No. 767,914. PATENTED AUG. 16, 1904.

T. F. PHILIPPI.

PUNCHING MACHINE.

APPLICATION FILED NOV. 30, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

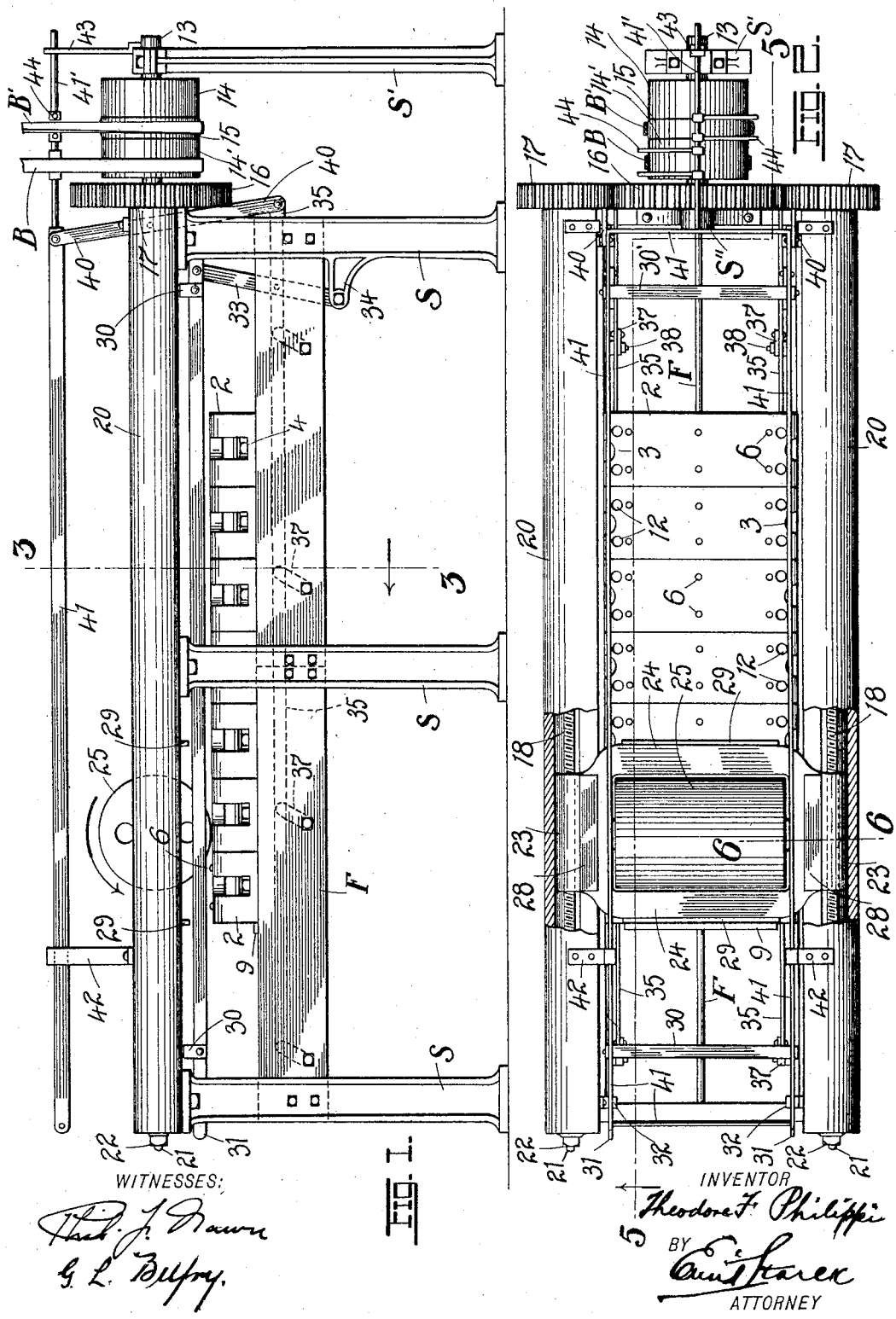


FIG. 1.

