

Aug. 8, 1944.

R. PETERSON

2,355,556

CUSHION BLANKING DIE

Filed Oct. 30, 1942

5 Sheets-Sheet 1

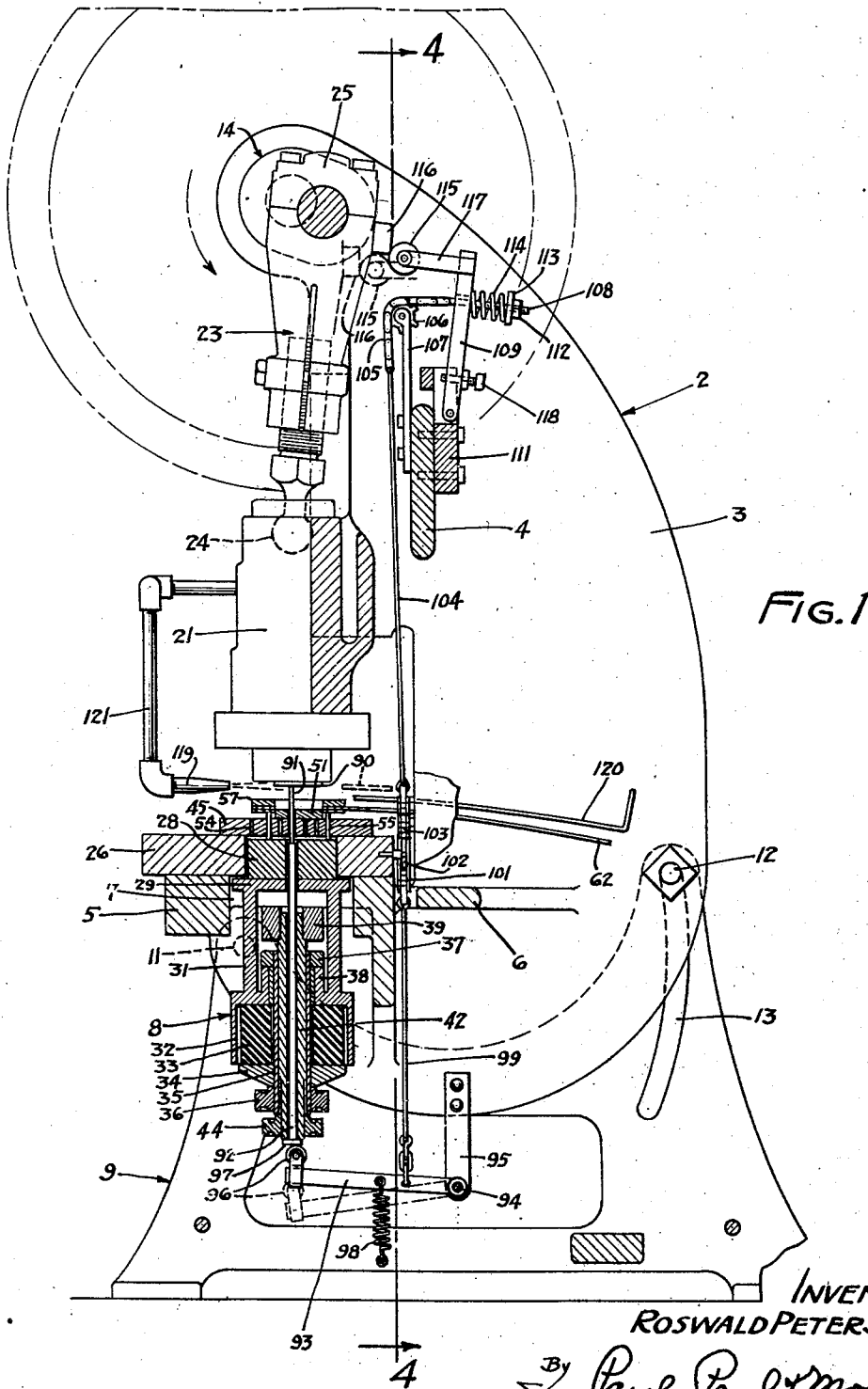


FIG. 1

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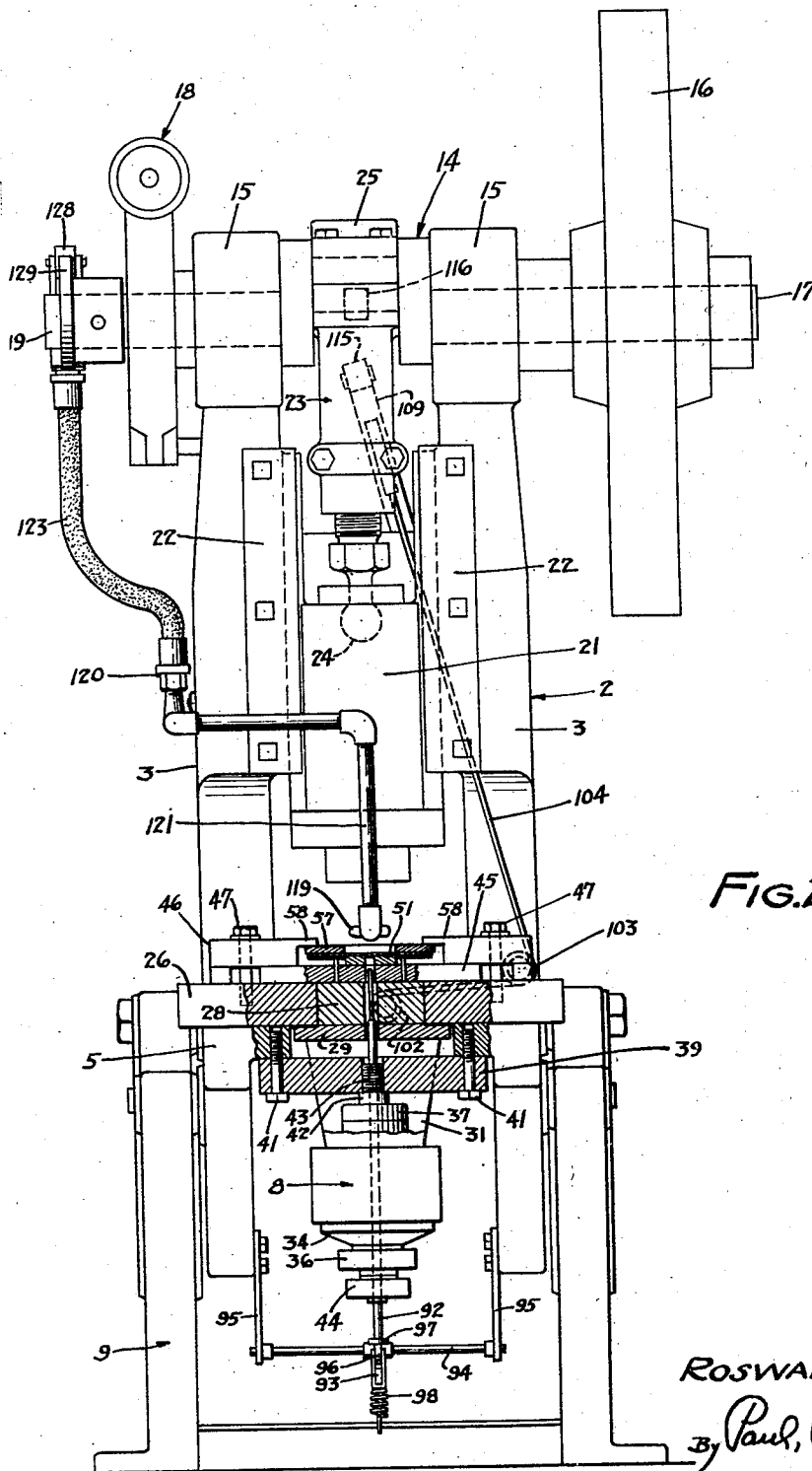
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5 Sheets-Sheet 3

