

July 11, 1939.

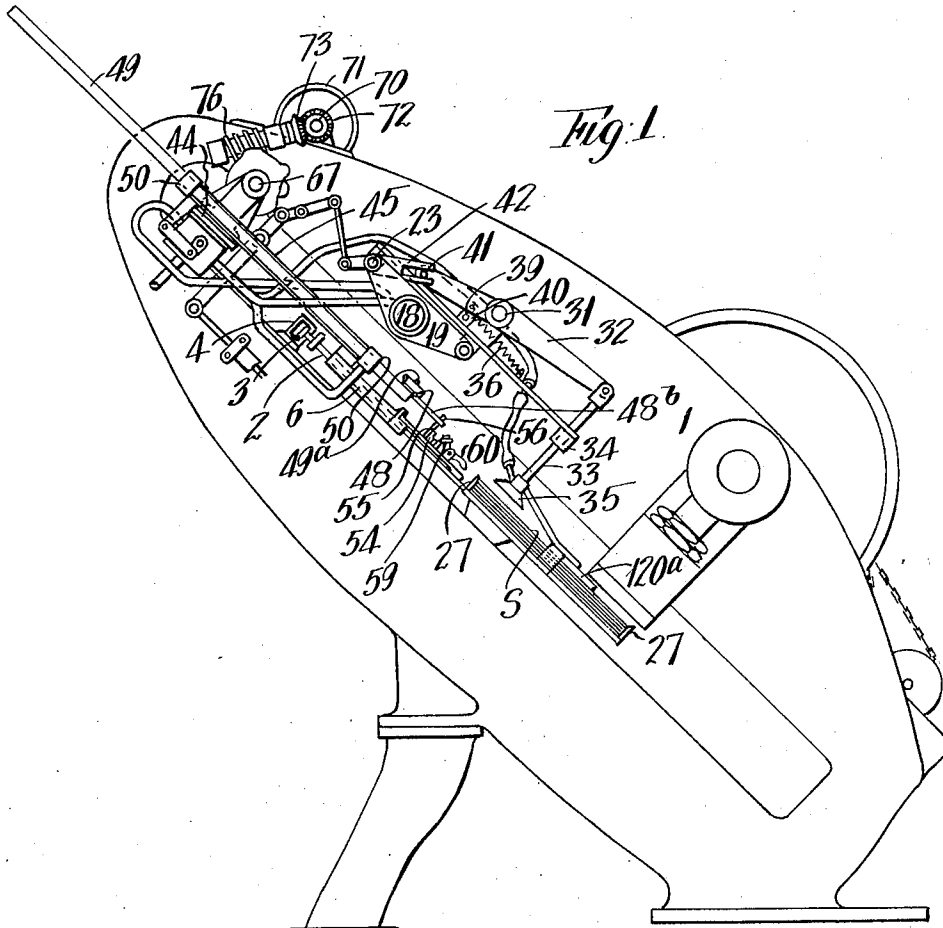
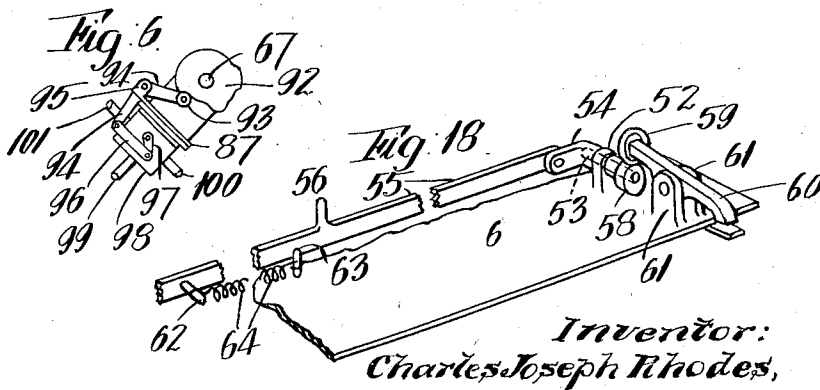
C. J. RHODES

2,165,676

PRESS FOR CUTTING SHEET METAL

Filed June 17, 1937

4 Sheets-Sheet 1



Inventor:
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By

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July 11, 1939.