FIG. 2.

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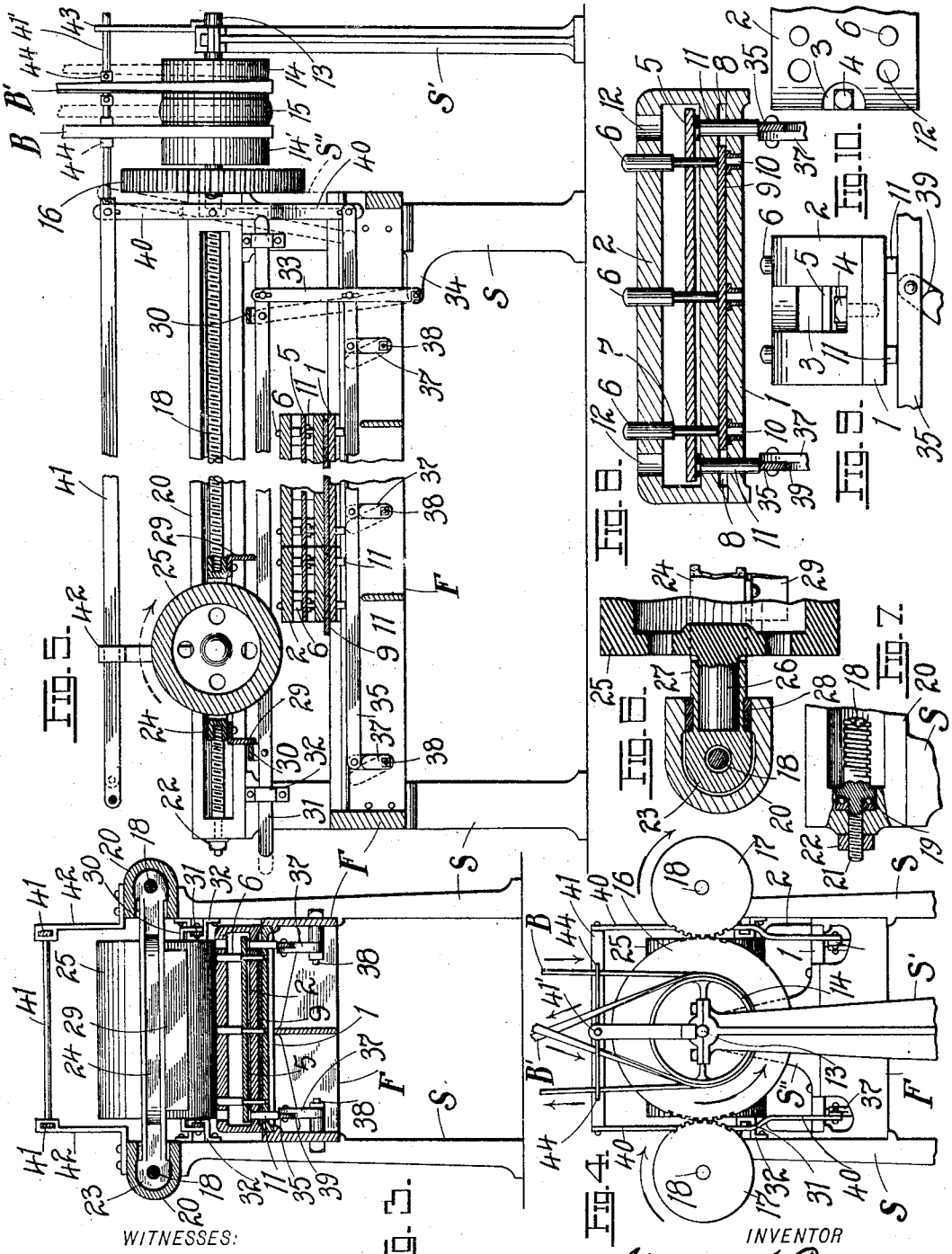
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UNITED STATES PATENT OFFICE.