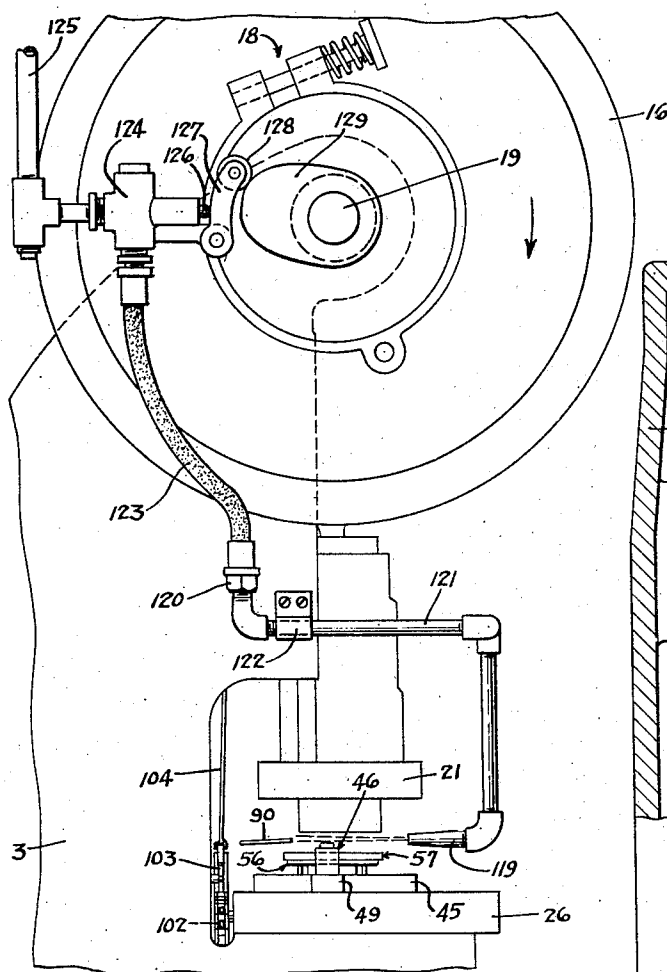


FIG. 3

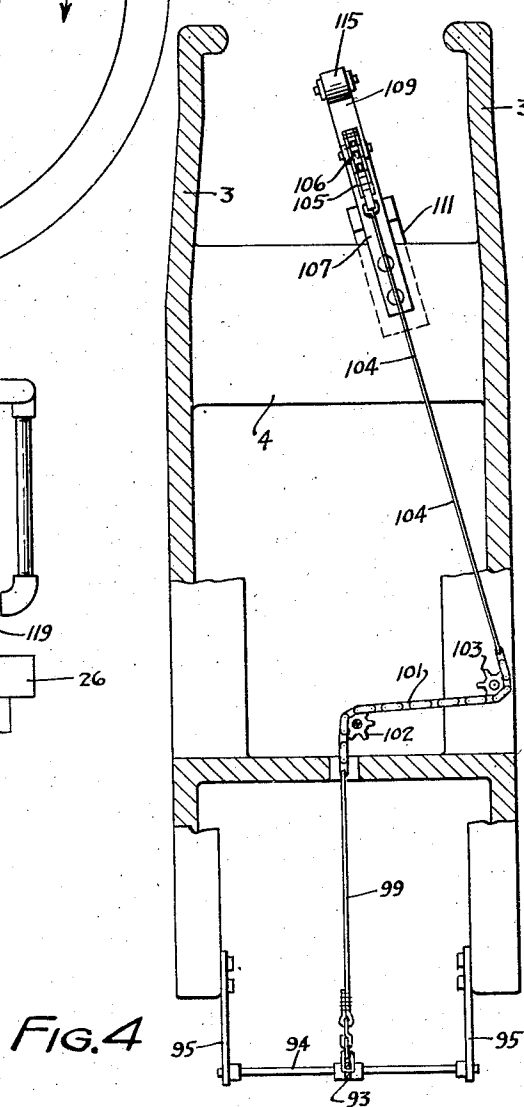


FIG. 4

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5 Sheets-Sheet 4

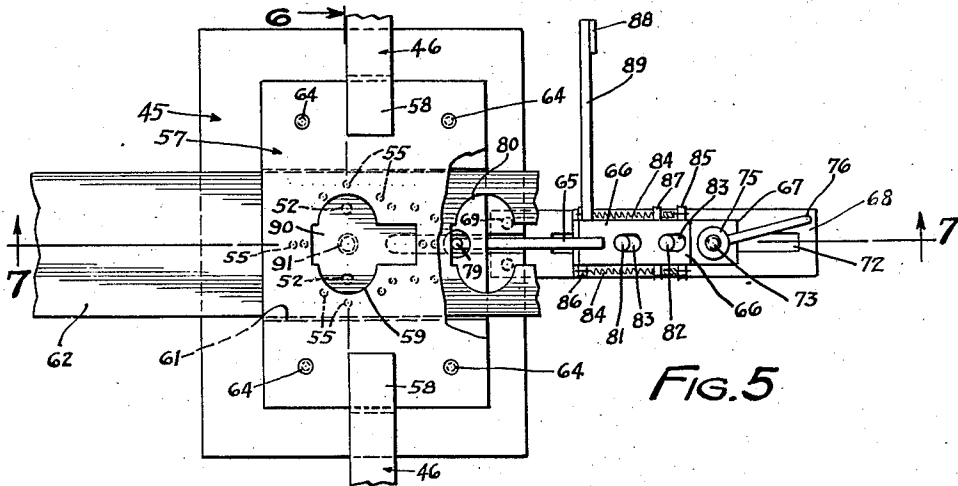


FIG. 5

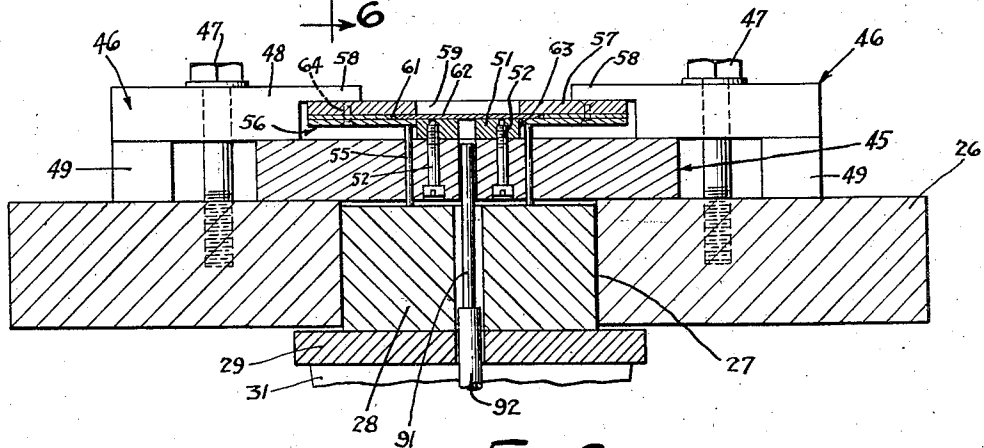


FIG. 6

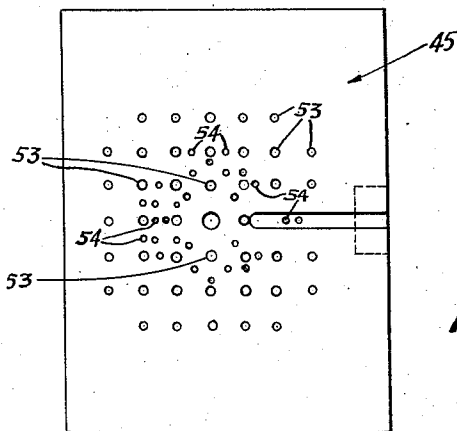


FIG. 10

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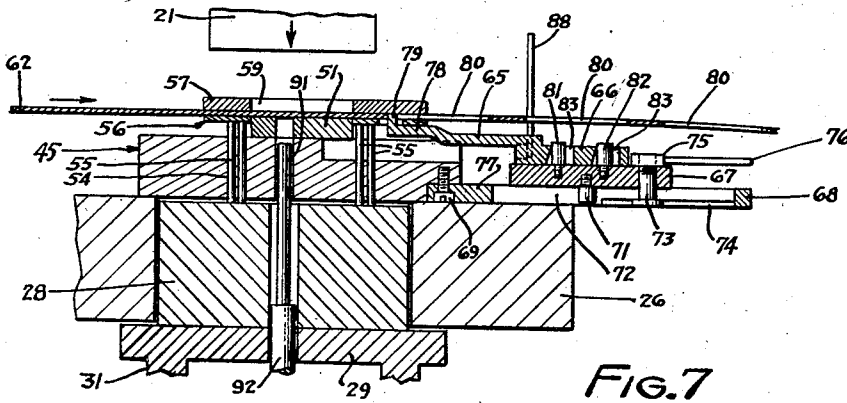


FIG. 7

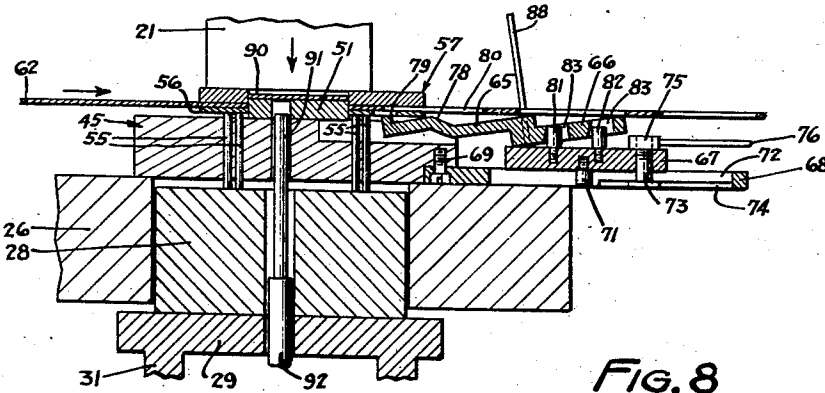


FIG. 8

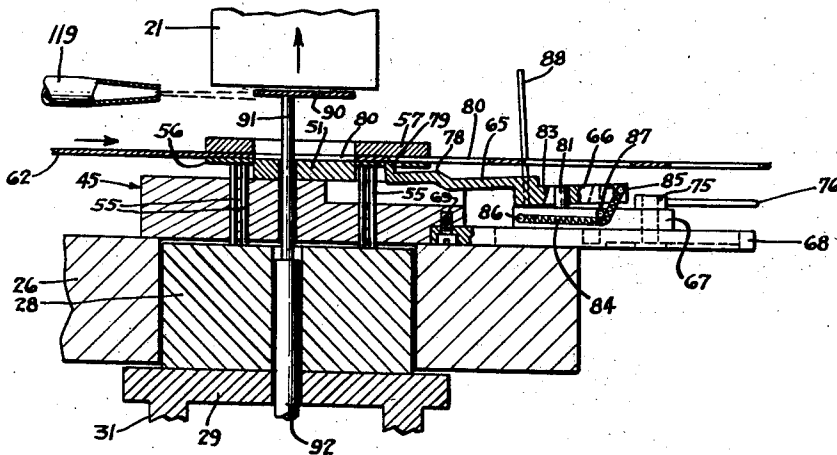


FIG. 9

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2,355,556

CUSHION BLANKING DIE

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Application October 30, 1942, Serial No. 463,970

14 Claims. (Cl. 164—19)

This invention relates to new and useful improvements in cushion blanking dies, and more particularly to such dies commonly referred to by the trade as temporary blanking dies, although not necessarily.

Attempts have heretofore been made to develop blanking dies utilizing air as a means for ejecting the blanks from the die after each blanking operation. Some such devices were constructed in such a manner as to allow the blanked out pieces to fall below the die where they were subjected to a blast of air which would eject them from the press into a suitable receiving means. In other types, the blanking die was so constructed as to allow the blanked out piece to stay in the die secured to the ram, until the ram of the press had ascended upwardly into engagement with a knock-out plate supported in the die, which would push the blank out of the die. Then, as the blank would drop downwardly from the die, a blast of air would eject the blank from the press.

Another known type of blanking die utilized a punch which was permanently attached to a metal plate having a plurality of holes therein. The punch and pad were clamped to the bolster plate of the press and allowed a plurality of stripper pins to pass freely thru a corresponding number of holes in the plate secured to the punch. The temporary blanking die was located on top of the stripper pins so as to allow the punch to enter the stripper plate nest sufficiently to guide the punch into the die. A cavity was provided in the underside of the die, whereby after the blank was blanked out, an air blast would sweep under the die and eject the blank from the press.

To the best of my knowledge, none of the above-mentioned methods of ejecting blanks or stampings from punch presses have proven practical, primarily because the action of the air to eject the stampings or blanks, was not positive enough to prevent occasional jamming of the die and punch with the work. The construction of the afore-mentioned apparatus was also such that it was difficult to guide the work between the punch and die at high speed without interruption, because of the inefficiency of the means provided for temporarily bringing the work to a stop in proper position with respect to the punch and die, each time a blank or stamping had been punched therefrom and the work advanced for the next stamping.

