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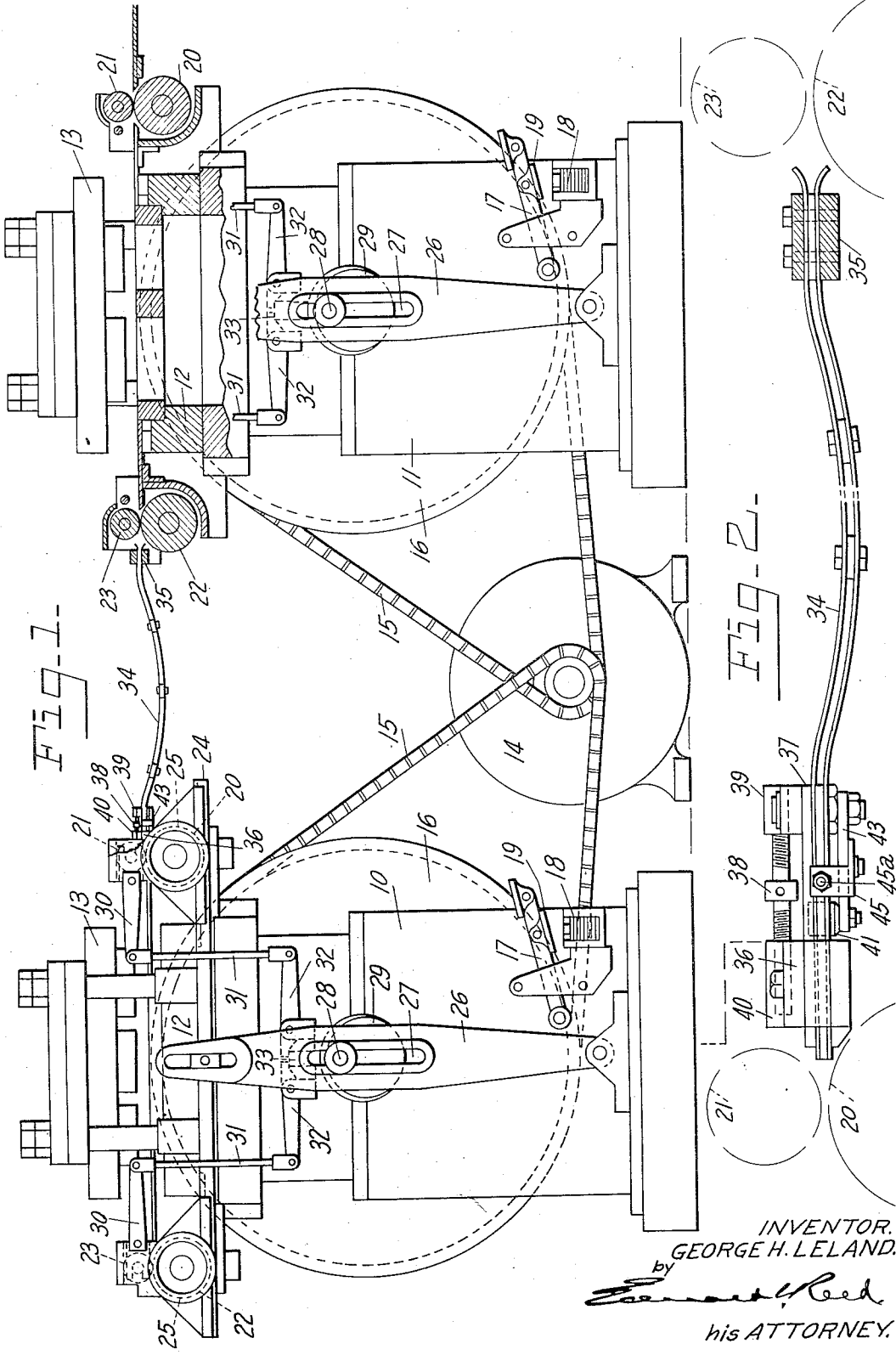
G. H. LELAND