THEODORE F. PHILIPPI, OF EAST ST. LOUIS, ILLINOIS.

PUNCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 767,914, dated August 16, 1904.

Application filed November 30, 1903. Serial No. 183,252. (No model.)

To all whom it may concern:

Be it known that I, THEODORE F. PHILIPPI, a citizen of the United States, residing at East St. Louis, in the county of St. Clair and State of Illinois, have invented certain new and useful Improvements in Punching-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in sheet-metal punching-machines; and it consists in the novel construction and arrangement of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a side elevation of the machine. Fig. 2 is a top plan thereof. Fig. 3 is a transverse vertical section on line 3 3 of Fig. 1. Fig. 4 is an end elevation thereof. Fig. 5 is a vertical longitudinal section on line 5 5 of Fig. 2. Fig. 6 is a sectional detail on line 6 6 of Fig. 2. Fig. 7 is a sectional detail of the terminal bearing for the driving-screw. Fig. 8 is a sectional detail corresponding to the section shown in Fig. 3 of one of the boxings or tool-racks carrying the punches and plate controlling the elevation of the same. Fig. 9 is an end view of Fig. 8, and Fig. 10 is a top plan of one end of the same.

The object of my invention is to construct a machine for punching metal sheets of given dimensions in a minimum amount of time and with a minimum expenditure of labor, the punches being driven consecutively into the plate or sheet by the pressure exerted thereon by a roller traveling over them, the heads of the punches being elevated to the required position in the path of said roller by mechanism forming a part of the subject-matter of the present invention, which in detail may be described as follows:

Referring to the drawings, S represents a series of standards, and F a ribbed frame carried at an intermediate point of the same, said frame being designed to support the longitudinal bed-plate or die-plate 1 of the machine. Disposed along and secured to the die-plate are a series of boxes or tool-racks 2, the ends of their upper and adjacent portions of the end walls being cut away at 3 to admit the insertion of the bolts 4, by which the boxes are secured to said die-plate 1, Figs. 9, 10. The sides of the boxes 2 are open, each box being adapted to receive a tool supporting and lifting plate 5, the shank or stem of each tool or punch 6 passing loosely through an opening formed in said plate and the head of each tool passing loosely through a larger opening formed in the roof or top wall of the box. When the tools are in their lowest position, the shoulders 7, formed between the stem and head of the tool, (punch,) rest directly on the plate 5, Fig. 3. The bottom wall of each box is raised slightly above the lower edges of the box, leaving a space 8 for the free insertion of the sheet 9 to be punched, Figs. 3, 9, the stems of the punches or tools being directly over the die-holes 10 formed in the die-plate. The die-plate rests upon the heads of the lifting-pins 11, previously dropped into the box through the openings 12, formed in the top or roof of each box, the pins playing loosely through openings formed for their reception in the bottom wall or floor of the box and in the die-plate to which said box is secured, Figs. 3, 9.

Mounted between a standard S′ and a standard S″, carried by the frame F, is a pulley-shaft 13, having disposed thereon the loose pulleys 14 14′ and the intermediate tight pulley 15, the inner end of the shaft carrying a gear-wheel 16. Meshing with the gear-wheel 16, at either end of the horizontal diameter thereof, are the pinions 17 17, each pinion being carried by the adjacent end of a longitudinally-disposed actuating-screw 18, located on each side of the machine, the ends of the screw being provided with roller-bearings 19 in the end walls of the channels 20, within which the screws are housed. One end of the screw is provided with a screw-threaded stem 21, over which is passed a nut 22, retaining the parts in place, Fig. 7. The channels 20 are substantially U-shaped in cross-section, opening inwardly, as shown. Adapted to travel along the screws 18 are the interiorly-screw-threaded heads 23 of an oblong carriage or frame 24, between whose sides is mounted the roller 25, the trunnions 26 of the rollers being received by tubular sockets or bearings