The novel apparatus herein disclosed is the

result of considerable experimental and development work in an effort to provide an apparatus of this character which can be used for producing flat stampings at extremely high speed, whereby the cost of producing such stampings may be materially decreased, and with the assurance that each stamping will be accurately formed.

An object of the present invention, therefore, is to provide a cushion blanking die for punch presses, having means for positively ejecting the blank from the die into the path of a blast of air, following each punching operation, whereby such blast of air may laterally eject the blank or stamping from between the die and the ram, into a suitable receiving means.

A further object is to provide a cushion blanking die comprising a knock-out pin or rod, preferably mounted in the die cushion, below the path of travel of the work through the press, and means being provided for operating said knock-out pin in timed relation to the travel of the ram, whereby each time the ram moves away from the path of travel of the work, following each blanking operation, said knock-out pin is operated to eject or knock the stamping out of the die and into a position where it may readily and positively be ejected from the press by a blast of air.

A further object of the invention resides in the novel construction of the punch holder plate to which the blanking punch is secured, and which is provided with a plurality of apertures adapted to receive cushion stripper pins, and whereby said pins may be inserted in selected apertures in the punch holder plate in such a manner as to substantially surround the punch, thereby to adequately support the die plate and nest during each blanking operation of the ram.

A further object resides in the novel construction of the means for automatically stopping the work or sheet of material being fed through the machine in proper alignment with the punch and die, following each stamping operation, and which stop means is adapted to be moved out of operative engagement with the work, by relative movement of the nest, or by any known instrumentality, when the ram is actuated to operate the die or punch to blank a stamping from the strip of material or work.

Other objects of the invention reside in the unique arrangement and timing of the various mechanisms of the apparatus, whereby an operator may feed the work thru the press without interrupting the operation of the press for each

stamping, as is now more or less common practice; in the novel construction of the knock-out rod or pin and the means for operating it in timed relation to the reciprocal movement of the ram; in the novel construction of the punch holder plate whereby a given punch holder plate may be utilized for supporting punches of different shapes and sizes, and also whereby the punch may be substantially completely surrounded by stripper pins which engage the nest adjacent to the punch, and provide an adequate support for the nest and the die secured thereto, during the stamping operation; in the specific construction of the stop means for the work, the operation of which is controlled entirely by the movement of the die plate and the nest, whereby each time a blank has been punched from the work or strip of metal, the stop means will automatically release the work or strip of metal, and permit it to be advanced by suitable means, not shown to the next position for punching a blank therefrom, said stop means being entirely automatic whereby it will require no attention on the part of the operator during the operation of the press; and in the provision of a cushion blanking die which may readily be embodied in a conventional press at low cost, and which is so constructed that when a piece of work as, for example, a long strip of sheet metal from which numerous stampings may be punched, is fed into the press, the operator may depress or actuate the usual clutch control lever or trip of the press and retain it in operative position so that the strip of sheet metal may be fed thru the press substantially without interruption, by any known intermittent strip feed, not shown.

Other objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a vertical sectional view of a punch press showing the invention embodied therein;

Figure 2 is a front view of the press, partially broken away, to more clearly illustrate the application of the invention thereto;

Figure 3 is a fragmentary view of the upper portion of the press, showing the means provided for controlling the blast of air for ejecting the blanks from between the blanking die and ram;

Figure 4 is a fragmentary view substantially on the line 4-4 of Figure 1, showing the operative connection between the operating arm of the knock-out pin and the crankshaft;

Figure 5 is a plan view of the cushion blanking die assembled on a smaller scale;

Figure 6 is an enlarged detail sectional view substantially on the line 6-6 of Figure 5;

Figure 7 is a sectional view on the line 7-7 of Figure 5, showing the stop lever in operative engagement with the work to temporarily interrupt the feeding movement thereof;

Figure 8 is a similar view showing the blanking die actuated by the ram, and also showing the stop lever moved out of operative engagement with the work to permit the work to be advanced, when the blanking die is moved out of operative

engagement with the punch upon the return stroke of the ram;

Figure 9 is a view showing a blank ejected from the blanking die by the knock-out pin, and whereby it has been moved into a position to be ejected from the press by a blast of air; and

Figure 10 is a plan view of the punch holder plate, showing the bolt holes and guide holes provided therein to facilitate mounting different size punches thereon, and also for guiding the stripper pins.

In the selected embodiment of the invention herein disclosed, there is illustrated in Figures 1 and 2, a punch press comprising the usual supporting frame, generally designated by the numeral 2, having side frame members 3-3 tied together adjacent their upper portions by a cross member 4. The lower portions of the side frame members are shown tied together by a horizontal frame member 5, having a rearwardly extending portion 6, as best shown in Figure 1. The horizontal frame portion 5 has an opening 7 therein for receiving the upper portion of the usual die cushion, generally designated by the numeral 8.

The press frame 2 is shown supported upon a suitable base, generally designated by the numeral 9. To vary the angle of the press frame to the vertical, the forward lower portions of the press frame are pivoted to the base 9 by suitable pivots 11, and the press frame is secured in adjusted position on the base by clamping elements 12, movable in arcuately formed slots 13 provided in the base 9.

The usual crankshaft 14 is shown mounted in suitable bearings 15 provided in the upper portion of the side frame members 3, and a flywheel 16 may be mounted for continuous rotation on the end portion 17 of the crankshaft. The flywheel 16 may be driven from a suitable source of power, not shown.

As is well known in the art, the crankshaft 17 is adapted to be operatively connected to the constantly rotating flywheel 16 by a conventional one-revolution clutch mechanism, not shown in the drawings. The operation of the clutch mechanism may be controlled by the usual trip or operating lever provided for such purposes, whereby each time said trip is manually operated, the clutch will operatively connect the crankshaft to the flywheel, whereby the crankshaft is rotated one revolution. A suitable brake mechanism, generally designated by the numeral 18, is shown mounted on the opposite end portion 19 of the crankshaft, and serves to prevent over-running of the crankshaft, each time it is released from the flywheel.

A ram 21 is mounted for reciprocal movement in vertical guides 22 provided in the side frame members 2 of the press, as best shown in Figure 2. One end of the ram is operatively connected to one end of a suitable pitman 23, as indicated at 24 in Figures 1 and 2, and the opposite end of the pitman 23 has a split bearing 25 connecting it to the crankshaft. The above-described parts of the press are well known in the art, and form no part of the present invention, except as to their association therewith.

An important feature of the present invention resides in the construction and operation of the cushion blanking die, and particularly in the means for ejecting the stampings or blanks from the die and punch, at the termination of each blanking operation of the ram.

As best shown in Figure 6, a suitable bolster

plate 26 is shown supported on the horizontal frame portion 5 of the press frame, and is secured thereto by suitable means, not shown. The bolster plate 26 has a central opening 27 therein adapted to receive a filler block 28, which is supported upon or rests on the upper end 29 of the movable frame 31 of the die cushion 8.

