March 16, 1943. K. C. BUTTERFIELD 2,314,123

PRESS UNLOADER

Filed May 17, 1940 5 Sheets-Sheet 1

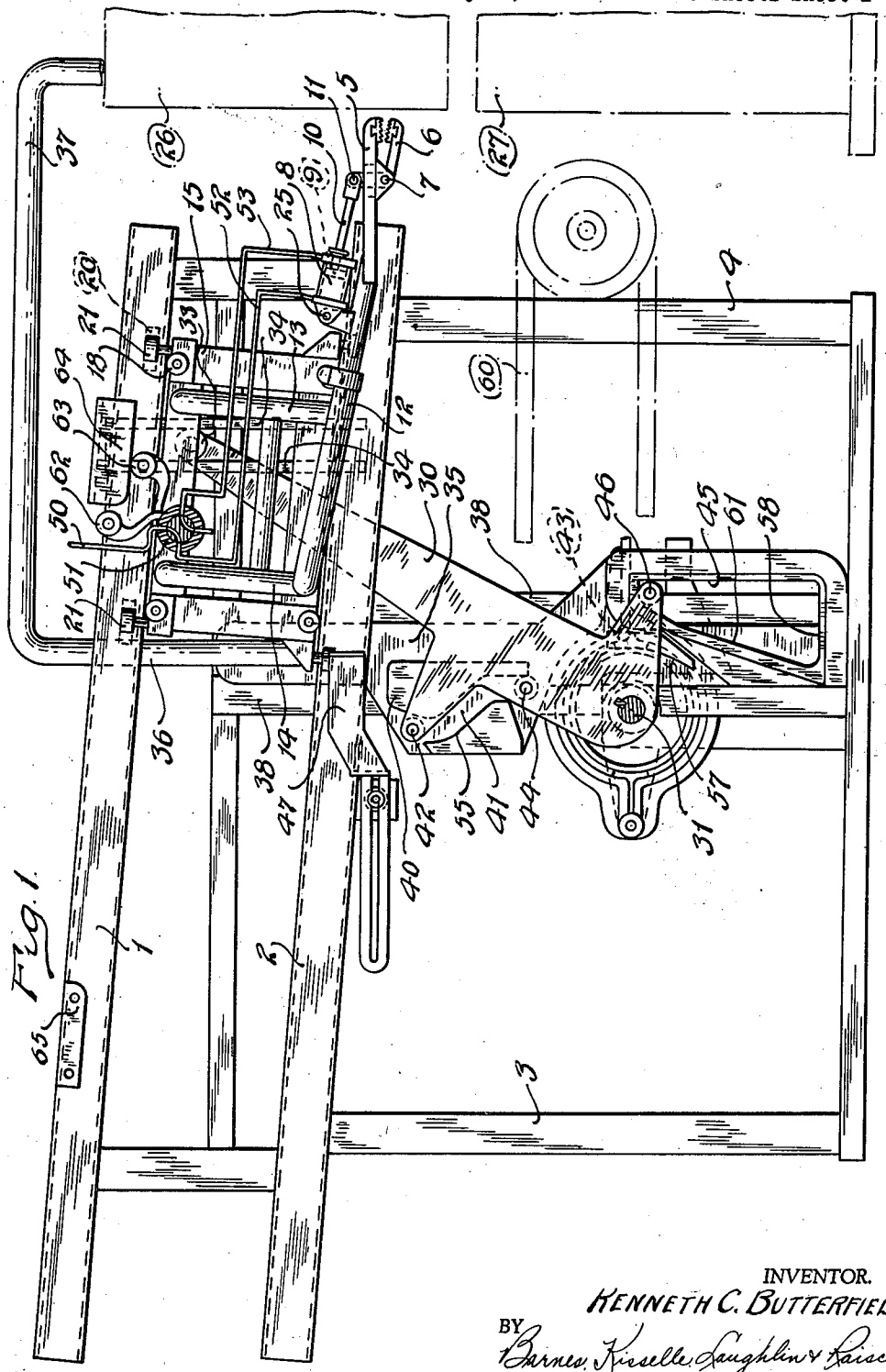


Fig. 1.