1,916,380

SYNCHRONOUSLY OPERATED PUNCH PRESS

Filed Nov. 19, 1931

2 Sheets-Sheet 1



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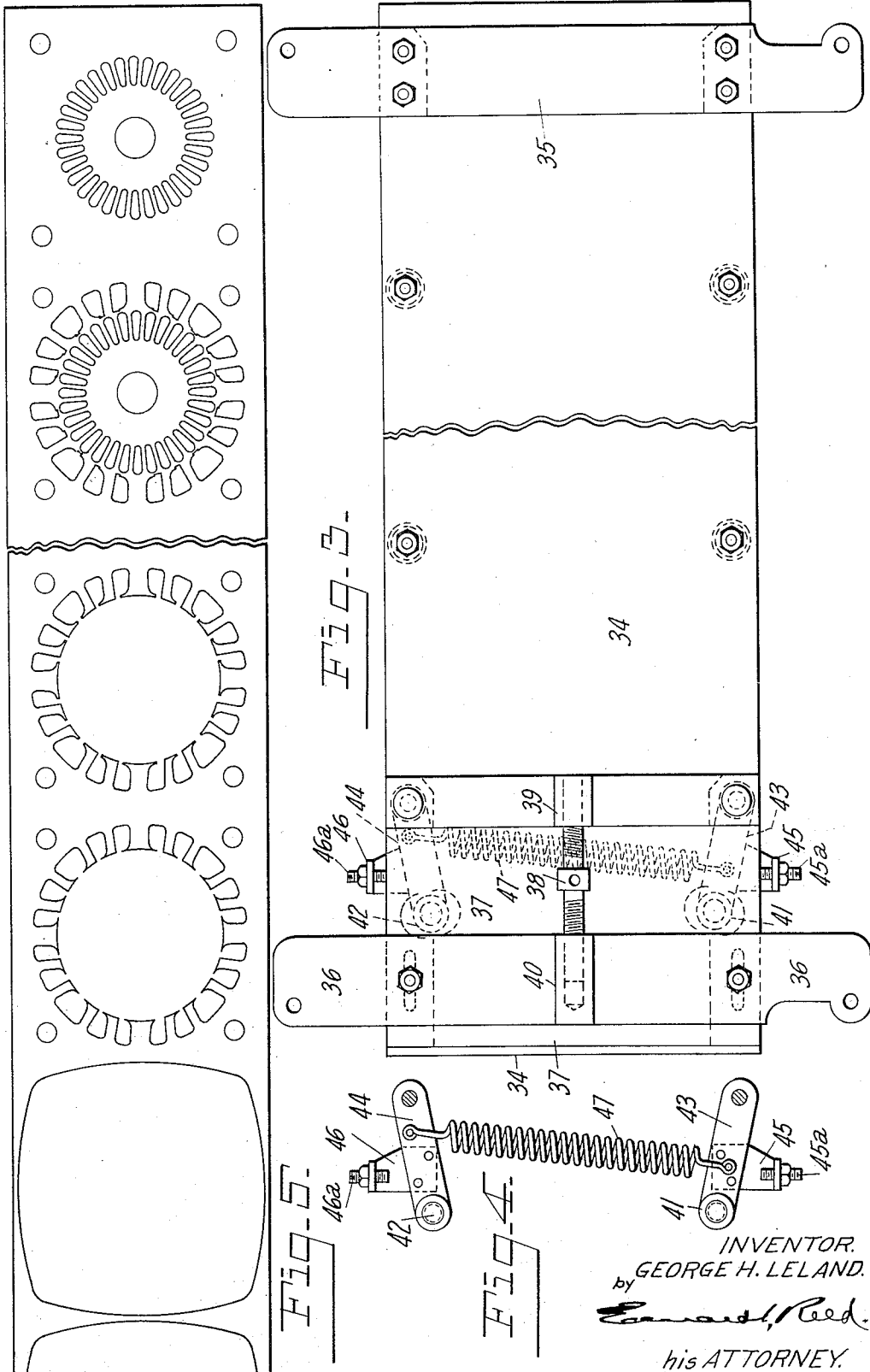
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# UNITED STATES PATENT OFFICE

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## SYNCHRONOUSLY OPERATED PUNCH PRESS

Application filed November 19, 1931. Serial No. 576,025.