The die cushion, as best shown in Figures 1 and 2, comprises the movable frame portion 31, whose upper end is engaged with the filler block 28, as previously stated. The die cushion frame 31 is shown provided at its lower end with a suitable counterbore 32 adapted to receive a suitable cushion element 33, the upper end of which is engaged with the bottom of the counterbore 32. The opposite or lower end of the cushion element 33 is engaged with a circular plate or washer 34, adjustably supported on a sleeve 35 by a suitable adjusting wheel 36 received in threaded engagement with the lower end of the sleeve. The upper end of the sleeve 35 is secured to a member 37 seated against the upper face of an upstanding hub 38, provided on the die cushion frame 31, as illustrated in Figure 1. The upper end portion of the sleeve 35 is slidable in the hub 38.

The die cushion 8, as a whole, is suspended or supported from a supporting bar 39 fixedly bolted to the horizontal frame portion 5 of the press frame by suitable bolts 41, as shown in Figure 2. To thus support the die cushion, a tubular member 42 has its upper end portion secured to the supporting bar 39 by such means as screw threads 43, shown in Figures 1 and 2. The tubular member 42 is mounted within the sleeve 35, and has a suitable adjusting wheel 44 received in threaded engagement with the lower end thereof. The upper face of the hub of the adjusting wheel 44 engages the lower terminal of the sleeve 35, whereby the sleeve 35 and washer 34 are normally restrained against relative downward movement. The sleeve 35 and washer 34 may, however, be vertically adjusted upon the tubular member 42 to properly tension the cushion element 33, by rotation of the handwheel 44, as will readily be understood by reference to Figure 1.

From the foregoing, it will be understood that the tubular member 42 is fixedly secured in the supporting bar 39, and is therefore restrained against axial or vertical movement. The sleeve 35 in turn is mounted upon the tubular member 42 in fixed relation thereto as a result of its lower end engaging the adjusting wheel 44, but may be axially adjusted thereon, as hereinbefore stated. The frame 31 of the die cushion, however, is mounted for relative vertical or axial movement on the sleeve 35, and is restrained against such movement only by the tension in the cushion element 33, which is such as to normally hold the upper horizontal portion 29 of the die cushion frame 31 against the filler block 28, which is constantly engaged with the portion 29 of the die cushion frame, and is therefore movable therewith as a unit.

A punch holder plate, generally designated by the numeral 45, is removably supported upon the bolster plate 26 by suitable clamping elements 46 secured to the bolster plate 26 by cap screws 47, as shown in Figure 6. The inner end portions 48 of the clamping elements 46 engage the adjacent marginal edge portions of the punch holder plate 45, and the outer end portions of said clamping elements are seated upon filler blocks 49, as shown. A suitable punch 51 is secured to the punch holder plate 45 by cap screws 52 re-

ceived in selected apertures 53, provided in the punch holder plate 45. The threaded terminals of the cap screws 52 are received in correspondingly tapped holes provided in the punch 51, as clearly shown in Figure 6.

Another feature of the invention resides in the unique construction of the punch holder plate 45 which, as clearly illustrated in Figure 10, is provided with a plurality of bolt holes 53 for selectively receiving the bolts 52. By thus providing a plurality of bolt holes 53 in the punch holder 45, punches of various sizes may be secured to the punch holder without the necessity of drilling new holes in the punch holder for different punches, or using punch holder plates with various drillings. The location of the tapped holes in the different punches 51 is determined from the bolt holes 53 provided in the punch holder plate 45.

By reference to Figure 10, it will be noted that the punch holder plate 45 is also provided with a plurality of spaced guide holes 54 adapted to selectively receive a plurality of cushion stripper pins 55 mounted for sliding movement in the guide holes or apertures 54. The lower ends of the stripper pins 55 are seated upon the filler block 28, and their upper ends are engaged with the usual nest and material guide, generally designated by the numeral 56, and which also serves as a stripper plate for stripping the temporary die plate 57 from the punch 51. The nest 56, as is well known in the art, is secured to the die plate 57, which, in the present instance, is supported in operative relation to the punch 51 by the stripper pins 55 and the overhanging end portions 58 of the clamping elements 46, as best shown in Figure 6.

The die plate 57 has an opening 59 therein, the contour of which corresponds to the contour of the punch 51, as is well known. The nest 56 is provided with a passageway 61 for receiving the strip material 62 from which the stampings are blanked. The passageway 61 in the nest is so located as to accurately guide the strip material 62 between the punch 51 and the die 57, as clearly shown in Figure 6, it being understood that the die plate 57 is constantly held in engagement with the overhanging end portions 58 of the clamps 46, as a result of the cushion element 33 constantly exerting a pressure against the stripper pins 55 thru the die cushion frame 31 and the filler block 28. By reference to Figure 6, it will be noted that the over-all length of the stripper pins 55 is such that the upper face of the filler block 28 cannot engage the punch holder plate 45, and also whereby the upper portion 29 of the die cushion frame 31 cannot engage the bottom of the bolster plate 26. Thus, the die plate 57 is normally yieldably held against the end portions 58 of the clamps 46 by the tension in the cushion element 33.

To retain the die plate 57 in accurate alignment with the punch 51, the parts are so positioned that the punch is always received in a guide aperture 63 provided in the lower wall of the nest 56, whereby the opening 59 in the die plate cannot become disaligned with the punch 51, because of the nest 56 being fixedly secured to the die plate by such means as rivets 64. The die plate 57 may readily be detached from the press by simply releasing the clamps 46, which also permits convenient removal of the punch holder plate from the bolster plate 26.

By providing the punch holder plate with a plurality of spaced holes 53 for receiving the

bolts 52, many different sizes of punches may be secured to the punch holder plate without the necessity of drilling new holes in the punch holder, it being understood that the holes to be drilled in each punch are located therein in accordance with certain of the holes in the punch holder plate.

In like manner, by closely spacing the guide holes 54 for the stripper pins 55, a plurality of such pins may be positioned around the circumference of the punch, whereby a relatively thinner stripper plate or nest 56 may be utilized, because by locating the stripper pins so as to thus approximate the contour of the banked out piece or stamping, a fairly uniform stripping pressure is exerted on the stripper plate or nest 56 around the punch, whereby the nest and temporary die plate 57 will readily respond to the stripping pressure exerted thereon by the die cushion 8.

Another important feature of the invention resides in the mechanism provided for automatically controlling the traveling or feeding movement of the strip material between the punch and die, after each blank has been punched therefrom. This mechanism is best shown in Figures 7, 8 and 9, and comprises a stop finger, generally designated by the numeral 65, having one end secured to a head 66 mounted for rocking movement on a block 67. The block 67 is longitudinally adjustable on a rearwardly extending bar 68 having its forward end suitably secured to the punch holder plate 45 by screws 69, whereby the stop finger and its supporting means is removable as a unit with the punch holder plate 45, as will readily be understood by reference to Figures 5 to 9, inclusive.

A suitable stud 71 is secured to the block 67 and is slidable in an elongated opening or slot 72 provided in the supporting bar 68. A clamping bolt 73 also traverses the slot 72 and is received in a suitable aperture provided in the block 67. The bolt 73 has a flat head received in a recess 74 provided in the bottom face of the bar 68. A suitable clamping nut 75 is received in threaded engagement with the opposite end of the clamping bolt 73, and preferably has an operating handle 76 to facilitate rotating the nut 75 to secure the block 67 in adjusted position on the supporting bar 68. The end portion 77 of the supporting bar 68 is preferably fitted into a recess provided in the adjacent edge portion of the punch holder plate 45, whereby the bottom face of the supporting bar 68 is flush with the bottom face of the punch holder plate 45, as will be noted by reference to Figures 7, 8 and 9.