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PRESS UNLOADER

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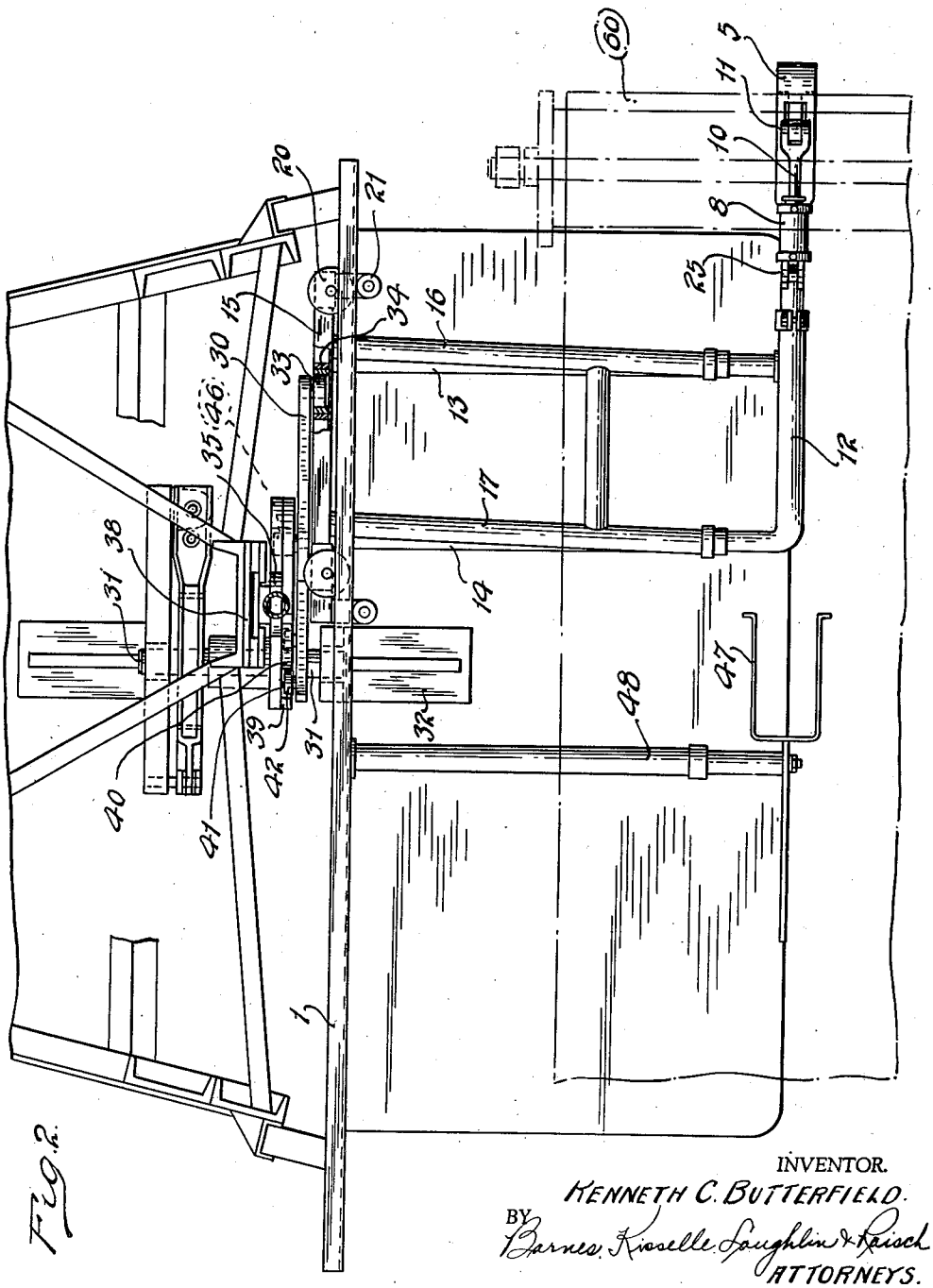


Fig. 2.