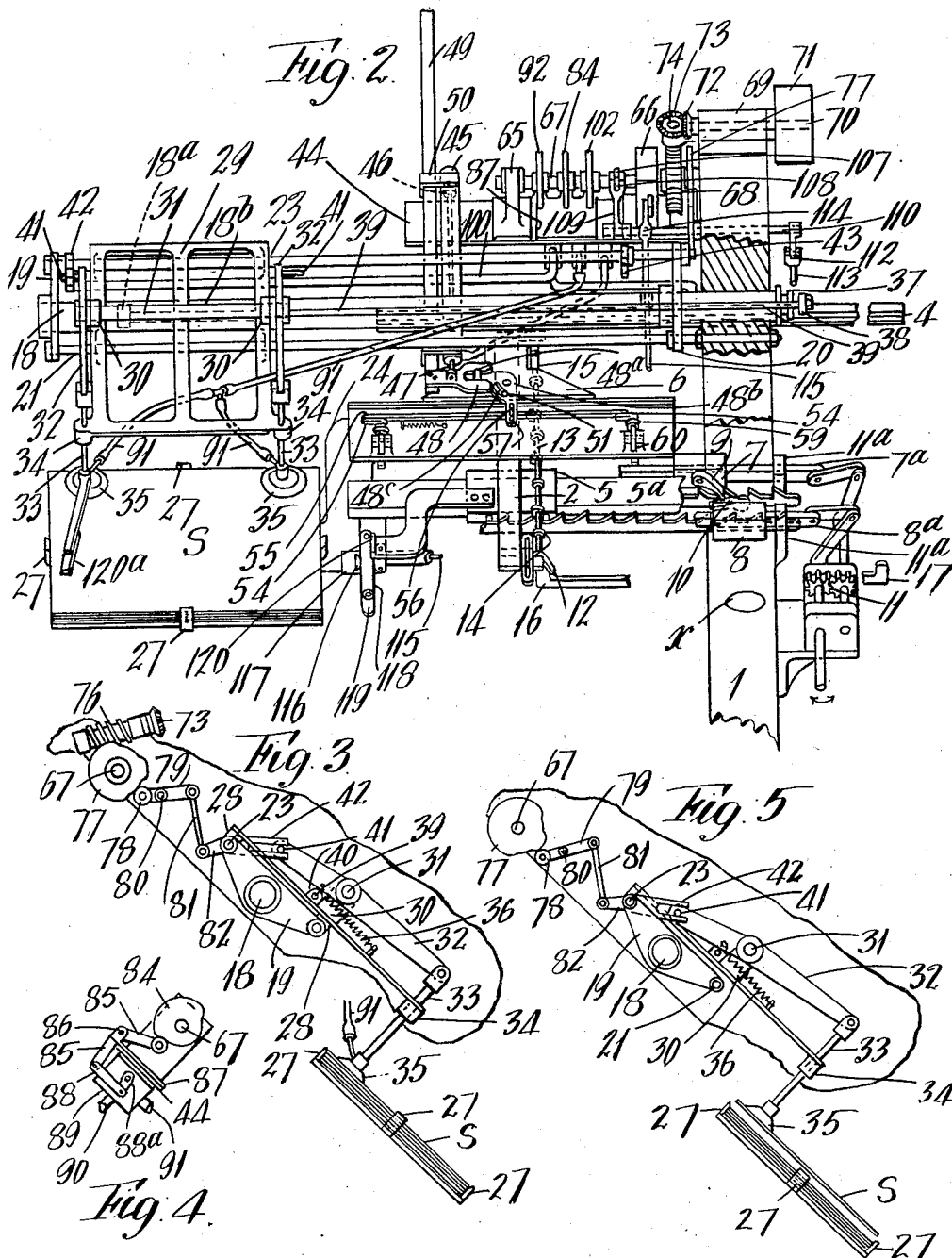
C. J. RHODES

2,165,676

PRESS FOR CUTTING SHEET METAL

Filed June 17, 1937

4 Sheets-Sheet 2



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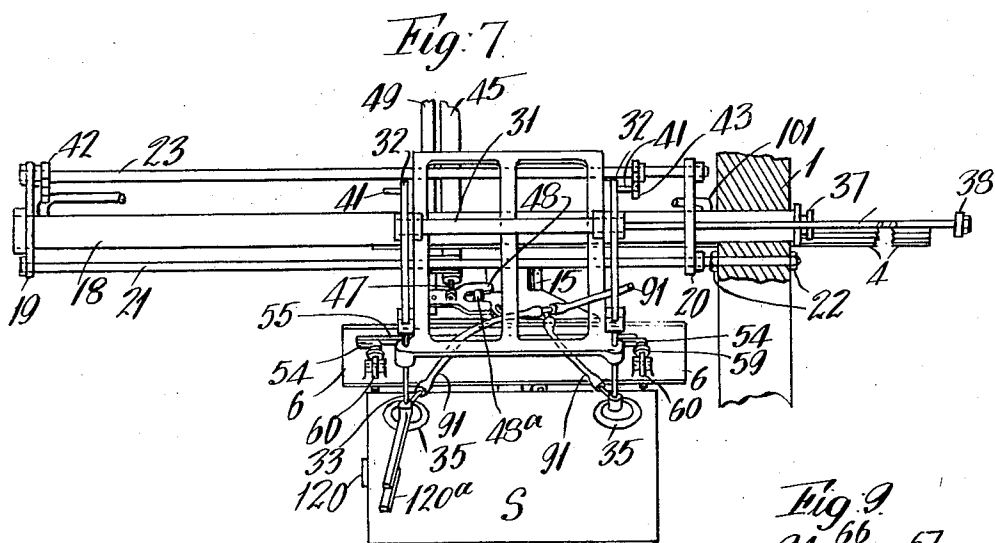
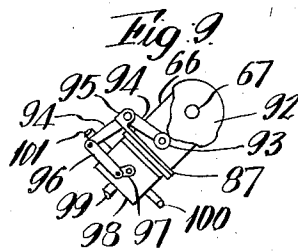
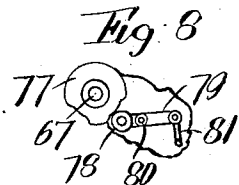
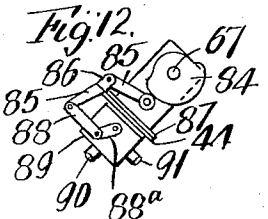
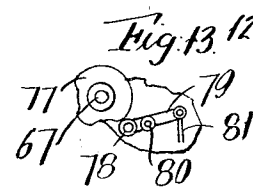
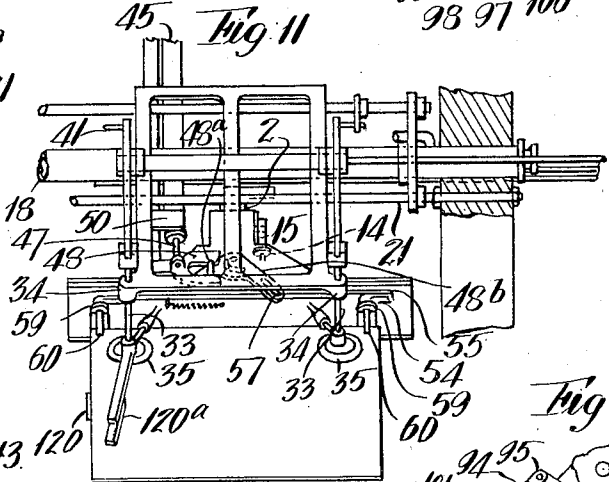
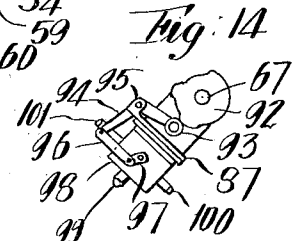
C. J. RHODES

2,165,676

PRESS FOR CUTTING SHEET METAL

Filed June 17, 1937

4 Sheets-Sheet 3



Inventor:
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July 11, 1939.