27, formed in the frame opposite each head 23, Fig. 6. On either side of the bearing-socket 27 is disposed a brass wearing-plate 28 28 for an obvious purpose. The sides of the frame 24 are in the shape of channel-bars, the base of each channel carrying a depending angle-bar 29, whose vertical member in the reciprocations of the carriage 24 is adapted to impinge against or strike the transversely-disposed tappet-bar 30, whose downturned ends are secured to the longitudinally-disposed reciprocating reversing-bars 31, mounted in brackets 32, carried by the standards S. Each bar 31 has secured adjacent to the rear end thereof the upper end of a lever 33, whose opposite end is pivotally carried by a bracket 34 and whose intermediate end is movably coupled to the adjacent end of a link 35, said link being pivotally secured at suitable points to the adjacent ends of a series of oscillating arms 37, whose lower ends are pivoted to pins 38 on the frame F, Fig. 3. In the oscillation of said arms the links 35 rest on the shoulders 39 immediately below the pivotal connections of the former, Figs. 3, 8. The rear end of each link is coupled pivotally to the base of a lever 40, pivoted to a standard S, the upper ends of the levers 40 being pivotally secured to the lateral members of the belt-shifting frame 41, said members being loosely mounted in the upper ends of the brackets 42, secured along the channels or ways 20, the rear centrally-disposed member 41′ operating in a bracket 43 on top of the standard S′. The prongs 44 44 of the belt-shifter are secured directly to said member 41′. One of the belts, B, is an open one, while the belt B′ is crossed.

The operation of the machine is as follows: By pulling the belt-shifting frame to the position indicated in Fig. 1 the belts B′ B will respectively engage the pulleys 15 and 14′, driving the gear 16 in one direction, it being understood that the belts lead to a common source of power. (Not shown.) With the position of the belt-shifter as shown in said Fig. 1 the levers 40 will be oscillated in a direction to draw the links 35 rearwardly, oscillating the levers 33, as well as the arms 37, to a rearwardly-inclined position. The highest position of said arms 37 is necessarily a vertical one, so that an inclination to one side (or other) of said vertical position is equivalent to a depression of their upper ends below the highest point of said ends. When thus inclined, it follows that the links 35 are lowered, and in thus lowering they permit the lifting-pins 11 and plate 5 to drop to their lowest positions in the box 2, the stems of the punches, however, resting on the sheet 9, inserted into the space 8, leaving the shoulders 7 raised above the plate 5 and the heads of the punches projecting the thickness of the sheet above the tops of the boxes, Fig. 8. Now with rotation imparted to the gear-wheel 16, as indicated, motion is imparted to the pinions 17, Fig. 4, and actuating-screws 18, the latter driving the carriage 24 and roller 25, mounted therein, in the direction indicated in Fig. 1, the roller passing over the projecting ends of the heads of the punches and forcing them downward, the cutting ends thereof punching the necessary holes in the sheet 9, the punches being thus forced to their lowest positions with their shoulders 7 resting against the plates 5, Fig. 3. By the time the carriage reaches the end of its movement in the direction indicated the angle plate or bar 29 on the advancing side strikes the adjacent tappet-bar 30, shifting the reversing-bars 31 to an intermediate position—that is to say, to a position to cause the levers 40 and 33 and the links 37 to assume a vertical position, Fig. 5—this shifting elevating the links 35, raising the pins 11 and plate 5 sufficiently to withdraw the punches out of the sheet 9 and permit the latter to be withdrawn from the front of the machine, Fig. 5, and allow for the insertion of a fresh sheet. By this impact of the angle-bar 29 against the tappet-bar 30, as indicated, the belt-shifter has been moved to bring both belts over the loose pulleys, so that now the machine is at rest. This is as it should be, for it is desirable that the machine stop automatically at the end of the punching operation, not only to permit the withdrawal of the sheet of metal punched, but to allow for the insertion of a fresh sheet. With the position of the parts, therefore, as shown by the full position of the parts in Fig. 5 the carriage is ready to travel in the reverse direction or that shown by the dotted arrow in Fig. 5. This is accomplished by the operator, who shifts the belt-shifter and belts to the dotted position in said Fig. 5, this movement oscillating the arms 37 to the opposite side of the vertical (again lowering the lifting-plate 5) and shifting the belts B B′, respectively, to the pulleys 15 14; but since under these circumstances the open belt (and not the cross-belt) becomes the driving-belt it follows that the gear mechanism, as well as the actuating-screws, will be reversed, and the carriage will thus travel in the opposite direction. At the end of its second reciprocation the advancing angle-bar 29 will strike the opposite tappet-bar 30, again bringing the machine to a standstill, when the punched sheet can be removed and a fresh one inserted. The operator again shifting the belt-shifter to the first position, as shown in Fig. 1, the carriage will travel back to its original position, Fig. 1, when the same series of operations can be repeated. Thus at the end of each reciprocation the machine comes to a stop automatically, when the carriage can be started in the opposite direction by a movement of the belt-shifter in the proper direction.