This invention relates to punch press mechanism and more particularly to such a mechanism which is adapted to operate progressively on a given portion of a strip of material fed through the same. Heretofore when the number of progressive operations was such that they could not be conveniently performed on a single press it has been customary to perform a part of the operations on one press and to subsequently convey the strips which have been so operated upon to a second and independent press where additional operations were performed thereon. This not only involves much additional time and labor but difficulty is often experienced in properly aligning the strip with the dies of the second press.

One object of the present invention is to provide a plurality of presses equipped with progressive dies and means for operating the presses in synchronism to feed a strip through the same and to perform progressive operations on given portions of the strip.

A further object of the invention is to provide such a plurality of presses with means for conducting the strips from one press to a succeeding press in proper relation to that succeeding press.

A further object of the invention is to provide a plurality of presses with means for conducting the strips from one press to a succeeding press which will permit of the relative movement of different portions of the strip to align the same with the dies.

A further object of the invention is to provide such a mechanism with means to properly center the forward end of the strip with the dies of a succeeding press as it is introduced into that press.

Other objects of the invention will appear as the mechanism is described in detail.

In the accompanying drawings Fig. 1 is a side elevation of two presses, one of which is partially in section, arranged in tandem and connected one with the other for synchronous operation; Fig. 2 is a sectional detail view of the conducting chute; Fig. 3 is a plan view of the conducting chute, partly broken away; Fig. 4 is a plan view of the strip centering device; and Fig. 5 is a plan view, partly broken

away, of a strip of material showing the operations of the successive dies thereon.

In these drawings I have illustrated one embodiment of my invention and have shown the same as applied to two presses of a well known type arranged in tandem but it will be understood that this invention may take various forms and may be applied to two or more presses of various kinds.

The mechanism here illustrated comprises two punch presses, 10 and 11, each of which is complete in itself and consists of a bed plate 12, mounted on the main frame, and a ram 13 movably mounted on that frame for movement toward and from the bed plate, the die members being carried respectively by the bed plate and the ram. The two presses are operated in synchronism from a common electric motor 14 which is connected by belts or chains 15 with drive wheels 16. The drive wheels are connected with the respective rams through the usual driving mechanism, which embodies a spring retracted clutch. This clutch is controlled by a foot lever 17 which, when depressed, serves to connect the driving wheel with the ram and which, when elevated, releases the clutch to permit the separation of the elements thereof to interrupt the connection between the driving wheel and the ram. This connecting mechanism forms no part of the present invention and as it is of a well known type it is not here shown in detail. Ordinarily the clutch controlling lever 17 is held in its depressed position, to maintain the connection between the driving wheel and the ram, by means of a manually operated latch but, in the present device, I have substituted for the latch an electromagnet 18 the armature 19 of which is carried by the lever 17 and will, when the magnet is energized, retain the lever in its depressed position, after it has once been moved to that position, thereby permitting the automatic control of the press.