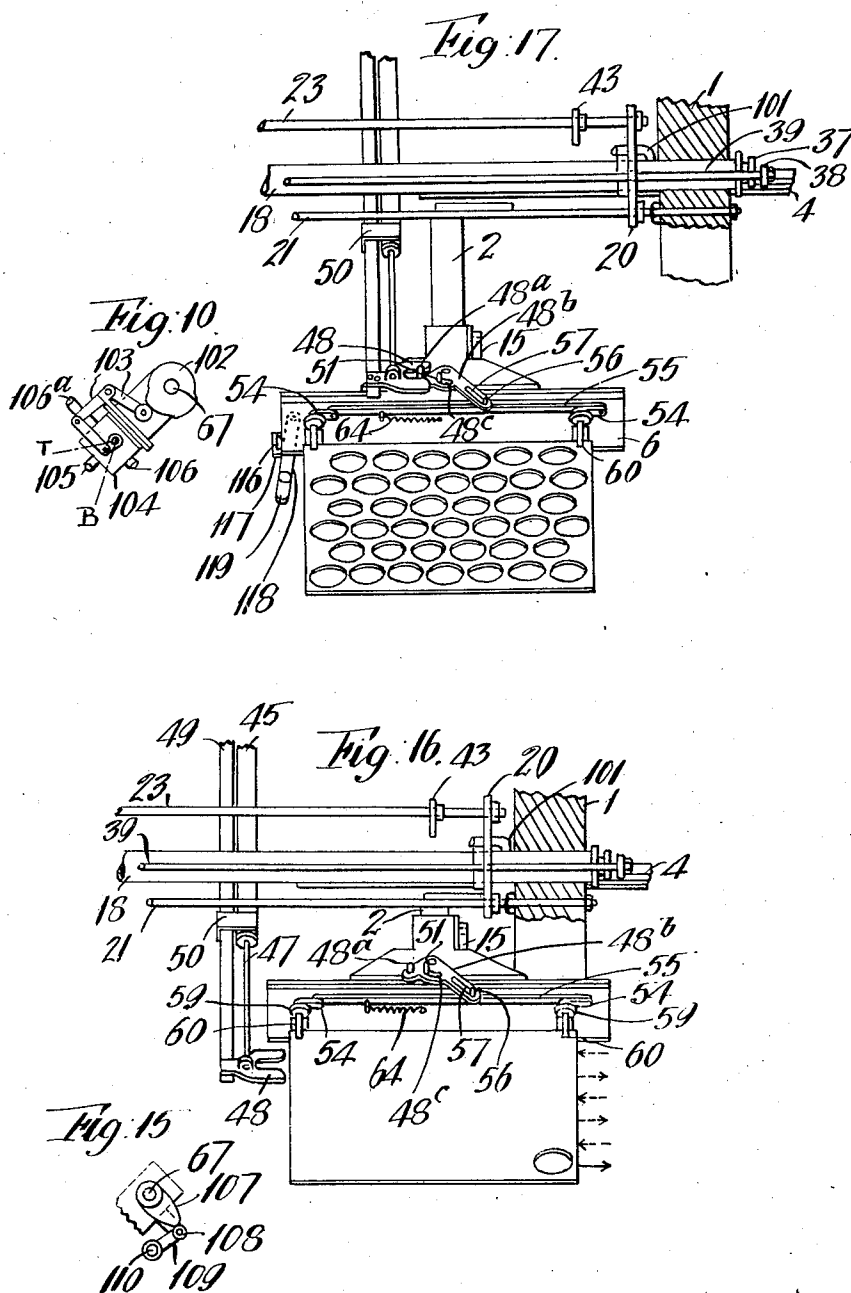
C. J. RHODES

2,165,676

PRESS FOR CUTTING SHEET METAL.

Filed June 17, 1937

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,165,676

PRESS FOR CUTTING SHEET METAL

Charles Joseph Rhodes, Wakefield, England

Application June 17, 1937, Serial No. 148,701
In Great Britain February 11, 1937

23 Claims. (Cl. 271—14)

This invention relates to presses for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto, and of the kind having mechanism whereby the sheet is automatically fed, for the punching operation, with a series of step by step motions, first in one direction and then, after being displaced laterally to the first line of movement, in the opposite direction.

For the purpose of preventing waste of material in the case where certain shaped articles, for example round ones, are being punched from the sheet, the machine is provided with sheet feeding means, which, although feeding the sheet in the manner just described, will cause the sheets to be so perforated that the perforations in one row are staggered with respect to those of the next row, in order that the maximum possible number of articles can be punched from each sheet, a machine in which the feed is so arranged being known as a "stagger press".

In one construction of this kind of machine, the punching means is arranged to reciprocate along a vertically inclined axis, and the sheet being operated upon is fed under said punching means whilst being maintained in an inclined plane at a right angle to the said axis, the sheet in this case usually being carried on a gravity actuated vertically inclined slide mounted upon a transverse slide, on which latter the sheet is fed from side to side of the machine underneath the punching means. After each horizontally extending row of perforations has been made in the sheet, as a result of a number of punching operations, the gravity slide is caused to drop an amount necessary to bring an unperforated portion of the sheet in position to be fed beneath the punching means upon the reverse lateral movement of the transverse slide.

The sheet is usually secured in position upon the gravity slide by hand actuated gripping means, which also needs to be manually operated to release the sheet after it has been completely perforated by the punching means.

It is more particularly to this construction of machine that the present invention applies.

According to the present practice, it is necessary for the sheets of metal to be individually placed in the machine by the operator.

According to the present invention, the sheets are assembled conveniently in a stack or pile, located at a different station from the step by step feeding means, from which pile they are automatically extracted one by one prior to being transported and automatically presented to the

step by step feeding means, each sheet being automatically released after it has been completely perforated by the punching means.

Preferably the means whereby the successive sheets are removed from the pile or stack is pneumatic.

In cases where the machine is provided with grippers for holding the sheets while they are presented to and fed through the machine, mechanical means is provided for taking a sheet from a pack of sheets and presenting it to said grippers without manual assistance, together with mechanism for causing said grippers to automatically grip the sheet, and mechanism whereby each of the sheets is automatically freed after it has been completely perforated by the punching means.

According to one construction, as applied to a machine having the aforesaid transverse and gravity actuated slides, automatically closing grippers are provided for holding the sheet onto the gravity slide, together with means adapted to move onto each successive sheet of the pack and hold the sheet, and while so holding it, carry it to a point adjacent said slides for it to be gripped by said grippers, which latter are automatically opened after the completely perforated sheet has been carried clear of the punching means, to permit said sheet to fall from or be ejected from the machine, mechanism also being provided for then returning the gravity slide to its initial position prior to the feeding of the succeeding sheet into the position to be held by the grippers.

The means adapted to move onto each successive sheet of the pack and hold said sheet while carrying it to the point adjacent the slides, for it to be held by the grippers consists of suckers.

In all cases where the sheets are of magnetic material the means adapted to move onto each successive sheet of the pack and hold the sheet while carrying it to the point adjacent the slides, for it to be gripped by the grippers may be electro-magnetic means, in which case suitable provision must be made for preventing more than one sheet at a time being transported thereby.

Alternatively, the sheets may be extracted from the pack by a reciprocating member provided with a projection or projections designed to engage the edge of the sheet on its effective stroke, suitable provision being made whereby only one sheet at a time can be so extracted, and transported to the point adjacent the step by step feeding means and then presented to the latter.

According to a further modification, the ex-

traction of the sheets from the pack may be effected by means of grippers carried by a reciprocating member, which grippers are arranged to engage a sheet on the forward movement of the body and transport it into the desired position.

The invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a side view of a stagger press embodying the present invention.

Fig. 2 is a fragmentary part sectional view showing certain of the parts as seen from the front of the machine.

Fig. 3 is a view showing the manner in which the suckers are caused by a cam to descend onto the uppermost sheet in the magazine.

Fig. 4 is a view showing the manner in which suction is then applied to the suckers, by control means actuated by a second cam.

Fig. 5 is a view showing how the first cam next raises the suckers with the sheet from the magazine.