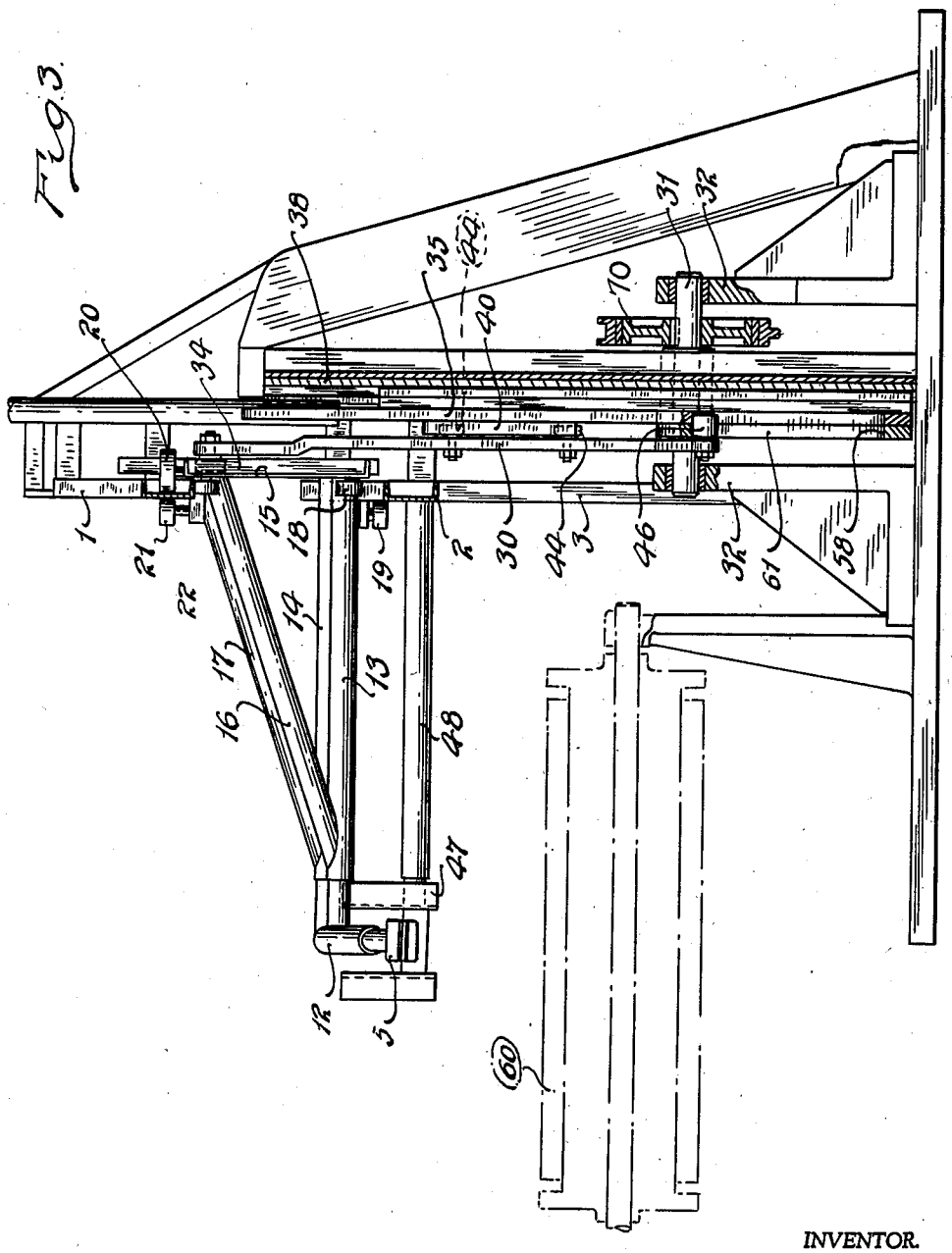
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Fig. 3.



