No. 616,213. Patented Dec. 20, 1898.

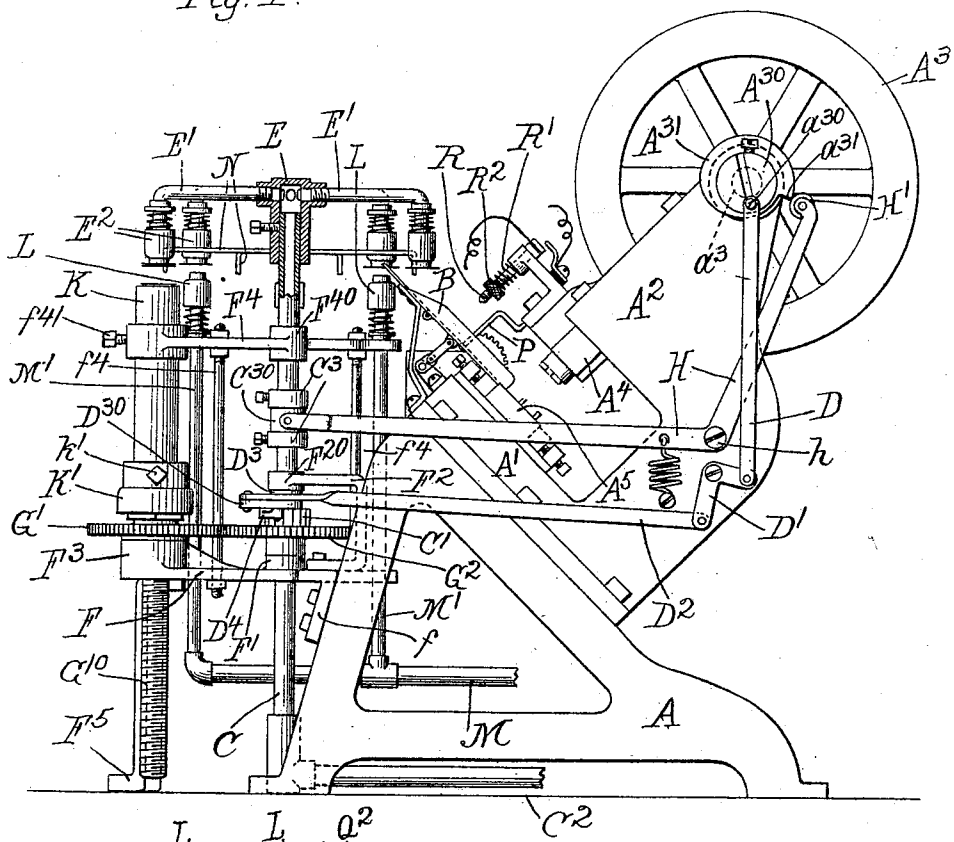
E. TYDEN.

CARRIER FOR DIE PRESSES.

(Application filed Jan. 26, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



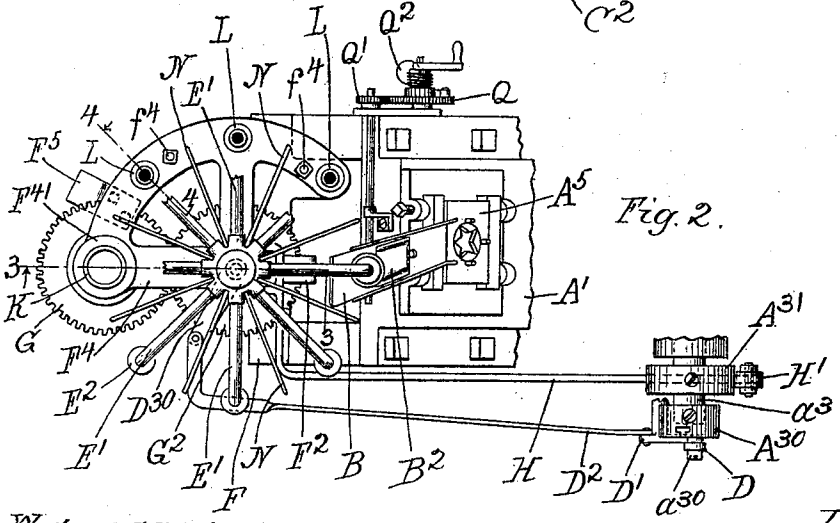


Fig. 2.