The forward end portion 78 of the stop finger 65 is upwardly offset, as shown in Figures 7, 8 and 9, and is provided with a detent 79 adapted to be successively received in the openings 80 provided in the strip material 62 as a result of punching the stampings therefrom.

The head 66 of the stop finger 65 is loosely supported on the adjusting block 67 by suitable spaced studs 81 and 82, secured in the block 67 and received in elongated apertures 83 provided in the head 66 of the stop finger. By thus supporting the head 66 of the stop finger 65 upon the block 67, the head 66 is adapted for limited longitudinal movement thereon, and it is also adapted for rocking movement, as will be noted by reference to Figure 8.

The head 66 of the stop finger 65 is retained in operative position upon the adjusting block 67 by a suitable tension means, such as a pair of springs 84, shown in Figures 5 and 9. One

such spring is shown provided at each side of the head 66, and each has one end attached to the head, as shown at 85 in Figures 5 and 9. The opposite ends of the springs are attached to laterally extending pins 86 secured to the forward end of the adjusting block 67. The intermediate portions of the spring pass under pins 87 secured to the block 67, whereby the springs, in addition to constantly urging the stop finger 65 in a forward direction, or towards the punch 51, as shown in Figure 9, also exert a downward pull on the rear end of the head 66, for reasons subsequently to be described.

The purpose of the stop finger 65 is, as hereinbefore stated, to positively arrest the forward or traveling movement of the strip material 62 at the proper time, each time it is fed forwardly following a punching operation. The operation of the stop finger 65 is controlled entirely by the action of the springs 84 and the downward movement of the nest or stripper plate 56, secured to the die plate 57.

In Figure 7, the ram 21 is shown in its normal elevated position about to descend, and the strip material 62 is shown moved forwardly into position to have a stamping punched therefrom. In this position of the strip material, it will be noted that the detent 79 of the stop finger is engaged with a wall of the opening 80, last punched in the strip 62, whereby further forward movement of the strip material is positively prevented.

When the punch 21 commences its downward movement, and engages the die plate 57, the die plate, and the nest 56 which supports and guides the strip material beneath the die plate, are simultaneously forced downwardly by the punch against the tension of the cushion element 33, as a result of the stripper pins 55 being interposed between the nest and the filler block 28, which rests upon the upper wall portion 29 of the die cushion frame 8. Such relative downward movement of the die plate and nest will cause the punch 51 to enter the opening 59 in the die plate and thus punch a stamping from the strip material 62. At the same time, the detent 79 of the stop finger 65 will be moved out of engagement with the wall of the opening 80 in the strip material 62 as a result of the nest engaging the offset portion 78 of the stop finger. Such engagement of the nest with the offset portion 78 of the stop finger will rock the stop finger from the position shown in Figure 7 to that shown in Figure 8, thereby releasing the strip material for its next forward movement.

When the punch commences its upward movement, the die plate 57 and nest 56 will return to their normal positions, shown in Figure 7, and at the same time the springs 84 will move the stop finger forwardly from the position shown in Figure 8 to that shown in Figure 9, whereby the detent 79 will engage the bottom face of the unpunched metal portion of the strip material 62, as clearly illustrated in Figure 9. When the detent 79 is thus engaged with the bottom surface of the strip 62, the latter may readily be moved forwardly to the next punching position, shown in Figure 7, in which position its forward movement will be positively arrested as a result of the detent 79 entering the last made opening 80 in the strip material 62.

From the foregoing it will be noted that the operation of the stop finger 65 is automatic, as its operation is controlled entirely by the up-

and-down movement of the stripper plate or nest 56, and the traveling movement of the strip material 62 thru the press.

If the stop finger 65 should, for some reason, fail to release the strip material 62, the stop finger may be manually operated by means of a suitable operating handle 88 provided at one end of a laterally extending arm 89 secured to the head 66 of the stop finger. The operating handle 88 is conveniently located whereby the operator may readily grasp it and operate the stop finger 65, should such an occasion arise.

Another important feature of the invention resides in means provided for ejecting the blanks or stampings 90 from between the ram and die plate at the conclusion of each stamping operation.

The means provided for thus ejecting the blanks is shown comprising a knock-out pin 91 provided at the upper end of a rod 92 which is slidably supported in the tubular member 42 of the die cushion 8, as best shown in Figure 1. The upper end of the rod 92 traverses suitable openings provided in the upper wall 29 of the die cushion frame 8 and the filler block 28, and also passes thru aligned openings in the punch holder plate 45 and punch 51. The knock-out pin 91 functions to knock the stamping 90 out of the opening 59 in the die plate 57, at the termination of each punching operation, as will readily be understood by reference to Figures 7, 8 and 9.

The means provided for positively operating the knock-out pin 91 is shown comprising a lever 93 having one end secured to a cross shaft or rod 94 shown mounted in depending brackets 95 secured to the press frame. The opposite end of the lever 93 has an antifriction roller 96 mounted thereon, adapted to engage a flat head 97 provided on the lower end of the knock-out rod 92. A suitable spring 98 has one end secured to the lever 93 and its opposite end to the base of the press frame, and functions to constantly urge the lever 93 downwardly.

One end of a suitable cable or flexible connection 99 is secured to the lever 93, and has its upper end shown secured to a chain section 101 having running connections with suitable idler sprockets 102 and 103, as shown in Figures 1 and 4. A similar cable 104 has its lower end secured to the opposite end of the chain section 101 and its upper end to one end of a chain section 105, having a running connection with a sprocket 106. The sprocket 106 is shown mounted on a bracket 107 secured to the tie member 4 of the press frame. The chain section 105 has a threaded rod 108 secured to its opposite end, which is received in an opening provided in an arm 109, pivoted to a bracket 111 secured to the tie member 4 of the press frame, as shown in Figure 1.

A nut 112 is received in threaded engagement with the adjusting screw 108 of the chain section 105, and engages a washer 113, between which and the arm 109 a suitable spring 114 is interposed. The spring 114 exerts a tension on the flexible connection between the lever 93 and the arm 109, whereby the roller 96 of the lever 93 is constantly held against the head 97 of the knock-out rod 92 by a yielding pressure.

The arm 109 is adapted to be actuated by movement of the upper end of the pitman 23, and is shown provided with a roller 115 adapted to engage a lug or projection 116 fixed to the upper end portion of the pitman 23, as clearly illustrated in Figure 1. The roller 115 is shown

mounted on the arm 109 by a suitable bracket 117 having one end suitably secured to the arm. The roller 115 of the arm 109 is normally positioned as indicated by the dotted lines in Figure 1, in the path of the lug 116 on the pitman 23.

Thus each time the crankshaft makes one revolution, the lug 116 of the pitman 23 will engage the roller 115 and oscillate the arm 109, whereby the lower lever 93 is swung upwardly against the tension of the spring 98 as a result of its connection with the arm 109, thru the cable sections 99 and 104 and the chain sections 101 and 105. Such upward movement of the lever 93 will actuate the knock-out pin 91 and thereby eject the blank or stamping 90 from the die block 57, as clearly illustrated in Figure 9.