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PRESS UNLOADER

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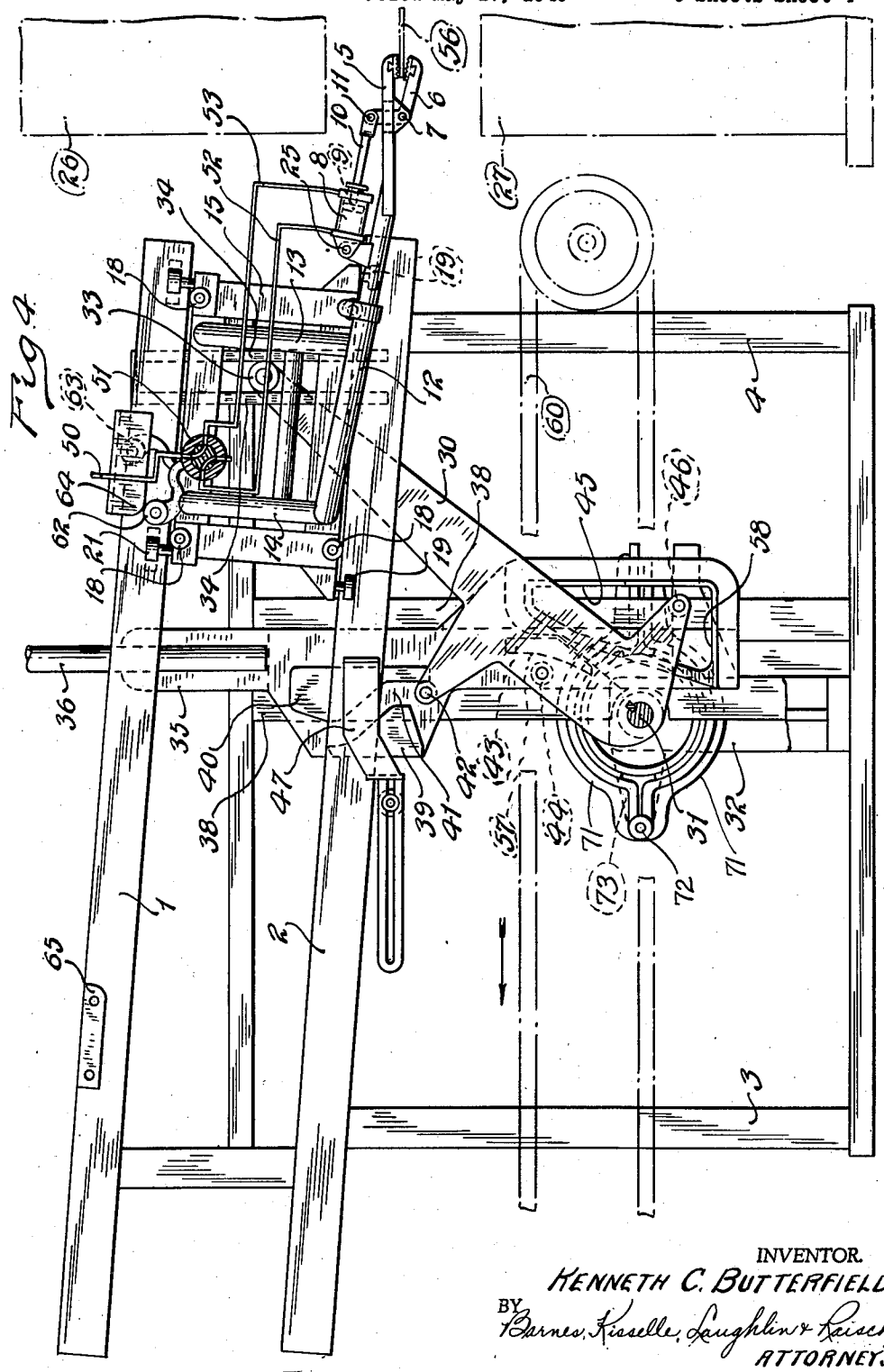