Witnesses.
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

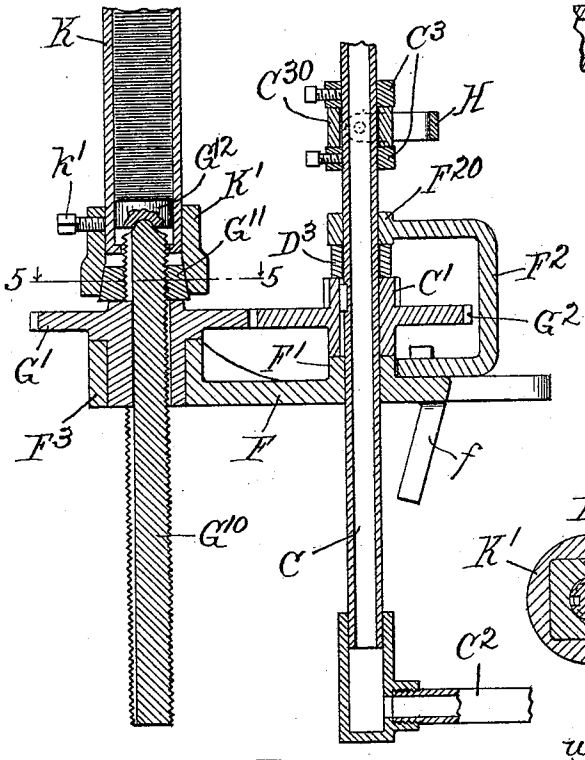


Fig. 4.

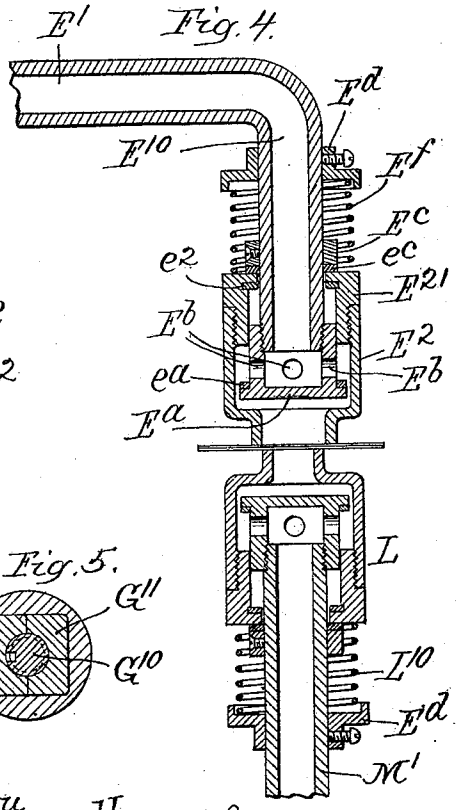


Fig. 5.

Fig. 6.

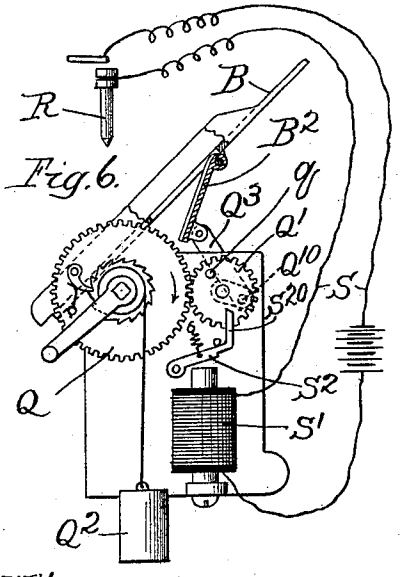


Fig. 7.

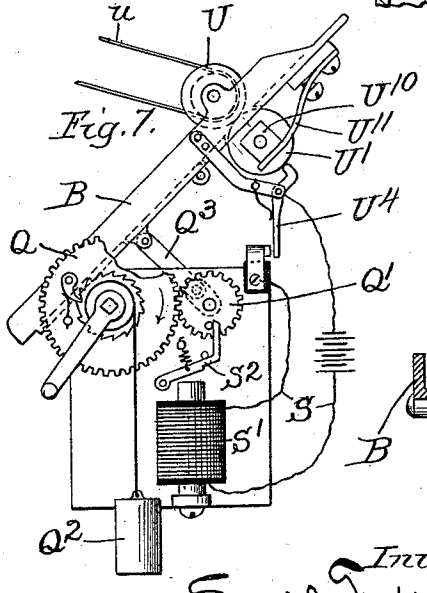
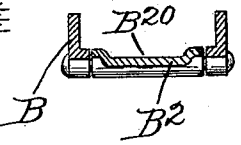


Fig. 8.



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No. 616,213. Patented Dec. 20, 1898.

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(Application filed Jan. 26, 1898.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 9.