The number of boxes or tool-holders 2 is of course immaterial, it being understood that

each box is provided with a sufficient number of openings for the accommodation of the punches intended to form the holes in the sheet to be operated on; neither do I wish to be limited to other details here shown, as they may in a measure be departed from without in any wise affecting the nature or spirit of my invention.

Having described my invention, what I claim is—

1. In a punching-machine, a suitable die-plate, means for suitably supporting a series of punches in proximity thereto, a carriage having a motion parallel to said die-plate adapted to travel along the same and a roller mounted on the carriage adapted to progressively force the punches toward the die-plate, substantially as set forth.

2. In a punching-machine, a suitable die-plate, means for supporting a series of punches thereover, a carriage having a motion of translation parallel to the face of the die-plate mounted above said die-plate, and a roller on the carriage adapted to force the punches into the dies of the die-plate, substantially as set forth.

3. In a punching-machine, a suitable die-plate means for supporting a series of punches thereover with their cutting ends raised a suitable distance above the face of the die-plate thereby permitting the insertion of the article to be punched between said cutting ends and the die-plate, means for subsequently withdrawing the support from the punches whereby the latter rest against the article to be punched, a carriage mounted above the punches and having a motion of translation parallel to the face of the die-plate, and a roller mounted on the carriage adapted to force the punches into the article to be punched with the passage of the carriage over the die-plate, substantially as set forth.

4. In a punching-machine, a suitable die-plate, a hollow box or tool-rack located above the same, devices located in the chamber of the box for normally holding the tools or punches elevated above the face of the die-plate thereby permitting the insertion of the sheet to be punched between the die-plate and the cutting ends of the punches, means under the control of the operator for effecting the removal of the initial support for the punches, a traveling carriage mounted above the die-plate, and a roller on said carriage for forcing the punches into the sheet to be punched, as the carriage advances over the die-plate, substantially as set forth.

5. In a punching-machine, a suitable die-plate, a hollow box or tool-rack located above the same, devices located in the chamber of the box for normally holding the punches elevated above the face of the die-plate, a belt-shifter, intermediate connections between said belt-shifter and said supporting devices for effecting the removal of the initial support for the punches upon a movement of the belt-shifter, a traveling carriage mounted over the die-plate, a roller on said carriage, a pulley-shaft having tight and loose pulleys, intermediate gearing between said shaft and the carriage for advancing the latter in either direction over the die-plate, motion being imparted to the carriage upon the removal of the initial support from the punches as aforesaid, substantially as set forth.

6. In a punching-machine, a suitable die-plate, a hollow box or tool-rack located above the same, a plate located in the chamber of the box for normally holding the punches elevated above the face of the die-plate, lifting-pins passed loosely through the bottom of the box and die-plate, horizontal links for supporting said pins, a series of oscillating arms carrying said links, reversing-bars movably mounted on the machine, levers pivoted at one end, and having their opposite ends and intermediate points pivotally coupled to the reversing-bars and links respectively, a reciprocating belt-shifter, levers pivoted at intermediate points and having their opposite ends pivotally secured to the belt-shifter and links respectively, a pulley-shaft carrying tight and loose pulleys, tappet-bars on opposite ends of the reversing-bars, a traveling carriage mounted over the die-plate and adapted to impinge alternately against said tappet-bars, a roller on said carriage, and intermediate connections between the carriage and pulley-shaft for advancing the former upon a movement of the belt-shifter in either direction, substantially as set forth.