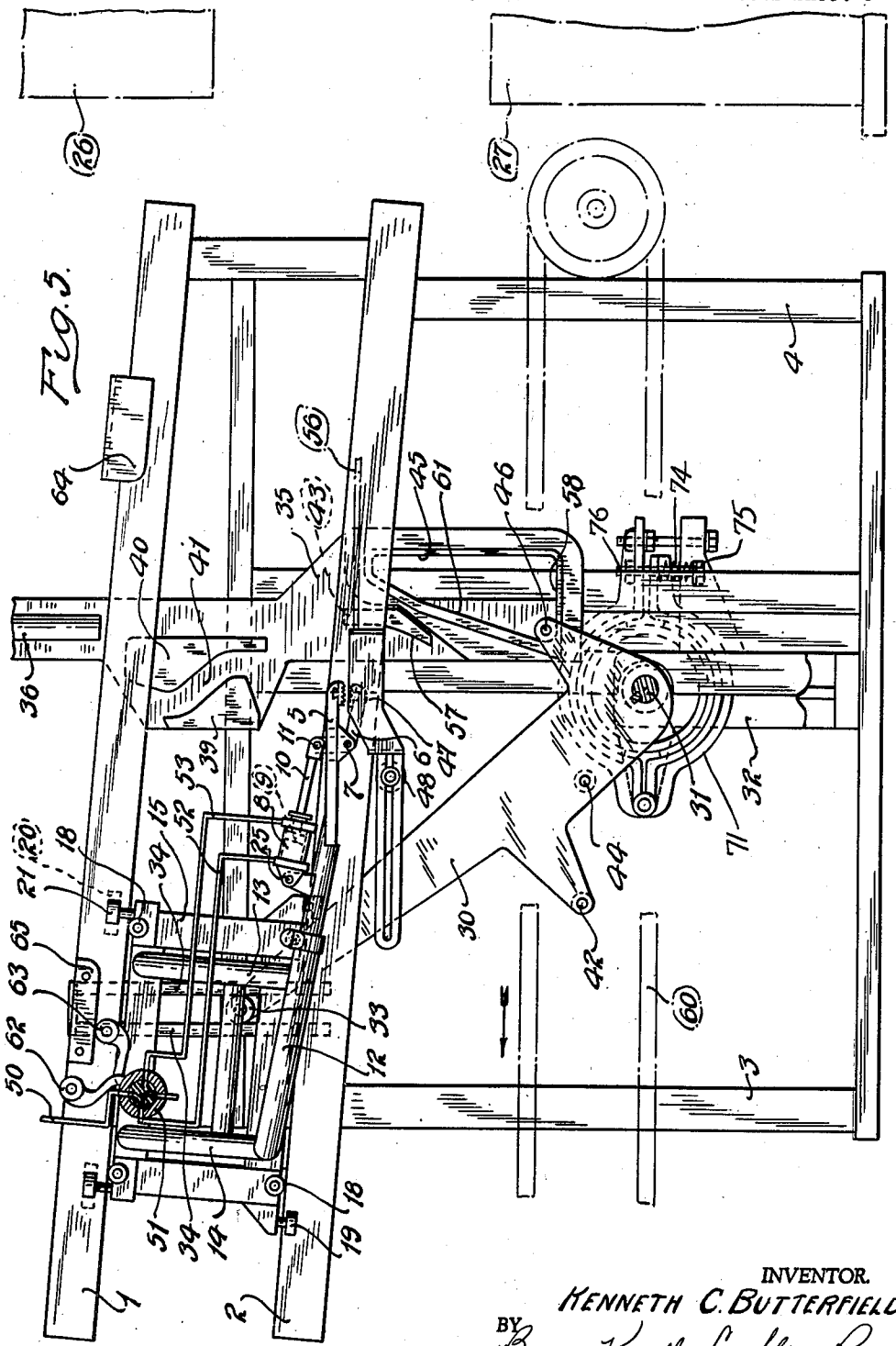
Fig 4.

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Patented Mar. 16, 1943

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UNITED STATES PATENT OFFICE

2,314,123

PRESS UNLOADER

Kenneth Carlyle Butterfield, Grand Rapids, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application May 17, 1940, Serial No. 335,690

6 Claims. (Cl. 113—50)

This invention relates to a press unloader and more particularly to a press unloader for positively removing metal stampings from the press after the stamping operation.