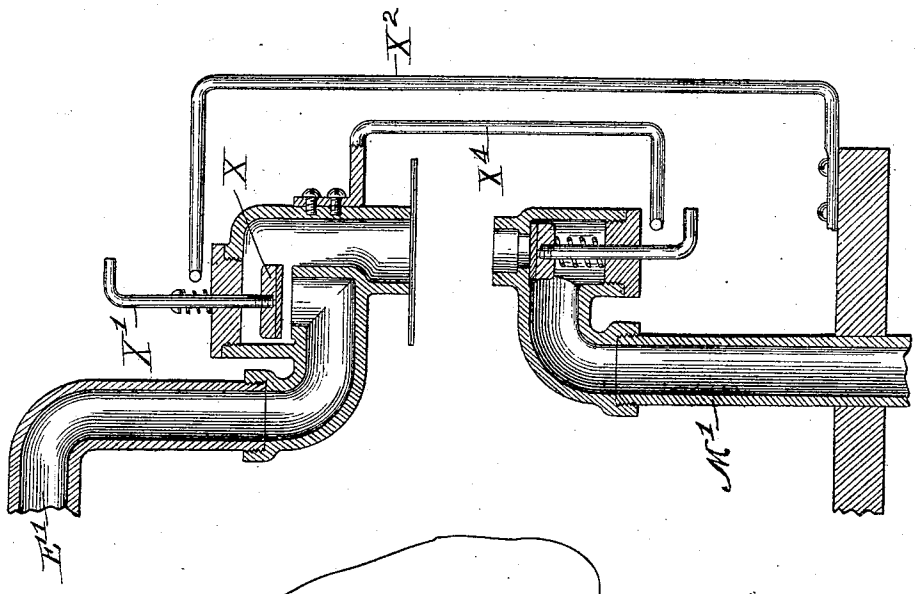
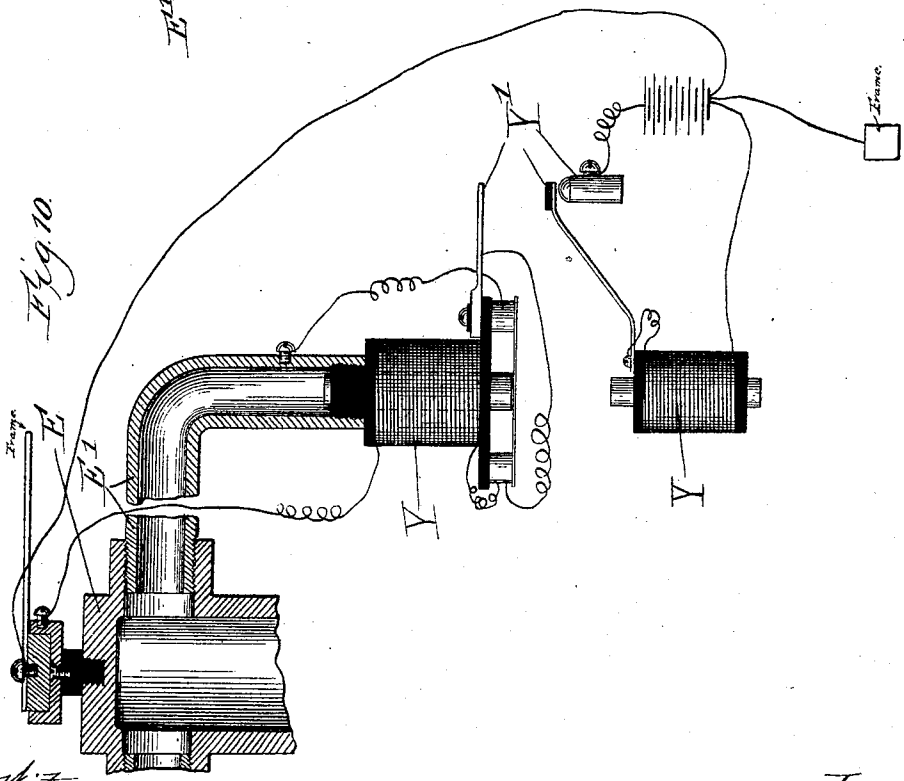


Fig. 10.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EMIL TYDEN, OF CHICAGO, ILLINOIS.

CARRIER FOR DIE-PRESSES.

SPECIFICATION forming part of Letters Patent No. 616,213, dated December 20, 1898.

Application filed January 26, 1898. Serial No. 668,003. (No model.)

To all whom it may concern:

Be it known that I, EMIL TYDEN, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Carriers for Die-Presses, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to means for carrying blanks or pieces of metal or other material to and from the die or other mechanism by which they are operated upon.