7. In a punching-machine, a suitable die-plate, a box or tool-rack mounted on top of the same, a traveling carriage mounted over the die-plate and comprising a suitable frame, terminal heads forming part of said frame and a roller having bearings in said heads, rotatable screws passing through said heads, channels or ways for the reception of the heads of the carriage-frame, pinions carried at one end of the screws, an intermediate gear-wheel meshing with said pinions, a pulley-shaft for said gear-wheel, and means under the control of the operator for imparting rotation to the shaft and screws, for advancing the carriage in either direction over the tops of the punches mounted in the tool-rack, substantially as set forth.

8. In a punching-machine, a suitable die-plate, a holder for the punches mounted over the die-plate, devices for normally supporting and lifting the punches above the die-plate to permit the insertion thereunder of the metal to be punched, a traveling carriage mounted above the tool-holder, a roller on the carriage for depressing the several punches, actuating-screws for the carriage, a tight and loose pulley shaft geared to the screws, and intermediate belt-shifting connections between the supporting and lifting devices and the pulley-shaft

for depressing said lifting devices and simultaneously effecting a positive driving connection between the pulley-shaft and carriage, substantially as set forth.

9. In a punching-machine, a suitable die-plate, a tool-holder mounted on top thereof, means for normally lifting the tools above the face of the die-plate, a drive-shaft, a traveling reciprocating carriage mounted over the tool-holder, a roller in said carriage, intermediate connections between the shaft and lifting devices for depressing the latter and simultaneously effecting positive driving connection between the shaft and carriage, the latter being adapted to restore the parts to their normal position at the end of its reciprocation in either direction, simultaneously terminating the positive driving connection aforesaid, and bringing the parts to a stop, substantially as set forth.

10. In a punching-machine, a suitable die, and movable punch therefor, and a traveling roller moving along said die for forcing the punch into the die, substantially as set forth.

11. In a punching-machine, a suitable die, a movable punch therefor, a traveling roller moving along said die for forcing the punch into the die, and means for withdrawing the punch upon conclusion of the punching operation, substantially as set forth.

12. In a punching-machine, a suitable die or dies, movable punches therefor, a traveling roller moving along said die for forcing the punches into the dies, and mechanical devices for automatically withdrawing the punches upon conclusion of the operation, thereby permitting the withdrawal of the material punched, substantially as set forth.

13. In a punching-machine, a suitable die-plate, a tool-holder superposed thereover, devices operating through the bottom of the holder for lifting the tools above the face of the die-plate, a drive-shaft having tight and loose pulleys, a reciprocating carriage mounted above the tool-holder, actuating-screws for advancing the carriage over the tools, a belt-shifter, suitable reciprocating reversing-bars adapted to be actuated by the carriage at the end of its reciprocation in either direction, intermediate connections between the reversing-bars and the lifting devices aforesaid, and between the lifting devices and the belt-shifter, whereby upon impact of the reversing-bars by the carriage, the elevating devices are raised to their highest position and the tools withdrawn from their dies, and whereby the belt-shifter is actuated to a position to shift the drive-belt onto the loose pulley, the machine coming to a stop, substantially as set forth.

14. In a punching-machine, a series of dies, tool holders or racks for the punches, devices operating through the walls of the holders for normally lifting the punches above the dies, means for releasing the tools from said lifting devices upon the insertion thereunder of the material to be punched, and a traveling roller for forcing the punches through the material and into the dies formed for their reception, substantially as set forth.

15. In a punching-machine, a suitable die-plate, means for suitably supporting a series of punches in proximity thereto, a carriage having a motion parallel to said die-plate adapted to travel along the same, and devices on said carriage adapted to progressively force the punches toward the die-plate, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

THEODORE F. PHILIPPI.

Witnesses:
EMIL STAREK,
G. L. BELFRY.