It is well known that accidents frequently occur in the operation of sheet metal stamping presses. Among these accidents are those which occur when the operator reaches between the dies of the press and the press is inadvertently tripped. It is an object of this invention to remove this hazard of sheet metal press operation. This object is achieved by a press unloader which will efficiently and positively remove the finished metal stamping from the press. In particular the invention contemplates a press unloader which, after the stamping operation is completed, reaches into the press, grasps the stamping and removes the same.

In the drawings:

Fig. 1 is a side elevational view of the press unloader with the press closed.

Fig. 2 is a top plan view of the press unloader with the press closed.

Fig. 3 is a front elevational view, partly in vertical section, of the press unloader as viewed from the right of Fig. 2.

Fig. 4 is a side elevational view of the press unloader during the initial upward movement of the ram.

Fig. 5 is a side elevational view of the unloader with the press fully opened at the end of the press unloading stroke.

The press unloader comprises a pair of channel iron tracks 1 and 2 which are inclined slightly forwardly and downwardly toward the press. The tracks 1 and 2 are supported upon the rigid vertical frame members 3 and 4.

Preparatory to removing the sheet metal stamping from the press the stamping is gripped between the fixed jaw 5 and the jaw 6 which is pivotally supported upon the fixed jaw as at 7. The pivoted jaw 6 is opened and closed by means of an air motor in the form of a cylinder 8 pivotally supported as at 25 on carriage member 12, piston 9 and connecting rod 10 which is pivotally connected to the swinging jaw as at 11. The work gripping device, that is, jaws 5 and 6, is supported upon a roller carriage, generally designated 15, by means of a tubular frame-work comprising a tubular arm 12 supported upon the carriage by the tubular members 13 and 14 which are reinforced by braces 16 and 17 respectively.

The roller carriage 15 comprises a rectangular metal frame-work supported upon the lower track member 2 by rollers 18 and 19 and held in rolling relation with the upper rail 1 by opposed rollers 20 and 21. The carriage is also provided with rollers 22 which roll along the bottom face of the upper track 1. From the above description it is evident that the carriage forms a cantilever suspension for the gripping jaws on the tracks 1 and 2.

The carriage 15 is arranged to be reciprocated upon tracks 1 and 2 by means of the arm 30 fixed on the horizontal shaft 31 which is journalled in support member 32. The outer end of the arm is provided with a roller 33 positioned between, and having a rolling contact with the vertical guide members 34 mounted upon the carriage 15. Since the gripping jaws must enter between the upper and lower dies of the press after the stamping operation to grip the work and remove the same, the movement of the gripping jaws must be synchronized with that of the press. By way of description the arm 30 will be actuated by the reciprocating die member of the press in the form of ram 26, the lower die member is indicated at 27.

The driving connection between the ram 26 and the arm 30 takes the form of a cam plate 35 positively connected by means of rod 36 and arm 37 with the punch 26. Slide plate 35 is guided in its vertical reciprocation by the guide members 38. The slide member is provided with cams 39 and 40 which cooperate to form a cam way or track 41 for roller 42 mounted on arm 30. The slide plate 35 is also provided with a cam 43 for roller 44 mounted on arm 30. The lower end of the slide plate 35 is provided with an approximately triangular opening 45 which is arranged to cooperate with roller 46 mounted on arm 30. A work knock-out device 47 is adjustably mounted on rod 48 fixed to the frame of the unloader.

The compressed air is supplied to the cylinder 8 by means of air line 50 which is connected with a source of compressed air (not shown). Air supply line 50 is connected through valve 51 either with air line 52, as shown in Fig. 4, or with air line 53, as shown in Fig. 1.

As shown in Fig. 1, the press is closed, that is, the punch is lowered and the stamping operation is completed. At this time line 52 is connected through valve 51 with air line 50 and the jaws 5 and 6 are opened. Slide plate 35 is at the bottom of its stroke with roller 42 about to enter cam way 41. As the punch 26 starts its upward movement, slide plate 35 correspondingly moves upwardly. Roller 42 contacts cam surface 55 thereby swinging arm 30 to the right, Fig. 1, causing the carriage and jaws to advance be-

tween the upper and lower dies in work gripping position. The work or metal stamping is indicated at 56.