In the drawings, Figure 1 is a side elevation of a die-press provided with improved feeding mechanism. Fig. 2 is a plan of the same, a portion of the press immaterial to the improvements being broken away. Fig. 3 is a section at the line 3 3 on Fig. 2. Fig. 4 is a section at the line 4 4 on Fig. 2. Fig. 5 is a section at the line 5 5 on Fig. 3. Figs. 6 and 7 are detail side elevations of two forms of trap-door locking and operating mechanisms in the chute. Fig. 8 is a transverse detail section through the trap-door. Fig. 9 is a detail vertical section showing a pneumatic pick-up device adapted to act without contact of its nozzle with the blank, and a similar section of a similar pneumatic detaching device with mechanical tripping devices for the valves, being modifications of the corresponding parts shown in the principal figures. Fig. 10 is a detail view showing an electric pick-up device and an electric detaching device with the energizing-circuits diagrammatically represented, the view being sectional with respect to the carrier-arm in the vertical plane of the axis of such arm and the central hub or head from which it projects.

A is the base-frame of the press. A′ is the die-bed, A^2 the upper head of the press, and A^3 the fly-wheel on the main shaft a^3. A^4 is the reciprocating head or plunger of the press. A^5 represents a die secured in the die-bed A′.

B is a chute adapted to deliver the blanks onto the die A^5.

My improved feeding mechanism comprises an upright shaft C, which is rotated with step-by-step movement by means of the crank-pin a^{30}, which is adjustable in a cross-head A^{30}, secured on the end of the shaft a^3, said crank-pin being connected by a link D to a bell-crank lever D′, fulcrumed on the frame, the other arm of the bell-crank lever being connected by a link D^2 to the lever-arm D^{30} of a sleeve D^3, mounted loosely on the shaft C above the ratchet-wheel C′, fixed on the shaft and actuated by a dog or pawl D^4, which is carried by the lever-arm D^{30}. The shaft C is tubular, and at its lower end it is rotatably connected to a flexible pipe C^2, which is connected with any source of rarefied air for suction. At the upper end of said shaft there is secured a spider-hub E, which is hollow and has the tubular radial arms E′ E′ E′, &c., extending out horizontally, and each carrying at the end a downwardly-projecting suction nozzle or lifter E^2, the construction of which will be hereinafter explained in detail. To afford bearing for this upright shaft C and for other purposes, I provide a bracket F, secured to the press-frame rigidly at *f*, comprising the horizontal arm or web, on which there is a bearing at F′ for the shaft C and having secured to it the bracket F^2, which has at F^{20} another bearing for the shaft C. The bracket F is extended outwardly beyond the bearing F′ and terminates in a boss F^3, which affords bearing for a gear-wheel G, which meshes with and is driven by a gear-wheel G^2, feathered on the shaft C above the bearing F′. The purpose of these gears will be hereinafter explained.

The shaft C is adapted to be reciprocated vertically. In order to accomplish the purposes of the device, as hereinafter explained, and to effect such vertical reciprocation, I provide a cam A^{31} on the shaft a^3, and on the frame there is fulcrumed at *h* a lever H, one end of which has an abutment in the form of a roll H′, which tracks on the cam A^{31}, while the other end, extending horizontally, is pivotally connected to a sleeve-collar C^{30}, which is loose on the shaft C between two stop-collars C^3 C^3. The cam A^{31} is spiral in form, so that at each rotation of the shaft the abutment H′ is forced outward and drops off the shoulder a^{31} onto the inner coil of the spiral, thus lifting the shaft gradually and dropping it suddenly. It will be understood that both the step-by-step rotary movement of the shaft C and its vertical reciprocation correspond to the rotations of the shaft a^3, one step in the rotary movement and one reciprocation

in the vertical movement occurring at each complete rotation of the shaft.

The suction-nozzles or pick-up devices E^2 are designed to operate to pick up blanks from a receptacle at one point in their path of rotation and leave them at another point in said path, the last-mentioned point being above the chute B, by which the blanks descend by gravity onto the die. The receptacle for the blanks, from which they are picked up, is a vertical cylinder K, which is held in fixed position above and conaxial with the gear-wheel G'. For the purpose of holding it in this position as well as for the purpose of affording bearing and supports for certain parts of the mechanism a spider-frame F^4 is upheld by rods f^4 f^4, which extend up from the bracket F. This upper frame F^4 has a bearing at F^{40} for the shaft C and a boss F^{41}, through which the cylinder K extends and by which said cylinder is held in place near the upper end. To support the bracket F at the lower end of the cylinder K, I provide a standard F^5, which extends up from the floor to the boss F^3. At the lower end of the cylinder K, I secure a collar K', in which is rigidly seated a nut G^{11}.

G^{10} is a screw-shaft which is feathered through the gear G', screwed through the nut G^{11}, and adapted to extend axially within the cylinder K and is rotated by the gear G'. Such rotation, derived from the shaft C through the gear G^2, having the step-by-step character of the rotation of said shaft C, causes the screw-shaft G^{10} to be advanced upwardly step by step in the cylinder K, in which, at the upper end of said shaft, is a follower G^{12}, above which, in the cylinder, there is represented a pile of blanks, which are thus fed step by step, the pitch of the thread of the shaft G^{10} being calculated so that each step advances the pile the thickness of one blank.