Fig. 6 shows a third cam which then causes compressed air to be applied to the left-hand end of a horizontal cylinder to cause the suckers to travel with the sheet in a direction toward the press to a certain point.

Fig. 7 shows the suckers and the sheet after they have arrived at this point.

Fig. 8 illustrates how the first cam then causes the suckers to move the sheet onto the sheet slide.

Fig. 9 shows how pressure is then caused by the third cam to be applied momentarily to the right hand end of the horizontal cylinder to cause the sheet to be moved against a locating stop.

Fig. 10 is a view of a fourth cam which next causes pressure to be removed from the lower end of a vertically inclined cylinder to allow the sheet slide to move down under its own weight onto positioning means.

Fig. 11 is a view showing the sheet slide after it has moved down onto said positioning means and the upper edge of the sheet has been clamped to said slide.

Fig. 12 shows how the second cam then causes the suction to be cut off from the suckers.

Fig. 13 shows how, after this, the first cam raises the suckers.

Fig. 14 illustrates how the third cam then causes pressure to be applied to the right-hand end of the horizontal cylinder to send the suckers back to their initial position (in which they are shown in Fig. 2).

Fig. 15 shows a fifth cam which next trips a lever operatively associated with the main machine clutch, to start the machine.

Fig. 16 shows the sheet being moved by the sheet slide under the punch, which latter has punched the first article from the sheet.

Fig. 17 shows the completely punched sheet still in the slide, after it has been moved clear of the punch.

Fig. 18 is a fragmentary perspective view showing certain details.

Referring to the accompanying drawings, 1 indicates generally the main machine or stagger press having the usual form of transverse slide 2 carried at its upper end by means of rollers 3 which are located within and adapted to traverse a hollow slotted rail member 4 secured to the frame of the machine. The transverse slide is, at a point near its lower end, secured to a shoe 5 slidably mounted upon a rail 5a in the known manner, which rail is mounted upon the machine frame in any suitable manner (not shown).

Mounted upon the transverse slide 2 is a vertical slide 6.

Carried by blocks 7, 8, mounted on rods 7a, 8a, are pawls 9, 10, the said rods being slidably mounted in brackets such as 11a mounted upon the frame 1.

The rods 7a, 8a, are adapted to be oppositely reciprocated through gearing 11 operatively connected to the crank shaft P of the punch, and the pawls 9, 10, are adapted to be alternately lowered and raised by means (not shown) usually employed in this type of press, into and out of engagement with the respective racks 9a, 10a, carried upon the transverse slide 2, whereby the transverse slide, together with the gravity slide, 15 which latter also carries the sheet, is given a step by step motion beneath and in timed relationship with respect to the operation of the punch, and over the die x, first in one direction for one row of perforations to be punched, and then (after the gravity slide has moved downward) in the opposite direction for the next row of perforations to be punched.

The downward movement of the gravity slide is controlled by an arm 12 which is tripped after each horizontal row of perforations has been punched to partially rotate a shaft 13 provided with a series of staggered projections 14 and carried by the transverse slide 2, the said projections being so arranged that they are successively engaged by a pawl 15 carried by the upper end of the gravity slide, whereby the latter is permitted to move downward after each horizontal row of perforations is produced in the sheet.

16, 17 indicate the projections against which the arm 12 is tripped at the end of each row of perforations.

The staggering of the rows of perforations in the sheet is effected by virtue of the fact that the ratchet teeth of one rack are staggered with respect to those of the other rack.

Index or detent means (not shown), such as are usually employed on this type of machine, are provided for holding the transverse slide as the pawls 9, 10, ride over the respective racks, and whereby said slide is prevented from shifting during each punching operation.

The whole of the construction, arrangement and operation of the transverse slide 2 and vertical or gravity slide 6 just described is similar in principle to that of the well known arrangements with which such presses are usually provided.

Passing laterally through and secured in the frame of the machine is a cylinder 18 which extends for a considerable distance beyond the left hand side of the said frame and is provided at its extreme outer or left hand end with a bracket 19 and at a point closer to the machine with a similar bracket 20, which last-mentioned bracket is connected to the bracket 19 by a tie rod 21, which extends along in spaced relationship to the lower portion of the cylinder and at its inner end passes through and is secured by nuts 22, to the said frame.

Extending between the upper portions of the brackets 19 and 20 and journaled in bearings formed therein is a shaft 23.

The tie rod 19 and shaft 23 are arranged parallel to each other and to the cylinder.

Secured to the slide 5a by a bracket 24 is a magazine 25 for containing the sheets S, the said magazine being provided with a base portion 26 and upstanding lugs 27 by means of which the

sheets are maintained in the correct position upon said base.

Slidably mounted by means of downwardly extending lugs 28 upon the tie rod 21 and the shaft 23 is a plate 29 provided with upstanding lugs 30 perforated to form bearings for a shaft 31, upon the opposite ends of which are secured two armed levers 32, to the lower end of each of which levers is pivoted the upper end of a rod 33 which extends through a guide 34 formed upon the lower surface of the plate 29.

Each of the rods 33 is provided, at its lower end, with a rubber sucker 35, the purpose of these suckers being to descend against the action of springs 36 (Fig. 1) onto the uppermost plate in the magazine, in the manner which will hereinafter be described.

Disposed within the cylinder 18 is a piston 18a, indicated in Fig. 2 by dotted lines, the piston rod 18b of which passes through a gland 37 at the inner end of the cylinder and is connected by a yoke 38 to a bar 39 which freely passes through a perforation in the main frame, also a perforation in the bracket 20, and is at its extreme outer or left-hand end secured to a lug 40 (Fig. 1) formed upon the plate 29.

The arrangement just described is such that when compressed air is applied to the left-hand end of the cylinder, the plate 29 and the parts carried thereby will be caused to travel along toward the main machine frame, into the position in which it is shown in Fig. 7, it being adapted to thereafter be returned to its initial position by the application of compressed air to the right-hand end of the cylinder 18.

Provided upon the upper end of each of the levers 32 is a pin 41, the pin 41 of the left-hand lever engaging a forked lever 42 secured upon the left-hand end portion of the shaft 23 when the plate 29 is in its initial position, and the pin 41 of the right-hand lever 32 engaging a forked lever 43 also fixed upon said shaft, when the said plate moves into the position in which it is shown in Fig. 7.

Fixed to the upper portion of the main frame is a bracket 44, upon which is mounted a vertically inclined cylinder 45, the piston 46 of which is connected by a piston rod 47 to a forked member 48 carried at the lower end of a square rod 49 slidably mounted in brackets 50 secured to the upper and lower ends of the cylinder 45.

The forked member 48 normally engages a pin 48a upon a bell crank lever 48b pivoted upon the upper part of the gravity slide. The bell crank lever is provided with an arcuate slot 48c formed concentrically with the pivot of said lever and with which slot engages a pin 51 fixed upon the gravity slide to limit the movement of the lever between the position in which it is shown in Figs. 2 and 7 and that in which it is shown in Figs. 11, 16 and 17.