At this time the valve 51 is shifted so that air line 53 is connected with air line 50 and air line 52 is open to exhaust whereby the air motor closes the jaws which grip the work 56, see Fig. 4. As the die 26 and slide 35 continue their upward movement, roller 42 rolls out of cam way 41 and roller 44 rides on to cam surface 57 thereby causing the arm 30 to reverse its direction and now swing to the left or counterclockwise, as viewed in Fig. 4, thereby causing the carriage 15 to roll to the left and withdraw the work from the press. As roller 44 rides off of cam surface 57, roller 46 contacts slide 35 along the lower edge 58 of opening 45 thereby continuing the movement of the arm 30 and carriage 15 to the left until the die reaches its topmost position, Fig. 5. Just prior to reaching the work knock-out 47, valve 51 is reversed so that the air line 50 is now connected with line 52 and line 53 is open to exhaust thereby causing the air motor to open the jaws 5 and 6 to release the work. The work is ejected from the jaws by the work knock-out 47 and falls on to the conveyor 60.

The press is again loaded and the upper die 26 now starts on its downward stroke. At this time roller 46 rolls along the inclined edge 61 of opening 45 as the slide 35 travels downwardly with the upper die. This causes arm 30 to swing to the right or clockwise, Fig. 5, thereby rolling the carriage 15 along the tracks toward the die. At the end of the downstroke of the upper die 26 and slide 35, roller 46 approaches the end of the cam surface 61, roller 42 is about to enter cam way 41 and the slide 35 and die 26 are about to reverse their direction and move upwardly to repeat the cycle of operation as above described.

Air valve 51 which is fastened to carriage 15 is equipped with offset actuating arms 62 and 63. Arms 62 and 63 are in different vertical planes. Cams 64 and 65 are fastened rigidly to upper track 1. Cam 64 is in the same vertical plane as valve arm 62. Cam 65 is in the same vertical plane as valve arm 63. In closed position of dies 26 and 27, carriage and valve 51 have position as indicated in Fig. 1. As die 26 starts to raise and, as above described, advances the carriage 15 toward the press, valve arm 62 engages cam 64 throwing valve 51, thus letting air to air line 53 thus closing the gripping jaws. Carriage 15 now reverses direction and the work is pulled from the press, the jaws remaining closed. Just before the removed panel meets knockout 47, valve arm 63 engages cam 65 and throws valve 51 to the opposite position, allowing air to flow into air line 52, thus opening the gripping jaws.

Shown on shaft 31 is a braking drum 70. A pair of brake shoe levers 71 are pivotally mounted as at 72 on arm 73. The brake shoe levers are yieldably forced against the brake drum 70 to brake the same by means of the coil spring 74 supported between the head 75 of bolt 76 and the lower brake shoe lever 71. Bolt 76 is mounted on the upper lever 71 and passes freely through an opening in the lower arm 71. This brake continuously brakes arm 30 and the carriage mechanism.

From observation of the up and down movement of a press, it can be seen that high accelerations and decelerations are evident in the movement. These same accelerations and decelerations are transferred to the unloader mechanism. In fact, they are multiplied approximately three times in the unloader movement.

From further observation of the unloader mechanism it can be shown that the movement of arm 30 at certain points in the cycle, that is, when arm 30 is being actuated by cams 57 or cam opening 45, is not entirely controlled. In other words, at these points, if due to press action, cam plate 35 suddenly slows down, arm 30 and all carriage parts due to momentum are free to continue on at the last speed imparted by cam plate 35 to arm 30. This, of course, is undesirable and a continuous brake is necessary to hold arm 30 at all times against cam surfaces on plate 35. The amount of brake effort used is just slightly more than that needed to give smooth action to the mechanism throughout the press cycle. When once adjusted the brake requires no attention and the energy it absorbs, due to the continuous braking, is dissipated as heat and lost into the air.