The construction of the suction-nozzles or pick-up devices E^2 will now be explained by reference to Fig. 4. The arm E', which carries the nozzle, is bent downward at the end, and on the downwardly-extending portion E^{10} the nozzle is mounted and secured. To the end of the arm E^{10} there is screwed a flanged cap-terminal E^a, above whose flange there is a packing-gasket e^a. This cap has lateral apertures E^b above the gasket and below the end of the arm E^{10}. On the arm E^{10}, at a distance above the cap equal, substantially, to the length of the latter, there is secured the stop-collar E^c and below it a packing-gasket e^c. Into the upper end of the nozzle E^2 there is screwed a sleeve E^{21}, which at the lower part is interiorly chambered to adapt it to slide outside of the cap E^a, while at the upper part said sleeve fits the arm E^{10} and is adapted to seat up against the gasket e^c. This sleeve has also a packing-gasket e^2 at the upper end of its enlarged chamber, which adapts it to fit air-tight on the cap E^a. The nozzle, which at its upper part is large enough to admit the flange of the cap E^a and to be screwed onto the lower end of the sleeve E^{21}, is at the lower end preferably reduced in diameter. Above the stop-collar E^c on the arm E^{10} is a second stop-collar E^d, between which and the upper end of the sleeve E^{21} a spring E^f reacts with a tendency to force the nozzle downward and adapted to force it thus downward until the gasket e^2 seats upon the upper end of the cap E^a, and at the same time the lower end of the sleeve E^{21} seats upon the gasket e^a. The operation of this nozzle or lifter may now be understood upon considering that suction is constantly exerted through the arm E^{10} by reason of the connection of the shaft C with means for exhausting the air and producing such suction. The normal condition of the parts of the nozzle, it will be seen, is that under the action of the spring E^f the nozzle will be at its lowest position, being stopped by the contact of the gaskets e^2 and e^a, respectively, with the upper end of the cap E^a and the lower end of the sleeve E^{21}, and in this condition no suction will be experienced at the end of the nozzle because the parts described operate as valves, effectually shutting off the suction, which could only reach the end of the nozzle by way of the ports E^b and the space within the nozzle around the cap E^a. As soon, however, as the nozzle descends onto a blank, which occurs when the shaft C is reciprocated downward, the pile of blanks arresting the nozzle while the arm continues to descend causes the nozzle to be pushed up on the arm and the ports E^b to be opened, admitting the suction, which, acting upon the blank which now closes the end of the nozzle, holds it firmly thus closed, and the spring E^f being inadequate to resist the atmospheric suction will be held compressed so long as the blank remains covering the nozzle after the arm is lifted from the pile of blanks. The nozzle will therefore lift the blank which thus covers it off the pile and carry it with it in the subsequent step-by-step rotation of the shaft C. Passing over for the present the intermediate processes and mechanism, the blank is carried thus step by step until it overhangs the chute B. When the shaft makes its descending movement with the blank in this position above the chute, the edge of the blank, which extends laterally some little distance out from the nozzle, strikes the inclined chute at the upper side before the full descending movement is completed, and during the remainder of that movement evidently the blank will be forced off the mouth of the nozzle, tilting over the edge of the latter nearest the inclined chute, and thus admitting the air to the nozzle, whereupon the spring E^f immediately closes the nozzle, thrusting it downward and completing the delivery of the blank into the chute.

In practice blanks of thin metal, such as tin or brass, which it is the purpose of this mechanism to feed to the dies which are to