The fork 48 is maintained in the normal position in which it is shown in Figs. 2 and 7 by reason of the fact that compressed air is supplied to the lower end of the cylinder 45, in a manner to be hereinafter described, this holding the gravity slide 6 in its uppermost position in which the pawl 15 is above and out of contact with the uppermost of the aforesaid projections 14, as shown in Fig. 1.

Formed upon the upper portion of the gravity slide 6 and near each end thereof is a lug 52 perforated to form a bearing for a short spindle 53, such as shown more clearly in Fig. 18.

Secured upon the upper end of each of the

spindles 53 is an arm 54, these two arms being operatively connected by a link 55 having an upstanding pin 56 which engages a slot 57 formed in the lower arm of the bell-crank lever 48b.

Mounted upon the lower end of each spindle 53 is a cam 58, (see Fig. 18), which engages with a roller 59 carried on the upper end of a jaw member 60 pivoted between a pair of lugs 61 cast upon the gravity slide 6, the arrangement being such that when the arms 54 are maintained by the bell crank lever in the position in which they are shown in Figs. 2 and 7, the effective portions of the jaw members are in spaced relationship with respect to the upper surface of the slide 6, but when said arms are moved by the bell crank lever into the position in which they are shown in Figs. 11, 16 and 17, the effective portions of said jaws are closed upon said surface.

A suitable leaf or other spring (not shown) is provided between the non-effective portion of each jaw member 60 and the slide 6, whereby said jaw will not remain shut merely by reason of its own weight.

Provided upon the link 55 is a pin 62 between which and a pin 63 upon the gravity slide 6 is stretched a spring 64, the purpose of which is to snap over the arms 54 into the two positions previously mentioned.

Mounted upon the aforementioned bracket 44 is a bearing 65, in which bearing and a bearing formed in the wall of the housing of a clutch, which latter is indicated generally by 66, is journaled a shaft 67, the said shaft extending through said housing and carrying a worm wheel 68, the said clutch being of the kind adapted to be set or tripped to clutch the worm wheel to the shaft for one revolution at a time only.

Provided upon the upper portion of the machine frame is a bearing 69 in which is journaled a spindle 70 carrying at one end a driving pulley 71 and at the other end a bevel pinion 72 which engages with a second such pinion 73 mounted upon the end of a spindle 74 carried in bearings 75 secured to the frame.

Also secured upon the spindle 74 is a worm 76 which engages with and drives the worm wheel 68.

Mounted upon the shaft 67 is a cam 77 which engages with a roller 78 carried upon one end of a lever 79 pivoted at 80 to the machine frame (as shown in Figs. 3, 5, 8 and 13) the opposite end of the lever being connected by a link 81 to an arm 82 mounted upon the inner end of the shaft 23, so that said cam will rock this shaft when one or other of the pins 41 is in engagement with its respective forked lever 42 or 43 and thus raise and lower the suckers 35 in suitably timed relationship with the operation of other parts of the machine.

Also mounted upon the shaft 67 is a second cam indicated by 84, and more clearly shown in Figs. 4 and 12, which cam engages with a roller carried at the upper end of a lever 85 pivoted between lugs such as 86 formed on a plate 87 carried by the bracket 44. The lower end of the lever 85 is connected by a link 88 and an arm 88a to a valve indicated generally by 89, and the valve 89 is connected by a pipe 90 to the suction side of a pump, not shown, the valve also being connected by a rubber or other suitable flexible tube 91 to the suckers 35.

The shape of the cam 84 and the arrangement of the parts associated therewith is such that the suckers 35 are connected to the suction side of the pump and are disconnected therefrom and connected to atmosphere in suitably timed rela-

tionship with respect to the working of other parts of the machine.

Mounted upon the shaft 67 is a third cam, indicated by 92, which cooperates with a roller 93 carried upon the upper end of a lever 94 pivoted between lugs such as 95 formed upon the aforesaid plate 87, the lower end of the lever 94 being operatively connected through link 96 and arm 97 to a valve indicated generally by 98.

The valve 98 is connected by a pipe 99 to a compressed air reservoir, not shown, and supplied with compressed air from the pressure or output side of the aforesaid pump, the said valve having three positions, consisting of a neutral position, a position in which it is shown in Fig. 6 in which it causes compressed air to be supplied to the left-hand end of the cylinder 18 through a pipe 100 at the same time opening the right-hand end of the cylinder to atmosphere through a pipe 101, and vice versa, the position in which it is shown in Figs. 9 and 14.

102 indicates a fourth cam, also mounted on the shaft 67, which (as shown more clearly in Fig. 10) controls through a lever 103 a three position valve 104 connected by a pipe 105 to the aforesaid compressed air reservoir, by a pipe 106 to the lower end of the inclined cylinder 45, and by a pipe 106a to the upper end of said cylinder, said valve initially being in the position indicated by the line B to supply compressed air to the lower end of the cylinder.

Also mounted upon the shaft 67 is a fifth cam, indicated by 107 designed to engage with a roller 108 (Fig. 15) carried by an arm 109 mounted upon a shaft 110 carried in bearings 111 formed integral with the bracket 44, the said shaft passing through the machine frame and being operatively connected by means including an arm 112 and link 113 to the main machine clutch, not shown.

Freely mounted upon the shaft 110 is a lever 114, the upper end of which is operatively connected to the aforesaid clutch 66.

The lower end of the lever 114 is connected in any suitable manner, for example by a Bowden wire 115 to a projection 116 slidably mounted upon a bracket 117 secured to the underside of the guide rail 5a.

Pivoted upon the bracket 117 is a starting lever 118 having a handle 119, the arrangement being such that when said lever is swung outwardly upon its pivot, in a lateral direction, it engages and moves the projection 116, to pull the Bowden wire and cause the lever 114 to be rocked and make the clutch 66 clutch the worm wheel 68 to the shaft 67.

Upon the rotation of the shaft 67 the cam 77 causes the shaft 23 to be rocked to depress the suckers 35 onto the uppermost sheet in the magazine, as shown in Fig. 3.

While the suckers are pressed onto the sheet, the second cam, 84, causes suction to be applied to the suckers, as shown in Fig. 4, and, whilst the suction is so applied, the cam 77 raises the suckers together with the sheet from the magazine into the position shown in Fig. 5.

The third cam, 92, then causes compressed air to be applied to the left-hand end of the cylinder 18, in the manner shown in Fig. 6, to cause the suckers to carry the plate laterally into the position in which it is shown in Fig. 7, in which position the cam 77 depresses the plate onto the lateral slide, by rotating into the position in which it is shown in Fig. 8.