I claim:

1. In a press for stamping sheet material having relatively movable die members which upon closing stamp the sheet material and upon opening release the same, the combination of a reciprocable carriage, gripping means mounted on the carriage for gripping the stamping, a driving arm for said carriage pivotally mounted on a fixed pivot, a connection between the free end of the arm and the carriage, and a cam plate adapted to be connected to the movable die member and arranged to reciprocate with the same acting upon the pivoted arm whereby the carriage moves the gripping means into the press as the dies open to grip the stamping and then retracts the gripping means and stamping from the press as the dies continue their opening movement.

2. In a press for stamping sheet material having relatively movable die members which upon closing stamp the sheet material and upon opening release the same, the combination of a reciprocable carriage, gripping means mounted on the carriage for gripping the stamping, a driving arm for said carriage pivotally mounted on a fixed pivot, a connection between the free end of the arm and the carriage, a cam plate arranged to travel upwardly and downwardly and adapted to travel with the movable die member, said cam plate including a cam surface acting upon the arm to move the arm and carriage toward the press during the initial upward movement of the die whereby the gripping means moves into the press and grips the stamping, said cam plate also including a cam surface for moving the arm and carriage away from the press as the die continues its upward movement whereby the stamping is withdrawn from the press.

3. In a press for stamping sheet material having relatively movable die members which upon closing stamp the sheet material and upon opening release the same, the combination of a reciprocable carriage, gripping means mounted on the carriage for gripping the stamping, a driving arm for said carriage pivotally mounted on a fixed pivot, a connection between the free end of the arm and the carriage, a cam plate arranged to travel upwardly and downwardly and adapted to travel with the movable die member, said cam plate including a cam surface acting upon the arm to move the arm and carriage toward the press during the initial upward movement of the die whereby the gripping means moves into the

press and grips the stamping, said cam plate also including a cam surface for moving the arm and carriage away from the press as the die continues its upward movement whereby the stamping is withdrawn from the press, said cam plate also including a cam surface acting against the arm on the down stroke of the cam plate to swing the arm and move the carriage toward the press.

4. In a press for stamping sheet material having relatively movable die members which upon closing stamp the sheet material and upon opening release the same, the combination of a reciprocable carriage, gripping means mounted on the carriage for gripping the stamping, a pivoted arm for reciprocating said carriage, and cam plate means for swinging the arm toward the press as the dies open to permit the gripping means to grip the stamping and then away from the press as the dies continue their opening movement whereby the gripping means withdraws the stamping from the press, and braking means for applying a continual braking action to said pivoted arm whereby a smooth driving action is effected between the pivoted arm and the reciprocating carriage.

5. In a press for stamping sheet material having relatively movable die members which upon closing stamp the sheet material and upon opening release the same, the combination of a reciprocable carriage, gripping means mounted on the carriage for gripping the stamping, a driving arm for said carriage pivotally mounted on a fixed pivot, a connection between the free end of the arm and the carriage, a cam plate arranged to travel upwardly and downwardly and adapted to travel with the movable die member, said cam plate including a cam surface acting upon the arm to move the arm and carriage toward the press during the initial upward movement of the die whereby the gripping means moves into the press and grips the stamping, said cam plate also including a cam surface for moving the arm and carriage away from the press as the die continues its upward movement whereby the stamping is withdrawn from the press, and braking means for applying a continual braking action to said pivoted arm whereby a smooth driving action is effected between the pivoted arm and the reciprocating carriage.

6. In a press for stamping sheet material having relative movable die members which upon closing stamp the sheet material and upon opening release the same, the combination of a reciprocable carriage, gripping means mounted on the carriage for gripping the stamping, a stationary cam plate, control means movable with said carriage for actuating said gripping means, said control means cooperating with said cam plate to actuate said gripping means as said carriage is reciprocated, a pivoted arm for reciprocating said carriage and means adapted for swinging the arm toward the press as the dies open to permit the gripping means to grip the stamping and then away from the press as the dies continue their opening movement whereby the gripping means withdraws the stamping from the press.

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