operate upon them, frequently stick together either by reason of oil or other material upon their surfaces or by reason of the interlocking of the burs or fins, which frequently are formed at their edges in the previous processes of stamping them out of sheet metal, (these blanks being frequently mere waste material resulting from the manufacture of other articles,) and the pick-up above described is liable, therefore, to pick up two, or sometimes more, blanks from the pile. The delivery of an improper number thus stuck together into the die is liable to result in injury to the die and in any event in failure to produce the proper result with the die. To avoid both the danger to the die and the loss of blanks which would be occasioned in this manner, it is necessary to provide means for detaching any surplus blanks which may thus adhere to the one which is immediately in contact with the nozzle. For this purpose I provide a plurality of detaching-nozzles, similar in construction to the pick-up nozzles above described, but fixed in position underneath the path of rotation of the pick-up nozzles at positions corresponding to the descent of the latter nozzles. These detaching-nozzles L L L are connected with branches M′ M′ M′ of the suction-pipe M, which is connected with the same source of suction as the shaft C. The corresponding parts of the fixed and moving nozzles are indicated by the same letters, but the mouth of the pick-up nozzles is somewhat larger than the mouth of the detaching-nozzles, so that the same suction being operative through both, the former will have a stronger grip upon the blank than the latter, so that if there is only one blank on the pick-up it shall not be pulled off by the detaching device. The spring L^{10} of the detaching-nozzle should be strong enough to overcome the suction on the blank covering that nozzle, so that as soon as the pick-up nozzle has been lifted the spring will force upward the detaching-nozzle, and in this movement, admitting air for the instant of the movement itself and shutting off suction at the end of that movement, will relieve the blank from the suction, so that though it still lies over the mouth of the nozzle it will be free and may be dislodged by a proper device for that purpose. The device provided consists in a light-wire finger N, which projects from the hub E between each two consecutive arms E′, and in the path of rotation moves close enough to the upper mouth of the detaching-nozzles to dislodge any blanks which may be lying thereon. I have shown three of these detaching-nozzles in order that if more than one extra blank shall be picked up by adhesion, as described, and if the lowest one only should be taken off by the first detaching-nozzle another may be taken off by the second, and still another may be taken off by the third nozzle. In practice it will rarely occur that more than two blanks will adhere together, and by providing for the removal of three surplus blanks, thus taking into account the possibility of four adhering, it is rendered practically certain that there will never be two delivered together into the chute. If this should happen, however, notwithstanding all this precaution, I provide an additional means, which will now be described, for preventing the two blanks from reaching the die together. In the chute B back of the finger P, I provide a trap-door B^2. This trap-door is hinged at the upper edge and adapted to be dropped out by swinging on its hinge, so that a blank sliding down the chute would pass out if the door were opened instead of passing into the die. To the reciprocating head A^4 there is secured a finger P, which at the highest point of the head is just sufficiently above the face of the chute to allow the blank to pass under it. This finger overhangs the lower edge of the trap-door, and when the head descends it is thrust through a notch in the edge of the trap-door. This finger, therefore, serves as a stop to arrest the blanks as they descend the chute, letting them pass toward the die only at the instant that the head is at the highest point. The trap-door is made with an opening or depression B^{20} smaller than the blank, so that the latter cannot pass through or into it and in such position that the blank lying on the door and arrested by the finger P lies above the depression or opening, so that by virtue of its elasticity the blank may be depressed at the center slightly into the depression or opening. The reciprocating head of the press carries also a finger R, which encounters a blank lying on the trap-door when the head descends. This finger can yield back from the encounter, but is held protruded by a spring R′, sufficiently stiff to cause the finger to depress the blank at the center when it encounters it unless the stiffness of the blank exceeds a predetermined limit for which the spring is tensioned, the tension being adjustable by means of the nut R^2, which forms the stop for one end of the spring. The finger R when pushed back closes an electric circuit S, in which an electromagnet S′ is energized, and the armature S^2 of this electromagnet operates a latch (which, as illustrated, is a rigid terminal S^{20} of the armature) by which the trap-door is secured in closed position when the armature is away from the magnet-poles, but which is withdrawn from locking position when the armature approaches the magnet, when the circuit is closed and the magnet is energized. The tension of the spring R′ being adjusted so that one blank alone lying over the depression or aperture in the trap-door is not stiff enough to force back the finger R, but, on the contrary, will yield by springing into the aperture, no effect is produced if only one blank lies in place on the trap-door. If, however, two blanks lie together on the trap-door or an extra thick or extra stiff blank occupies that position, the additional stiffness causes the finger R to be

forced back when the head descends, closing the circuit, energizing the magnet, and unlocking the trap-door, which is thereupon opened by the rotation of the train consisting of the two wheels Q and Q', the former actuated by any suitable motor, as by a weight Q^2, and the latter having a crank-pin Q^{10}, from which a link Q^3 extends to the trap-door. The means of latching the trap-door being a pin *q* on the wheel Q', such pin being stopped by the latch at the position at which the pitman-link Q^3 holds the door shut, the releasing of the train, effected instantaneously upon the closing of the circuit, causes the door to be withdrawn and the blank to escape, whereupon, the circuit being broken, the armature immediately returns to a position at which the pin Q will encounter the latch as soon as it completes one revolution, and in that revolution, the door having been opened and the blank having escaped, the door will be closed again during the same revolution and all the parts will be in original position. Instead of this device the device shown in Fig. 7 may be employed, which consists of rollers U U', the former protruding up through the bottom of the chute and the latter overhanging and in contact therewith and driven by any suitable means, and a belt *u*, so that the blanks sliding down that chute are seized between the rollers and fed through them toward the die. The lower roller U' is mounted in yielding bearings (represented by the journal-box U^{10}) carried on a spring-arm U^{11} and may be held with sufficient firmness by the spring-arm so that any bur or irregularity on the blank will be flattened out without causing the roller to yield; but if two blanks enter the rolls together the spring will yield, allowing the roll U' to retreat a distance equal to the extra thickness thus entered between the rolls. A lever U^4, which at one end bears against the roller U', at the other end operates to close the circuit by which the magnet is energized and causes the trap-door to be dropped precisely as when the circuit was closed by the action of the finger R, above described, and the blanks, whose accumulation one upon the other caused the spreading of the rolls, will be passed out through the open trap-door instead of being passed onto the die, and the roll U', returning to its position of contact with the roll U, causes the circuit to be broken and the trap-door latched.