The operation of the knock-out pin 91 is so controlled and regulated that it will hold the stamping 90 against the bottom face of the ram, as shown in Figure 9, until the ram approaches the limit of its upward movement. Just before the ram reaches the limit of its upward movement, the projecting or lug 116 on the upper end of the pitman will release the roller 115, whereupon the knock-out pin will be returned to its normal inoperative position by the spring 98, shown in Figure 6. A suitable adjusting screw 118 may be provided in the arm 109 for limiting the forward movement of said arm, and also whereby the upper terminal of the knock-out pin 91 may be properly positioned with respect to the stamping 90, as shown in Figures 7 and 8.

Another feature of the invention resides in the means provided for laterally ejecting the stampings 90 from between the ram and die plate, each time the knock-out pin 91 releases a stamping, as when the ram approaches the limit of its upward movement or stroke.

The means provided for thus ejecting the stamping is shown comprising a pneumatic nozzle 119, mounted to project a blast of air against each stamping, at the moment that it is released by the knock-out pin 91, as indicated in Figure 1, whereby each stamping will be quickly and positively ejected from between the ram and the die plate, at the termination of each stamping operation. A suitable tray or pan 120 is suitably located on the press to receive the finished punchings, as shown in Figure 1. The nozzle 119 is secured to the lower end of a pipe 121, supported on the frame of the press by a suitable bracket 122, as shown in Figure 3. One end of a flexible connection or hose 123 is secured to the upper end of the pipe 121 by a suitable fitting 120, and has its opposite or upper end connected to a suitable control valve 124, having a pipe 125 connecting it to a source of air supply under pressure, not shown.

The valve 124 has a control plunger 126 adapted to be actuated by an arm 127 having a roller 128 engaged by a cam 129 secured to the end portion 19 of the crank shaft 14. The cam 129 is so positioned with respect to the arm 127, that each time the ram reaches the limit of its upward movement and the knock-out pin 91 releases a stamping 90, the valve 124 is momentarily opened, whereby a blast of air is projected from the nozzle 119 against the stamping, thereby ejecting the stamping from between the ram and die block and delivering it into the pan 120.

The operation of the ejecting mechanism above described, including the knock-out pin 91 and the air control valve 94, is entirely automatic, and is not dependent upon the operator. This makes it possible to feed the strip material

62 thru the press at a high rate of speed and substantially without interrupting the operation of the press. In other words, the usual trip for engaging the crankshaft with the constantly rotating flywheel, may be depressed and retained in such position, whereby the crankshaft will rotate simultaneously with the flywheel with the result that a stamping is punched from the strip material 62 each revolution of the flywheel.

The above-described mechanism, as clearly illustrated in the drawings, is comparatively simple and may readily be embodied in punch presses of conventional design at little cost. In actual operation, it has been found that by the utilization of the present invention in connection with conventional punch presses, it has been possible to operate many such presses at much higher speeds than has heretofore been possible. In some instances it has been possible to increase production as much as five hundred per cent, depending upon the size of the punchings, thereby greatly reducing the cost of producing stampings in quantity production.

The mechanisms for controlling the feeding movement of the strip material 62, and for ejecting the stampings from the press, are so arranged that the press may be operated continuously while punching the stampings from each piece of strip material. In other words, all of the mechanisms of the press are so controlled and regulated that the usual clutch trip lever of the press, not shown, may be retained in operative position, whereby the crankshaft will rotate synchronously with the flywheel whereby a stamping is produced for each revolution of the flywheel, while feeding a piece of strip material thru the press.

It will be apparent to those skilled in the art that I have accomplished at least the principal objects of my invention, and it will also be apparent to those skilled in the art that the embodiments herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that my invention is not limited thereto.

I claim as my invention:

1. A punch press including a bolster plate, a ram and a die cushion, a punch holder supported on the bolster plate, a punch on the punch holder, a die plate supported over the punch, means for guiding the material to be punched between the punch and die plate, said punch holder having a plurality of stripper pin holes therein arranged in closely spaced relation over an extended zone of use thereof whereby a plurality of stripper pins may be placed in holes adjacent punch peripheries of varying sizes and shapes, whereby the stripping pressure exerted against the die plate to strip the die from the punch is uniformly distributed on the die around the die opening, and a knockout pin for ejecting the stamping from the die plate.

2. A punch press comprising a frame including a bolster plate, a ram, a crank shaft and a die cushion, a punch on the punch plate, a die plate supported over the punch and having a nest secured thereto provided with a passageway for guiding the material to be punched between the punch and die plate, said punch holder hav-

ing a plurality of stripper pin holes therein arranged in closely spaced relation over an extended zone of use thereof whereby a plurality of stripper pins may be placed in holes adjacent punch peripheries of varying sizes and shapes with their opposed ends engaging the nest and die cushion, whereby a uniform stripping pressure is exerted against the nest and die around the die opening when stripping the die from the punch, a knockout pin in the punch holder, and means made operable by rotation of the crank shaft to actuate the knockout pin to eject the stamping from the die upon the return movement of the ram.

3. A punch press comprising a frame including a bolster plate, a ram, a die cushion, a punch holder supported on the bolster plate, a punch on the punch holder, a die plate supported over the punch and having a nest secured thereto, said nest having a passageway for guiding the strip material to be punched between the punch and die plate, a plurality of guide holes in the punch holder, stripper pins selectively supported in said guide holes and engaging the nest and the die cushion, said stripper pins being located around the circumference of the punch in proximity to the periphery thereof, whereby a uniform stripping pressure is exerted against the nest and die when stripping the die from the punch, and a knock-out pin for ejecting the stamping from the die.

4. A punch press comprising a frame including a bolster plate, a ram, a die cushion, a punch holder supported on the bolster plate, a punch secured to the punch holder, a plurality of stripper pins mounted in the punch holder with their lower ends engaging the die cushion, a die plate mounted over the punch and having a nest secured thereto and resting upon the upper ends of the stripper pins, said nest having a passageway therein for guiding the strip material between the punch and die plate, a knockout pin mounted for reciprocal movement in the punch holder and normally disposed below the path of travel of the strip material fed between the punch and die plate, and means for actuating said knock-out pin to eject the stamping from the die plate, following the punching operation.

5. A punch press comprising a frame including a bolster plate, a ram, a die cushion, a punch holder supported on the bolster plate, a punch secured to the punch holder, a plurality of stripper pins mounted in the punch holder with their lower ends engaging the die cushion, a die plate mounted over the punch and having a nest secured thereto and resting upon the upper ends of the stripper pins, said nest having a passageway therein for guiding the strip material between the punch and die plate, a knock-out pin mounted below the path of travel of the strip material fed between the punch and die plate, means for momentarily directing a blast of air between the ram and the die, during the return stroke of the ram, and means for actuating said knock-out pin to eject the stamping from the die into said blast of air, whereby said blast of air will laterally eject the stamping into a suitable receiving means.