Each press is provided with a feeding-in device which in the present instance comprises a lower roller 20 and an upper roller 21, and a feeding-out or ejecting device which is shown as consisting of a lower roller 22 and an upper roller 23. These feed rollers

are actuated by a rack bar 24, the respective end portions of which mesh with pinions 25 secured, respectively, to the lower rollers 20 and 22 by means of pawl and ratchet mechanism, not shown, which will cause the rollers to be actuated when the rack bar is moved in one direction but will permit the same to remain stationary when the rack bar moves in the other direction. The rack bar is actuated by a rock arm 26 having a slot 27 through which extends a crank pin 28 driven from the operating mechanism, and, in the present instance, carried by a cam disk 29. In order that the strip may be shifted to aline the same with the dies the upper rollers of each pair are mounted for movement into and out of engagement with the strip, this movement being so controlled that the rollers will be moved to their inoperative positions as the ram moves downwardly and will be moved into their operative positions as the ram moves upwardly. As here shown, each upper roller is mounted in a pivoted supporting device comprising an arm 30, and the arms of the two supporting devices extend inwardly, one toward the other, and are connected by links 31 with levers 32 pivotally mounted between their ends on the frame of the press above the cam disk 29. The inner ends of the levers are arranged for engagement by a plunger 33 which is actuated by the cam 29, the cam being arranged to impart movement to the rollers at the proper time with relation to the movements of the ram. The feeding rollers and their operating mechanism are of a well known type and form no part of the present invention. The strips may be delivered to the feeding rollers, and the operation of the rollers thereon controlled, in any suitable manner, but the present mechanism is well adapted for use with the automatic strip delivery mechanism shown in my co-pending application filed November 9, 1931, Serial No. 573,785, and with the feed roller controlling mechanism shown in my co-pending application filed November 16, 1931, Serial No. 575,324.

In the arrangement here illustrated the two presses are arranged in tandem and each is provided with two or more progressive dies, the several dies being adapted to operate progressively on the same portion of the strip of material. After the dies of the first press have operated on the strip it is conducted to the second press and the portion thereof which has been operated upon is alined successively with the dies of the second press so that the strips are fed progressively through the two presses and the several operations completed with but one handling of the strip. The two presses are so arranged with relation one to the other that a strip of normal length will be engaged by the feeding-in rollers of the second press before it passes beyond the feeding-out rollers of the first press. The strip must be presented to the second press in such relation to the dies thereof that the portion thereof which has been operated upon by the dies of the first press will be in substantial alinement with the dies of the second press, that is, it must be so nearly in alinement with the dies of the second press that the usual alining devices will properly position the same with relation thereto. Any suitable means may be provided for conducting the strips from the first press to the second press which will cause the same to be properly presented to the second press and which will permit of such movement of the strip as is necessary to accurately aline it with the dies of the second press. To permit of the alinement of the forward end of the strip with relation to the dies of the second press while the rear end of the strip is held by the alining devices of the first press it is necessary that the end portions of the strip should be capable of relative movement and in order to permit of this movement I have, in the present machine, provided the conducting means in the form of a chute 34 supported at its respective ends by the two presses. The front end of this chute is arranged to receive the strip from the feeding-out rollers of the first press and the rear end of the chute is arranged to deliver the strip to the feeding-in rollers of the second press. The upper and lower walls of the chute are spaced apart a distance somewhat greater than the thickness of the strip and the intermediate portion of the chute is curved or bowed downwardly. Consequently when the forward end of a strip is engaged by the alining devices of the second press that portion may have movement toward or from the rear end of the strip, this relative movement of the forward portion of the strip serving merely to slightly increase or decrease the curvature of that portion of the strip which is then in the chute. The construction of the chute will also permit of a slight lateral or twisting movement of the strip. The chute is capable of initial adjustment to properly locate the strips lengthwise with relation to the dies and to accommodate the same to different arrangements of dies on the two presses. In the construction here shown this chute has sufficient flexibility to permit the curvature thereof to be varied, thus increasing or decreasing the length of that portion of the strip which lies between the dies of the two presses. For this purpose the body of the chute is anchored to the first press, as shown at 35, and the rear end of the chute is slidably mounted in a guideway 36 in the second press. Preferably that portion of the chute which extends into the guideway 36 has secured thereto a plate 37 and this plate and means are provided for adjusting this plate and the end of the chute in the guideway. In the present construction I have employed a turn

buckle adjustment which comprises a screw 38 having its end portions threaded in opposite directions and inserted in lugs 39 and 40, secured respectively to the plate 37 and to that portion of the second press in which the guideway 36 is formed, it being understood of course that the lug 40 is stationary and that the rotation of the screw will move the lug 39 toward or from the same.