It will be obvious that the principle of the mechanism hereinabove described, consisting in the employment of a detaching device opposed to the pick-up device to remove superfluous blanks while the pick-up device is carrying them toward the die, may be applied with other than pneumatic devices for either picking up or detaching the blanks or for both purposes; also, that when pneumatic devices are employed this principle is equally applicable to pneumatic nozzles which do not depend upon contact with the blank to admit the suction, but, on the contrary, are so constructed as to produce an inward current of air before the blank is seated on the nozzle-mouth, and which therefore are adapted to operate in a manner to lift the blanks toward the nozzle, as well as to lift them with the nozzle after they are in contact with it. This mode of action, which involves adaptability to draw the blank to the nozzle, is closely allied to attraction such as may be exerted by the magnet. I have shown in Fig. 9 a form of pneumatic nozzle which operates in this manner, the suction being controlled positively by means independent of the presence or absence of the blank, so that an inward current of air operates to draw the blank toward the nozzle-mouth, as well as to hold the blank on the mouth after it is seated. In this structure the valve X has a stem X', which encounters a trip X^2 when the nozzle descends toward the blank, and thereby the valve is opened before the blank is reached and the latter is lifted by the resulting inward current of air. A similar nozzle may be used for the detaching device, the valve being opened by the contact of its stem with a suitable abutment X^4, which may be provided on the pick-up nozzle.

In Fig. 10 I have shown in place of the pneumatic device magnetic pick-up and detaching devices consisting of electromagnets Y, whose poles occupy a position corresponding to the nozzle-mouth of the pneumatic devices and in whose circuits are contact making and breaking devices Y', which are actuated to close the circuit by abutments encountered during the descent of the pick-up in the same manner as the valves of the device shown in Fig. 9 are operated in the same movement. I illustrate these devices in order to indicate the intended scope of certain claims in which the character of the pick-up and detaching devices are not specified; but specifically I prefer the pneumatic devices. It will be obvious, however, that pneumatic devices may be employed for one purpose and magnetic devices for the other purpose, and such combination is too obvious to require specific illustration.

I claim—

1. In a press-feeding mechanism, a carrier having a pick-up device adapted to detachably hold the blanks by action upon one surface thereof, a source of blanks and means for moving the carrier from such source to delivering position, in combination with a detaching device adapted to act upon the blank at the opposite side from the pick-up device located adjacent to the path of movement of the pick-up device between the source and the point of delivery; whereby a superfluous blank may be detached from the blank primarily held by the pick-up before the latter reaches the delivering position.

2. In a press-feeding mechanism, a carrier having the pick-up device adapted to hold the blanks detachably by acting upon one surface thereof; a source of blanks, and means for

moving the carrier from such source to delivering position, in combination with a plurality of detaching devices adapted to act upon the blank at the surface opposite that at which the pick-up acts, located adjacent to the path of movement of the pick-up from the source to delivering position, whereby a plurality of surplus blanks may be detached one by one, from the blank primarily held by the pick-up before the latter reaches delivering position.

3. In a press-feeding mechanism, a carrier having a pick-up device operating by suction adapted to hold the blanks by acting at one surface thereof, a source of blanks, and means for moving the carrier from such source to delivering position, in combination with the detaching device similar to that of the pick-up, adapted to act upon the blanks at the side opposite that at which the pick-up acts, but with less force than the latter, such detaching device being located adjacent to the path of movement of the pick-up between the source and the delivering position.

4. In a press-feeding mechanism, a carrier having a pick-up device adapted to hold blanks detachably by acting upon one surface thereof; a source of blanks and mechanism for giving the carrier step-by-step movement from such source to position for delivering the blanks to the press, in combination with a detaching device adapted to act upon the blanks at the surface at which they are acted upon by the pick-up, located adjacent to the path of movement of the pick-up between the source and the delivering position, and at the limit of one step of movement along said path; mechanism for communicating such step movement from the press adapted to cause one step of such movement for each cycle of the movement of the press.

