collar is turned to any required extent in one direction or the other, and by the action of its right and left screw-threads in the interiors of the hollow cylinders V' and V^2 it moves the latter farther apart or draws them nearer together, according to the direction in which it is turned. Then V^3 is again held stationary and the threaded sleeves V^4 and V^5 are again turned to bring their ends into firm contact with the adjacent faces of the collar of V^3, and all is again ready for work. The central piece, V^3, carries a right-hand thread on its upper part, and a left-hand thread on its lower part both these threads having the same pitch.

Both the nuts V^4 V^5 are formed with right-hand threads, but of smaller pitch than the threads of V^3. In this manner the nuts V^4 V^5 are caused to operate as efficient lock-nuts. When the central piece, V^3, tends to turn to the right, the upper face of its collar will immediately bind on the lower face of the nut V^4, the latter not being able to advance as fast as the piece V^3, and when the latter tends to turn toward the left the lower face of its collar will bind on the upper face of the nut V^5, because turning V^3 and V^5 in the same direction will bring those parts nearer to each other.

In the modification shown in Fig. 9 both the upper and the lower portions of the piece V^3 carry a right-hand thread; but the pitch of the upper portion is larger than the pitch of the lower portion. The nuts V^4 V^5 are both formed with left-hand threads of smaller pitch than that of the threads on the upper portion of V^3. It will be seen that in this manner the same result is obtained as with the construction shown in Fig. 9. The difference of pitch of the threads on V^3 allows of shortening and lengthening the connecting-link, and the nuts V^4 V^5 act in a similar manner as lock-nuts, as above described.

I claim as my invention—

1. The fixed support A and adjustable framing A', with suitable supporting means, *a*, and the die-carrier C, with means for operating it, in combination with each other and with the slide K, having curved arm K^3, receiving motion from a treadle mounted on the fixed portion, all arranged to serve substantially as herein specified.

2. The pins *e e'* of the female clutch, located in a recess formed by enlarging the bore of the fly-wheel, and adapted to serve substantially as herein specified.

3. A clutch-pin having a straight cylindrical body, *e*, and a head, *e'*, bounded by radial and circumferential lines of the recess in the fly-wheel, substantially as herein specified.

4. The sliding collar H, sliding bolts G, and screws G', passing through longitudinal slots or recesses in the crank-shaft, and serving to unite the collar H and bolts G, in combination with the springs L, tending to throw the bolts G outward, substantially as herein specified.

5. In a punching-press substantially as described, the wedge or start-and-stop piece H^4, made with a double face, so as to operate in relation to the slide K with either direction of

fly-wheel motion, substantially as herein specified.

6. The radially-sliding piece K, its end comprising the abutment K′, and having also the incline K^2, in combination with means, J J′, for moving it at the will of the operator, and with the sliding collar H, face-cam H^4, and rim H^2, having a lip, H^3, all arranged for joint operation as herein specified.

7. The combination, with the shaft D, of the curved wedge-shaped bearing-piece R and a spring for holding the same against its bearing with a constant force in a correspondingly wedge-shaped recess in the framing, as and for the purposes herein specified.

8. In a punching-press having a suitable die-carrier, C, operated by the eccentric D′, the compound connecting-rod having the eyes V′ V^2, right and left screws V^3, and upper and lower threaded sleeves V^4 V^5, all arranged for joint operation as herein specified.

9. In combination with the frame A′ and shaft D, the wedge-piece R, bushing T, spring *t*, and adjusting-screw *t′*, as and for the purposes set forth.

In testimony whereof I have hereunto set my hand, at Middletown, Connecticut, this 30th day of December, 1882, in the presence of two subscribing witnesses.

NORMAN C. STILES.

Witnesses:
CHAS. G. R. VINAL,
L. H. RONALD.