It is also desirable that some means should be provided for positioning the forward end of the strip laterally with relation to the dies of the second press, that is, for centering the strip. For this purpose I have mounted on the second press, adjacent to the feeding-in rollers, a centering device which comprises two yieldable guides arranged to engage the respective edges of the strip and properly position the same. As here shown, the guides are in the form of studs or rollers 41 and 42 which extend through relatively large openings in the forward portion of the chute, just in advance of the feeding-in rollers of the second press, and are supported at their lower ends on arms 43 and 44 pivotally mounted beneath the chute and extending lengthwise thereof. Yieldable means are provided to move the arms and studs inwardly, the inward movement being limited by stops 45 and 46. In the present instance, these stops are carried by the arms 43 and 44, respectively, and contact with the adjacent edges of the chute. Preferably means, such as set screws 45a and 46a are provided to adjust the normal positions of the studs. The yieldable means which acts on the studs is of such a character that greater pressure will be exerted on one stud than on the other, so that when a strip is introduced between the two studs that stud which is subjected to the lighter pressure will yield and the other stud will remain stationary to properly locate the strip, but should the strip be curved edgewise the last mentioned stud will yield to permit the passage of the curved portion of the strip, which travels in a straight line due to the action of the alining devices on the presses. In the present construction the two arms are connected one to the other by a coiled spring 47 which is connected with the two arms at different distances from the axes thereof, thus causing a greater pressure to be exerted on the one arm than on the other. As here shown, the spring is connected with the arm 43 at a distance from its axis sufficiently greater than the distance which the other end of the spring is spaced from the axis of the arm 44 to cause the pressure exerted on the arm 43 to be substantially twice that exerted on the arm 44.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A punch press mechanism comprising a plurality of presses having dies to operate progressively on a given portion of a strip of material, each press having a feeding-in device and a feeding-out device, the feeding-in device of the succeeding press being arranged to engage the strip before the rear end thereof has passed the feeding-out device of the first press, and means for operating said presses in synchronism.

2. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, means for operating said presses in synchronism, and means for conducting said strip from one press to a succeeding press and for so supporting said strip that the end portions thereof may have limited movement relatively one to the other.

3. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, means for feeding a strip through said presses, and means arranged between said presses to support a strip in a transversely curved position as it passes from one press to another and to permit a limited vertical movement of the intermediate portion of said strip.

4. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, means for feeding a strip through said presses, means arranged between said presses to support a strip in a transversely curved position as it passes from one press to another and to permit a limited vertical movement of the intermediate portion of said strip, and means to adjust said supporting means to vary the curvature imparted to said strip.

5. A punch press mechanism comprising a plurality of separate presses having dies to act progressively on a given portion of a strip of material, each press having a feeding-in device and a feeding-out device, a chute arranged to receive a strip from the feeding-out device of one press and to guide said strip to the feeding-in device of a succeeding press, and means for operating said presses in synchronism.

6. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, each press having a feeding-in device and a feeding-out device, a chute arranged to receive a strip from the feeding-out device of one press and to guide said strip to the feeding-in device of a succeeding press, said chute having upper and lower walls spaced apart a distance greater than the thickness of the strip and having a trans-

versely curved intermediate portion, and means for operating said presses in synchronism.

7. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, each press having a feeding-in device and a feeding-out device, a chute arranged to receive a strip from the feeding-out device of one press and to guide said strip to the feeding-in device of a succeeding press, said chute having upper and lower walls spaced apart a distance greater than the thickness of the strip and having a transversely curved intermediate portion, and means for adjusting one end of said chute to vary the curvature of said transverse portion.

8. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, means to conduct a strip of material from one press to a succeeding press, yieldable means arranged near the discharge end of said conducting means to center said strip with relation to the dies of the second press, and means for operating said presses in synchronism.

9. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, means for operating said presses in synchronism, means for conducting a strip from one press to a succeeding press, a strip centering device arranged near the discharge end of said conducting means and comprising spaced guides mounted for movement toward and from each other, stops to limit the movement of said guides one toward the other, and spring means to hold said guides against said stops, said spring means being arranged to exert a greater pressure on one guide than on the other.

10. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, means for operating said presses in synchronism, a chute to conduct a strip from one press to a succeeding press, said chute having openings therethrough near the discharge end thereof, studs mounted in said openings for movement transversely to said chute, and yieldable means tending to move said studs one toward the other, said yieldable means being arranged to exert a greater pressure on one stud than on the other stud.

11. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, means for operating said presses in synchronism, a chute to conduct a strip from one press to a succeeding press, said chute having openings therethrough near the discharge end thereof, arms pivotally mounted beneath said chute and extending lengthwise thereof, studs carried by the respective arms

and extending through said openings into said chute, stops to limit the inward movement of said arms, and a spring connected with said arms at different distances from the axes thereof.

12. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, means for operating said presses in synchronism, a chute to conduct a strip from one press to a succeeding press, said chute having openings therethrough near the discharge end thereof, arms pivotally mounted beneath said chute and extending lengthwise thereof, studs carried by the respective arms and extending through said openings into said chute, stops rigidly secured to said arms and arranged to engage the respective edges of said chute to limit the inward movement of the arms, and yieldable means acting on said arms to hold said stops normally in engagement with said chute, said yieldable means being arranged to exert greater pressure on one arm than on the other.

13. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material and having separate feeding means, said presses and dies being located at fixed distances one from the other, a guideway through which said strip of material is progressed from the first press and die to the second press and die, and means whereby the length of said guideway may be varied to cause said strip to properly register with each of said dies.

14. A punch press mechanism comprising two stationary presses having dies to act progressively on a strip of material and having separate strip feeding means, a guideway leading from the first press to the second press, said strip of material being arranged to receive at equal intervals duplicate imprints from the first press and die, thence to progress through said guideway to the second press and die and to there receive further imprints, said guideway being of a length greater than the straight line distance between the two dies and being adjustable to cause correct registration of the imprints on said strip with both dies simultaneously.

15. A punch press mechanism comprising two dies mounted in separate stationary presses to operate progressively on strips of material, one of said dies being adapted to produce duplicate imprints at equally spaced intervals on said strips, one after another, separate feeding means for said presses cooperating to cause said strips to advance one after another to the other of said dies, and means to conduct said strips from one press to the other and to cause said imprints to register correctly with the succeeding die to receive additional imprints therefrom.

16. A punch press mechanism comprising

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a plurality of presses having dies to act progressively on a given portion of a strip of material, each press having separate means for feeding strips through the same in succession, means for operating said presses in synchronism, and means for conducting the successive strips from the feeding means of one press to the feeding means of a succeeding press.

17. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, each press having separate means for feeding strips through the same in succession, means for operating said presses in synchronism, means for conducting the successive strips from the feeding means of one press to the feeding means of a succeeding press, and for maintaining each strip in such rela-

tion to said presses that it will be properly positioned with relation to the dies of the second press.

18. A punch press mechanism comprising a plurality of presses having dies to act progressively on a given portion of a strip of material, each press having separate means for feeding strips through the same in succession, means for operating said presses in synchronism, and a guideway to conduct the successive strips from the die of one press to the die of a succeeding press, said dies being located a fixed distance one from the other and said guideway being of a length greater than the straight line distance between said dies.

In testimony whereof, I affix my signature hereto.

GEORGE H. LELAND.

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