5. In a press-feeding mechanism, a pneumatic carrier comprising a tubular arm connected with a source of rarefied air for suction; a pick-up nozzle at the end of such arm; a spring tending to hold such nozzle closed and adapted to be overcome by the positive advance of the nozzle against the blank, the resistance of the spring being less than the inward pressure of the atmosphere upon the blank when it closes the mouth of the nozzle.

6. In a press-feeding device having a pneumatic carrier consisting of a tubular arm connected with a source of rarefied air for suction; a pick-up device consisting of a nozzle, adapted to slide on the end of the arm, said arm having a terminal provided with lateral ports which are covered and uncovered by the sliding movement of the nozzle, whereby such nozzle operates as a valve to open and close the arm, the inward movement of the nozzle being the opening movement, and suitable means for resisting the movement and causing the arm to be normally closed.

7. In a pneumatic feeding mechanism for presses, a pick-up device comprising the tubular arm connected with a source of rarefied air; a laterally-apertured outwardly-flanged terminal E^a for such arm; a stop-collar E^c on the arm back of such terminal, and the nozzle adapted to slide on the arm and stopped at the limits of its movement by the stop-collar and the flange of the terminal, respectively.

8. In a press-feeding mechanism, a carrier having a pick-up device adapted to hold the blanks detachably by acting upon one surface thereof; a source of blanks, and means for moving the carrier from such source to delivering position, in combination with a pneumatic detaching device adapted to act upon the blanks on opposite sides from the pick-up device, said detaching device comprising a tubular arm connected with a source of rarefied air for suction; a nozzle at the end of such arm; a spring tending to hold the nozzle closed, and adapted to be overcome by positive advance of the blank thereagainst, the resistance of the spring being less than the suction exerted upon the blank when it closes the mouth of the nozzle; mechanism for moving the pick-up device toward the detaching device to cause a blank carried by the former to advance against the latter during the carrying movement of the carrier before it reaches delivering position.

9. In a press-feeding mechanism, a carrier having a pick-up device adapted to detachably hold the blanks by action upon one surface thereof; a source of blanks, and means for moving the carrier from such source to delivering position, in combination with a detaching device adapted to act upon the blank at the opposite side from the pick-up device, located adjacent to the path of the pick-up device from the source to the delivery, and mechanism for causing the pick-up device and the detaching device to approach each other at the point in the path of travel of the former at which said devices stand opposed to each other.

10. In a press-feeding mechanism, a carrier having a plurality of pick-up devices adapted to hold blanks detachably by acting upon one surface thereof; a source of blanks and mechanism for giving the carrier step-by-step movement from such source to the position for delivering the blanks to the press, each step being equal to the distance between consecutive pick-up devices of such carrier, and being performed synchronously with the action of the press; a detaching device fixed in position adjacent to the path of movement of the pick-up devices of the carrier between the source and delivery position, opposed to the blank-holding end of the latter and adapted to act on the blank at the opposite side from the pick-up device, and mechanism actuated by the press synchronously with the step-by-step movement of the carrier to reciprocate the carrier in a plane at right angles to its carrying movement to cause the pick-up devices to advance toward the detaching

device as they successively reach a position opposite the same and before they reach the delivery position.

11. In combination with a press, a chute in which blanks descend to the die; a trap in such chute; a gage-tester which operates on the blank when the latter is on the trap; an electric circuit having a circuit-breaker connected with the gage-tester and adapted to be operated to close the circuit when the predetermined gage is exceeded; and an unlocking device for the trap, which is operated when the circuit is closed.

12. In combination with a press, a chute in which blanks descend to the die; a trap in such chute; a gage-tester which operates on the blank when the latter is on the trap; an electric circuit having a circuit-breaker connected with the gage-tester and adapted to be operated to close the circuit when a predetermined gage is exceeded, and means for opening and closing the trap set in action by the closing of the circuit.

13. In combination with a press, a chute in which blanks descend to the die; a trap in such chute; an electromagnet and a circuit in which it is energized; a latch for the trap which is actuated by the armature of the magnet; a finger carried by the reciprocating head of the press adapted, upon the descent of the latter to encounter the blank on the trap, and a circuit-breaker actuated by said finger to close the circuit when the descent of the finger is resisted beyond a predetermined extent by the blank.

14. In combination with a press, a chute in which blanks descend to the die; a trap in such chute having a depressed or apertured center; an electromagnet, and a circuit in which it is energized; a latch for the trap which is actuated by the armature of the magnet; a yielding finger carried by the reciprocating head of the press, adapted upon the descent of the latter to encounter the blank on the trap above the depression or aperture of the latter, and a circuit-breaker actuated by said finger to close the circuit when the descent of the finger is resisted beyond a predetermined extent of the blank.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 22d day of January, 1898.

EMIL TYDEN.

Witnesses:
CHAS. S. BURTON,
JEAN ELLIOTT.