6. A punch press comprising a frame including a bolster plate, a ram mounted over the bolster plate, a die cushion suspended beneath the bolster plate, a punch holder supported on the bolster plate, a punch secured to the punch holder, said punch holder having a plurality of

guide apertures therein, a plurality of stripper pins selectively received in said guide apertures and arranged around the circumference of the punch, a die plate supported over the punch and having a nest secured thereto, said nest having a passageway for guiding the strip material between the punch and die plate, said stripper pins being interposed between the nest and the die cushion and yieldably supporting the die in operative relation to the punch, said die plate being mounted to be engaged by the ram, whereby it is forced into punching engagement with the punch, thereby to punch a stamping from the strip material, a knock-out pin mounted in the punch holder in alignment with the ram, and means for actuating the knock-out pin in timed relation to the return travel of the ram, whereby said pin will cooperate with the ram to eject the stamping from the die.

7. A punch press comprising a frame including a bolster plate, a ram mounted over the bolster plate, a die cushion suspended from the bolster plate, a punch holder supported on the bolster plate, a punch secured to the punch holder, said punch holder plate having a plurality of guide apertures therein, a plurality of stripper pins selectively received in said guide apertures, and arranged around the circumference of the punch, a die plate supported in operative relation to the punch, means for guiding the strip material between the punch and die plate, said stripper pins being interposed between the die and the die cushion and yieldably supporting the die in operative relation to the punch, said die plate being mounted to be engaged by the ram, whereby it is forced into punching engagement with the punch, thereby to punch a stamping from the strip material, a knock-out pin mounted in the punch holder in alignment with the ram, and means for actuating the knock-out pin in timed relation to the travel of the ram, whereby when the ram commences its return stroke, the knock-out pin will hold the blank in contact with the ram until the ram approaches the limit of its upward movement whereupon the blank is released and may be ejected into a suitable receiving means.

8. A punch press comprising a frame including a bolster plate, a ram, a die cushion, a punch holder supported on the bolster plate, a punch secured to the punch holder, a die plate, a plurality of stripper pins mounted in the punch holder and operatively associated with the die cushion and die plate, means for guiding the strip material between the punch and die plate, said stripper pins yieldably supporting the die in operative relation to the punch whereby the die may be forced into punching engagement with the punch by reciprocal movement of the ram, thereby to punch a stamping from the strip material, an air nozzle mounted adjacent to the path of travel of the ram and having an operative connection with a source of air under pressure, means for controlling the flow of air from the nozzle, a knock-out pin, means for actuating the knock-out pin in timed relation to the travel of the ram, whereby when the ram commences its return stroke, the knock-out pin will temporarily hold the blank in contact with the ram until the ram approaches said nozzle, whereby the knock-out pin is operated to release the stamping, and means for simultaneously actuating the air control means to cause a blast of air to be projected from the nozzle against the

released stamping, thereby to laterally eject the stamping into a suitable receiving means.

9. A punch press comprising a frame including a bolster plate and a crankshaft, a ram connected to the crankshaft, a punch holder supported on the bolster plate, a punch secured to the punch holder, a die plate mounted over the punch, a die cushion beneath the bolster plate, stripper pins interposed between the die plate and the die cushion, means for guiding the strip material between the punch and die plate, an air nozzle disposed at an elevation above the die plate and having a connection with a source of air under pressure, an air control valve on said connection, a knock-out pin slidably supported in the die cushion and having its upper end adapted to pass thru an opening in the punch, but normally positioned below the path of travel of the strip material, the lower end of the knock-out pin extending below the die cushion, a pivoted lever engaged with the lower end of the knock-out pin, an arm pivoted to the upper end of the press frame and having an operative connection with said lever, cam means carried by the crankshaft for operating the arm, thereby to actuate the knock-out pin after each punching operation whereby the stamping is ejected from the die plate into alignment with the nozzle, and means for simultaneously opening the air control valve whereby a blast of air is projected from the nozzle against the stamping to deliver it into a suitable receiving means.

10. A punch press comprising a punch and a die plate, a nest secured to the die plate and having a passageway therein for guiding the strip material between the punch and die, and a stop mechanism disposed adjacent to the punch and die comprising a detent adapted to engage the strip material to arrest its forward movement, following each punching operation, thereby to properly position the strip material with respect to the punch and die, said stop mechanism being positioned to be moved out of engagement with the strip material by downward movement of the nest during the punching operation, whereby the strip material may be advanced until its forward movement is again interrupted by said stop mechanism.

11. A punch press comprising a punch and a die plate, a nest secured to the die plate and having a passageway therein for guiding the strip material between the punch and die, and a stop mechanism disposed adjacent to the punch and die comprising an elongated member mounted for rocking and longitudinal movements, said member being adapted to successively engage the strip material and arrest its feeding movement after each punching operation, thereby to properly align the strip material with the punch and die, the operation of said stop mechanism being automatically controlled by engagement with the nest during each punching operation.

12. A punch press comprising a punch and a die plate, a nest secured to the die plate and having a passageway therein for guiding the strip material between the punch and die, an elongated member mounted for rocking and longitudinal movements, said member having an upright detent adapted to engage a wall of each blanked opening in the strip material, thereby to temporarily arrest the feeding movement of the strip material after each punching operation, and whereby the strip material will be accurately aligned with the punch and die, said

stop mechanism being positioned to be engaged by the nest as said nest is moved downwardly during each punching operation, whereby the detent is automatically moved out of engagement with the strip material to permit the strip material to be advanced to the next punching position.

13. A punch press comprising a frame including a bolster plate and a ram, a punch holder supported on the bolster plate and having a punch secured thereto, a die plate supported in operative relation to the punch, means for guiding the strip material between the punch and the die plate, a stop mechanism for controlling the feeding movement of the strip material between the punch and die plate, said stop mechanism including an elongated member having a terminal detent adapted to engage a wall of each blank opening in the strip material, thereby to temporarily arrest the feeding movement of the strip material in proper position with respect to the punch and die, after each punching operation, said elongated member being adapted to be actuated by relative movement of the die during the punching operation, thereby to temporarily release the strip material whereby the latter may be advanced for the next stamping.

14. A punch press comprising a frame including a bolster plate and a crankshaft having a ram connected thereto, a punch holder sup-

ported on the bolster plate and having a punch secured thereto, a die plate supported in operative relation to the punch, means for guiding the strip material between the punch and the die plate, a stop mechanism for controlling the feeding movement of the strip material between the punch and die plate, said stop mechanism including an elongated member having a terminal detent adapted to engage a wall of each blank opening in the strip material, thereby to temporarily arrest the feeding movement of the strip material in proper position with respect to the punch and die, after each punching operation, said elongated member being adapted to be actuated by relative movement of the die during the punching operation, thereby to temporarily release the strip material whereby the latter may be advanced for the next stamping, an air nozzle having a connection with a source of air under pressure, an air control valve, a knock-out pin, and means made operable by rotation of the crank shaft to first actuate the knock-out pin to eject the stamping from the die into alignment with the nozzle, after which the air control valve is momentarily opened to cause a blast of air to be projected from the nozzle against the stamping to thereby laterally eject the stamping from the press.

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