A projection on the cam 92 then engages with

the roller 93 as shown in Fig. 9 and causes compressed air to be applied momentarily to the right hand end of the cylinder 18 to cause the sheet to be moved rearwardly, into engagement with a locating stop 120, to correctly position the sheet on the lateral slide, a finger 120a being provided upon the left-hand sucker rod for ensuring that the sheet shall not buckle and ride over said stop.

The fourth cam 102 then causes the compressed air to be removed from the lower end of the cylinder 45 and said lower end to be connected to atmosphere, by moving the valve into the position in which it is shown in Fig. 10.

This causes the forked member 48 to move downward and in turn permit the gravity slide 6 to move down until the pawl 15 thereof engages the uppermost one of the aforesaid projections 14 and the jaw members 60 have passed over the upper edge of the sheet.

The continued downward movement of the fork 48 relatively to the now stationary gravity slide then causes the bell crank lever 49 to be rotated into the position in which it is shown in Fig. 11, and the upper edge of the sheet to be gripped in the manner previously described.

The second cam then moves into the position shown in Fig. 12 to cut off the suction from the suckers, after which the first cam moves into the position shown in Fig. 13, to raise the suckers from the sheet. The third cam then moves into the position shown in Fig. 14 to cause the suckers to be returned to their initial position (in which they are shown in Fig. 2).

The fifth cam, 107, then displaces the arm 109, and consequently causes the press to be put into operation by clutching the belt driven fly-wheel 1a to the press. The clutch 66 then automatically declutches the worm wheel 68 from the shaft 67.

The sheet is then carried by the lateral slide 2 through the press, from side to side thereof in the manner previously described, and as indicated by the arrows in Fig. 16, until it is completely perforated.

As soon as the pin 48a has moved out of engagement with the fork 48, the portion 102a of the cam 102 engages with the roller of the lever 103 and moves the arm of the valve 104 into the position indicated by the line T to apply compressed air through a pipe 106a to the top of the cylinder 45, whilst, at the same time, maintaining the lower end of the cylinder open to atmosphere, this causing the fork to be driven down into the position in which it is shown in Fig. 16, where it is ready to be re-engaged by the pin 48a after the last row of perforations has been punched in the sheet.

When the gravity slide 6 drops down into position for the uppermost or last row of articles to be punched, it comes into line with the aforesaid projection 116, so that when said last row has been punched the gravity slide 6 engages said projection and again causes the clutch 66 to clutch the worm wheel 68 to the shaft 67, which causes the cam 107 to immediately move out of engagement with the arm 109 and stop the press.

The continued rotation of the shaft 67 then causes the cam 102 to operate the valve 104 to return it to the position indicated by the line B, and thus cause it to again apply the compressed air to the lower end of the cylinder 45 and return the fork 48 and the gravity slide 6 to their initial positions.

Before the upward motion of the fork 48 is

transmitted to the gravity slide 6, the bell crank lever 49 is swung about its pivot and consequently opens the jaws 69 to free the perforated plate and permit it to fall out of the machine.

5 The continued rotation of the shaft 67 causes the foregoing cycle of operations to be repeated.

Should it be desired to stop the machine at any time, this can readily be done by manually opening the main machine clutch and/or stop-
10 ping rotation of the shaft 67 by uncoupling the means which control the automatic operation of the clutch, and for which suitable provision (not shown) is preferably made.

15 Instead of employing a cylinder such as 18 and its associated parts for moving the suckers to transport the sheet to the position to be gripped by the grippers, a rack and pinion could be employed.

20 A rack and pinion could also be employed for returning the gravity slide to its initial position.

Should such rack and pinion arrangement be used, however, it would be preferable for the pinions to be driven through friction clutches arranged to slip in the event of a sheet becoming
25 jammed, or of any other such contingency.

I claim:

1. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto and of the kind comprising a transverse slide and a gravity
30 feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions, first in one direc-
35 tion and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, means adapted to move onto and extract each successive sheet of a pack of sheets located at a
40 different station from said transverse and gravity slides; means for transporting each sheet so extracted, from said station to a point adjacent said slides to thereby permit it to be automatically
45 presented to said grippers; means for causing said grippers to automatically grip the sheet, and for causing the grippers to automatically release the sheet after it has been fully perforated and carried by the transverse slide clear of the
50 machine, and mechanism for then returning the gravity slide to its initial position prior to the transporting of the succeeding sheet to the point adjacent said slides and its presentation to the grippers.

55 2. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the
60 sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions, first in one direction and then, after being displaced by the grav-
65 ity slide laterally to the first line of movement, in the opposite direction, in combination, suckers adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity slides;
70 means for transporting each sheet so extracted, from said station to a point adjacent said slides to thereby permit it to be automatically presented to said grippers; means for causing said grippers to automatically grip the sheet, and for causing
75 the grippers to automatically release the sheet

after it has been fully perforated and carried by the transverse slide clear of the machine; and mechanism for then returning the gravity slide to its initial position prior to the transporting of the succeeding sheet to the point adjacent said
5 slides and its presentation to the grippers.

3. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto, and of the kind comprising a transverse slide and a gravity
10 feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions, first in one direc-
15 tion and then, after being displaced by the gravity slide, laterally to the first line of movement, in the opposite direction, in combination, means adapted to move onto and extract each successive sheet of a pack of sheets located at a different
20 station from said transverse and gravity slides; means for transporting each sheet so extracted, from said station to a point adjacent said slides, to thereby permit it to be automatically presented to said grippers; means for causing said grippers
25 to automatically grip the sheet, and for causing the grippers to automatically release the sheet after it has been fully perforated and carried by the transverse slide clear of the machine; and pneumatically operated mechanism for then re-
30 turning the gravity slide to its initial position prior to the transporting of the succeeding sheet to the point adjacent said slides and its presentation to the grippers.

4. In a press for cutting sheet metal and
35 punching a number of articles from sheets which are individually presented thereto and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet
40 is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions, first in one direction and then, after being displaced by the gravity slide laterally to the first line of movement, in
45 the opposite direction, in combination, suckers adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity
50 slides; means for transporting each sheet so extracted, from said station to a point adjacent said slides to thereby permit it to be automatically presented to said grippers; means for causing said grippers to automatically grip the sheet,
55 and for causing the grippers to automatically release the sheet after it has been fully perforated and carried by the transverse slide clear of the machine; and pneumatically operated mechanism for then returning the gravity slide to its
60 initial position prior to the transporting of the succeeding sheet to the point adjacent said slides and its presentation to the grippers.

5. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto, and of the kind comprising a transverse slide and a gravity
65 feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions, first in one direc-
70 tion and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, means
75

adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity slides; means for transporting each sheet so extracted from said station to a point adjacent said slides, to thereby permit it to be automatically presented to said grippers; and mechanism for causing said grippers to automatically release the sheet after it has been fully perforated and carried by the transverse slide clear of the machine, and then return the gravity slide to its initial position, said mechanism comprising a cylinder; a piston within said cylinder; and a lost motion device through which said piston is operatively connected to the grippers so that, after the latter have moved onto the edge of the sheet, relative motion will take place between said piston and gravity slide to cause said grippers to close upon and hold the sheet, whereas, when said piston is subsequently driven pneumatically in the reverse direction to return the gravity slide to its initial position, said piston will first move relatively to the gravity slide and cause said grippers to release the sheet.

6. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions, first in one direction and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, suckers adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity slides; means for transporting each sheet so extracted, from said station to a point adjacent said slides, to thereby permit it to be automatically presented to said grippers; and mechanism for causing said grippers to automatically release the sheet after it has been fully perforated and carried by the transverse slide clear of the machine, and then return the gravity slide to its initial position, said mechanism comprising a cylinder; a piston within said cylinder; and a lost motion device through which said piston is operatively connected to the grippers so that, after the latter have moved onto the edge of the sheet, relative motion will take place between said piston and gravity slide to cause said grippers to close upon and hold the sheet, whereas, when said piston is subsequently driven pneumatically in the reverse direction to return the gravity slide to its initial position, said piston will first move relatively to the gravity slide and cause said grippers to release the sheet.

7. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto, and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions first in one direction, and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, means adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity

slides; pneumatically operated means for then moving the sheet extracting means with the sheet extracted thereby, to transport the latter to a point adjacent said slides to thereby permit it to be automatically presented to said grippers; means for causing said grippers to automatically grip the sheet, and for causing said grippers to automatically release the sheet after it has been fully perforated and carried by said transverse slide clear of the machine; and mechanism for then returning the gravity slide to its initial position prior to the transporting of the succeeding sheet to the point adjacent said slides and its presentation to the grippers.

8. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto, and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions first in one direction, and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, suckers adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity slides; pneumatically operated means for then moving the sheet extracting means with the sheet extracted thereby, to transport the latter to a point adjacent said slides to thereby permit it to be automatically presented to said grippers, and for causing said grippers to automatically grip the sheet; means for causing said grippers to automatically release the sheet after it has been fully perforated and carried by said transverse slide clear of the machine; and mechanism for then returning the gravity slide to its initial position prior to the transporting of the succeeding sheet to the point adjacent said slides and its presentation to the grippers.

9. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto, and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation with a series of step by step motions first in one direction, and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, means adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity slides; pneumatically operated means for then moving the sheet extracting means with the sheet extracted thereby, to transport the latter to a point adjacent said slides to thereby permit it to be automatically presented to said grippers; means for causing said grippers to automatically grip the sheet, and for causing said grippers to automatically release the sheet after it has been fully perforated and carried by said transverse slide clear of the machine; and pneumatically operated mechanism for then returning the gravity slide to its initial position prior to the transporting of the succeeding sheet to the point adjacent said slides and its presentation to the grippers.

10. In a press for cutting sheet metal and punching a number of articles from sheets which

are individually presented thereto, and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions first in one direction, and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, suckers adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity slides; pneumatically operated means for then moving the sheet extracting means with the sheet extracted thereby, to transport the latter to a point adjacent said slides to thereby permit it to be automatically presented to said grippers; means for causing said grippers to automatically grip the sheet, and for causing said grippers to automatically release the sheet after it has been fully perforated and carried by said transverse slide clear of the machine; and pneumatically operated mechanism for then returning the gravity slide to its initial position prior to the transporting of the succeeding sheet to the point adjacent said slides and its presentation to the grippers.

11. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto, and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions, first in one direction and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, means adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity slides; pneumatically operated means for then moving the sheet extracting means with the sheet extracted thereby to transport the latter to a point adjacent said slides to thereby permit it to be automatically presented to the grippers; and mechanism for causing said grippers to automatically release the sheet after it has been fully perforated and carried by the transverse slide clear of the machine, and then return the gravity slide to its initial position, said mechanism comprising a cylinder; a piston within said cylinder; and a lost motion device through which said piston is operatively connected to the grippers so that, after the latter have moved onto the edge of the sheet, relative motion will take place between said piston and gravity slide to cause said grippers to close upon and hold the sheet, whereas when said piston is subsequently driven pneumatically in the reverse direction to return the gravity slide to its initial position, said piston will first move relatively to the gravity slide and cause said grippers to release the sheet.

12. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto, and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, for the punching operation, with a series of step by step motions, first in one direc-

tion and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, suckers adapted to move onto and extract each successive sheet of a pack of sheets located at a different station from said transverse and gravity slides; pneumatically operated means for then moving the sheet extracting means with the sheet extracted thereby to transport the latter to a point adjacent said slides to thereby permit it to be automatically presented to the grippers; and mechanism for causing said grippers to automatically release the sheet after it has been fully perforated and carried by the transverse slide clear of the machine, and then return the gravity slide to its initial position, said mechanism comprising a cylinder; a piston within said cylinder; and a lost motion device through which said piston is operatively connected to the grippers so that, after the latter have moved onto the edge of the sheet, relative motion will take place between said piston and gravity slide to cause said grippers to close upon and hold the sheet, whereas when said piston is subsequently driven pneumatically in the reverse direction to return the gravity slide to its initial position, said piston will first move relatively to the gravity slide and cause said grippers to release the sheet.

13. In a press for cutting sheet metal, of the kind having means for feeding each sheet in step by step fashion to have a plurality of rows of articles punched therefrom; means adapted to travel to a point adjacent said step by step feeding means, from a pack of sheets located at a different station from said feeding means; and means, carried by said travelling means, for automatically extracting the sheets one by one from said pack and transporting them to said point to thereby permit them to be automatically presented to said feeding means; together with mechanism whereby each of the sheets is automatically freed after it has been completely perforated.

14. In a press for cutting sheet metal, of the kind having means for feeding each sheet in step by step fashion to have a plurality of rows of articles punched therefrom and having grippers for gripping the sheet onto the step by step feeding means; means adapted to travel to a point adjacent said step by step feeding means, from a pack of sheets located at a different station from said feeding means, and mechanical means carried by said travelling means, for automatically extracting the sheets one by one from said pack and transporting them to said point to thereby permit them to be automatically presented to said feeding means; together with mechanism for causing said grippers to automatically grip the sheet; and whereby each of the sheets is automatically freed after it has been completely perforated.

15. In a press for cutting sheet metal, of the kind having means for feeding each sheet in step by step fashion to have a plurality of rows of articles punched therefrom; means adapted to travel to a point adjacent said step by step feeding means, from a pack of sheets located at a different station from said feeding means; and pneumatic means, carried by said travelling means, for automatically extracting the sheets one by one from said pack and transporting them to said point to thereby permit them to be automatically presented to said feeding means; together with mechanism whereby each of the

sheets is automatically freed after it has been completely perforated.

16. In a press for cutting sheet metal, of the kind having means for feeding each sheet in step by step fashion to have a plurality of rows of articles punched therefrom and having grippers for gripping the sheet onto the step by step feeding means; means adapted to travel to a point adjacent said step by step feeding means, from a pack of sheets located at a different station from said feeding means, and pneumatic means carried by said traveling means, for automatically extracting the sheets one by one from said pack and transporting them to said point to thereby permit them to be automatically presented to said feeding means; together with mechanism for causing said grippers to automatically grip the sheet; and whereby each of the sheets is automatically freed after it has been completely perforated.

17. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide beneath the punching means for the punching operation, with a series of step by step motions, first in one direction and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, means for releasing said gravity slide from its uppermost position, after the sheet has been brought adjacent to said grippers; means for causing said grippers to automatically grip said sheet upon the gravity slide being so released and for causing the grippers to automatically release the sheet after it has been fully perforated and as the gravity slide commences to return to its uppermost position; means whereby the feeding movement of the transverse slide is then initiated; means which arrests the movement of said transverse slide when the fully perforated plate has been carried clear of the punching means; means for then effecting said return of the gravity slide to its uppermost position.

18. In a press for cutting sheet metal and punching a number of articles from sheets which are individually presented thereto, and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, beneath the punching means, for the punching operation, first in one direction and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, pneumatic means for releasing said gravity slide from its uppermost position, after the sheet has been brought adjacent to said grippers; means for causing said grippers to automatically grip said sheet upon the gravity slide being so released and for causing the grippers to automatically release the sheet after it has been fully perforated and as the gravity slide commences to return to its uppermost position; means whereby the feeding movement of the transverse slide is initiated; means which arrests the movement of said transverse slide when the fully perforated plate has been carried clear of the punching means; pneumatic means for then effecting the return of the gravity slide to its uppermost position.

19. In a press for cutting sheet metal and

punching a number of articles from sheets which are individually presented thereto, and of the kind comprising a transverse slide and a gravity feed slide, together with grippers for holding the sheet upon said gravity slide, whereby the sheet is automatically fed, by the action of said transverse slide, beneath the punching means, for the punching operation, first in one direction and then, after being displaced by the gravity slide laterally to the first line of movement, in the opposite direction, in combination, pneumatic means for releasing said gravity slide from its uppermost position, after the sheet has been brought adjacent to said grippers; means for causing said grippers to automatically grip said sheet upon the gravity slide being so released and for causing the grippers to automatically release the sheet after it has been fully perforated and as the gravity slide commences to return to its uppermost position; means whereby the feeding movement of the transverse slide is then initiated; a pin and fork connection between said pneumatic means and said gravity slide, whereby said pneumatic means and gravity slide become disengaged when the transverse slide moves toward the punching means and re-engaged when the fully perforated sheet has been carried clear of said punching means; means which arrests the movement of said transverse slide when said fully perforated sheet has been carried into the last mentioned position, and said pin and fork connection has been re-established; pneumatic means adapted to operate, through said pin and fork connection, to then return said gravity slide to its uppermost position.

20. In a machine for punching parallel rows of perforations in sheets, punching means, and an operating mechanism therefor; a sheet holder having automatically operable sheet gripping means; means for so feeding the said sheet holder, that a sheet gripped by the said gripping means is passed below the punching means in feeding steps corresponding, respectively to the distance between the individual perforations of each row of perforations, and to the distance between the individual rows of perforations, means for causing the release of the waste sheet after termination of the sheet punching operation and for returning the sheet holder into its sheet receiving position, means for transferring individual sheets from a stack of sheets to the said sheet holder, so that the same may be received and clamped between the said sheet gripping means, while the sheet holder is in its sheet receiving position, and a control member for controlling the operation and timed relation of the said sheet transferring means, sheet gripping and sheet holder feeding means and of the said punching means operating mechanism, and being itself controlled by the said sheet holder subsequently to the latter carrying the completely perforated sheet clear of the punching means, so as to permit a continuous and automatic operation of the machine and its operation upon successive sheets, to thereby exclude any manual operation.

21. In a press for cutting sheet metal, of the kind having means for feeding each sheet in step by step fashion to have a plurality of rows of articles punched therefrom; means for automatically extracting the sheets one by one from a pack of sheets located at a different station from said step by step feeding means; and means for transporting each sheet so extracted, from

said station to a point adjacent said feeding means, to permit it to be automatically presented to the latter; together with mechanism whereby each of the sheets is automatically freed, after having been held continuously throughout the step by step feeding movement and the punching operation; and control means for controlling and timing the operation of the means for extracting the sheets from the pack and the said means for transporting each sheet, and which control means is itself controlled by movement imparted from the step by step feeding means subsequently to the latter carrying the completely perforated sheet clear of the punching means, so as to permit a continuous and automatic operation of the machine and its operation upon successive sheets to thereby exclude any manual operation.

22. In a press for cutting sheet metal, of the kind having means for feeding each sheet in step by step fashion to have a plurality of rows of articles punched therefrom and having grippers for gripping the sheet onto the step by step feeding means; mechanical means for extracting, without manual assistance, the sheets one by one, from a pack of sheets located at a different station from said step by step feeding means; and means for transporting each sheet so extracted, from said station to a point adjacent said feeding means, to thereby permit it to be automatically presented to the latter; mechanism for causing said grippers to automatically grip the sheet and hold it continuously throughout the step by step feeding and punching operation and to automatically free it after it has been completely perforated; and control means for controlling and timing the operation of the means for extracting the sheets from the pack and the

said means for transporting each sheet, and which control means in itself controlled by movement imparted from the step by step feeding means subsequently to the latter carrying the completely perforated sheet clear of the punching means, so as to permit a continuous and automatic operation of the machine and its operation upon successive sheets to thereby exclude any manual operation.

23. In a press for cutting sheet metal of the kind having means for feeding each sheet in step by step fashion to have a plurality of rows of articles punched therefrom; pneumatic means for automatically extracting the sheets one by one from a pack of sheets located at a different station from said step by step feeding means; means for transporting each sheet so extracted from said station to a point adjacent said feeding means to permit it to be automatically presented to the latter; together with mechanism whereby each of the sheets is automatically freed after having been held continuously throughout the step by step feeding movement and the punching operation; and control means for controlling and timing the operation of the means for extracting the sheets from the pack and the said means for transporting each sheet, and which control means is itself controlled by movement imparted to it from the step by step feeding means subsequently to the latter carrying the completely perforated sheet clear of the punching means, so as to permit a continuous and automatic operation of the machine and its operation upon successive sheets, to thereby exclude any manual operation.

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