May 9, 1933. W. H. SLABAUGH ET AL 1,908,563

PUNCH PRESS

Filed Aug. 14, 1930 3 Sheets-Sheet 1

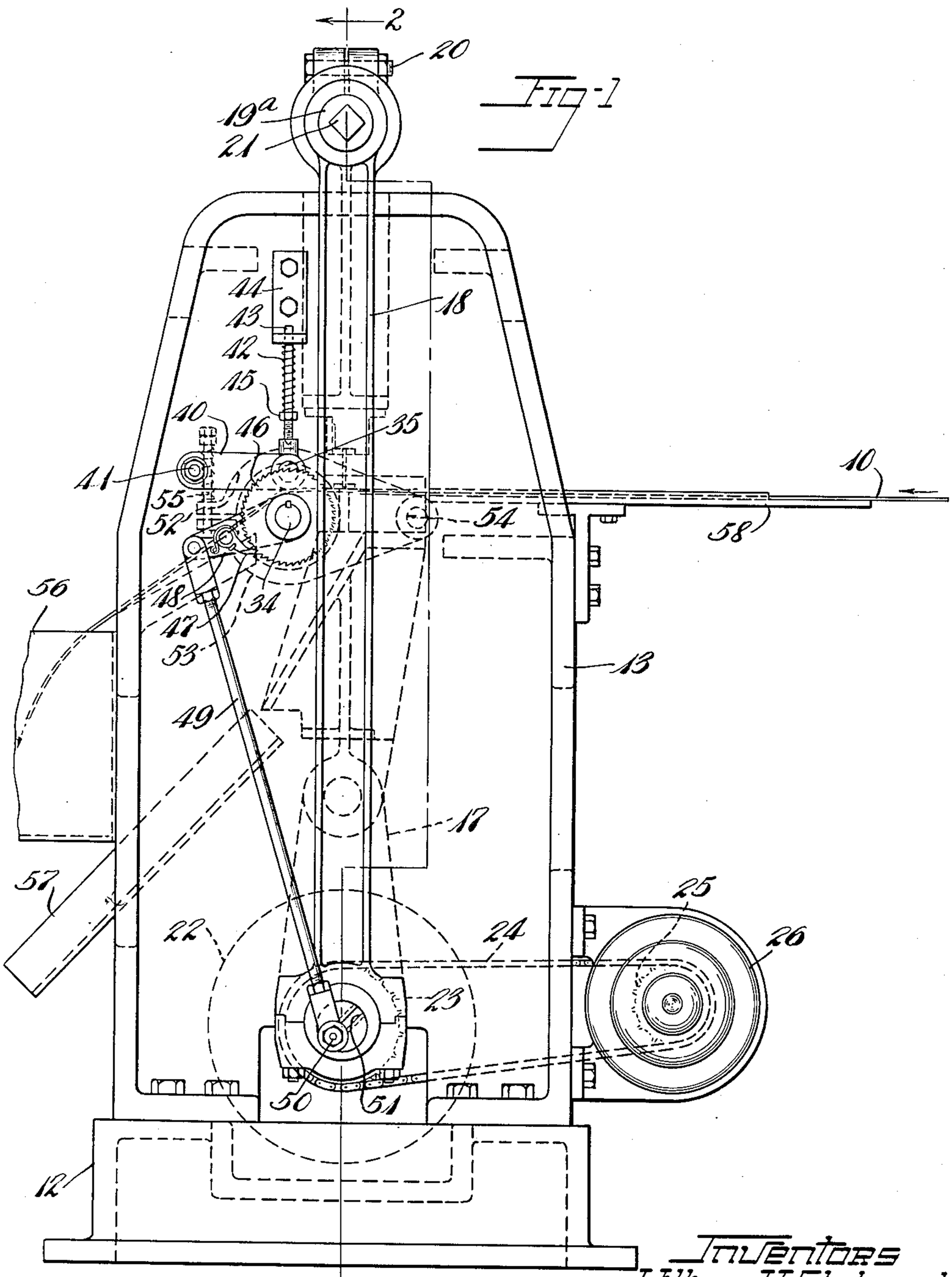

Fig-1

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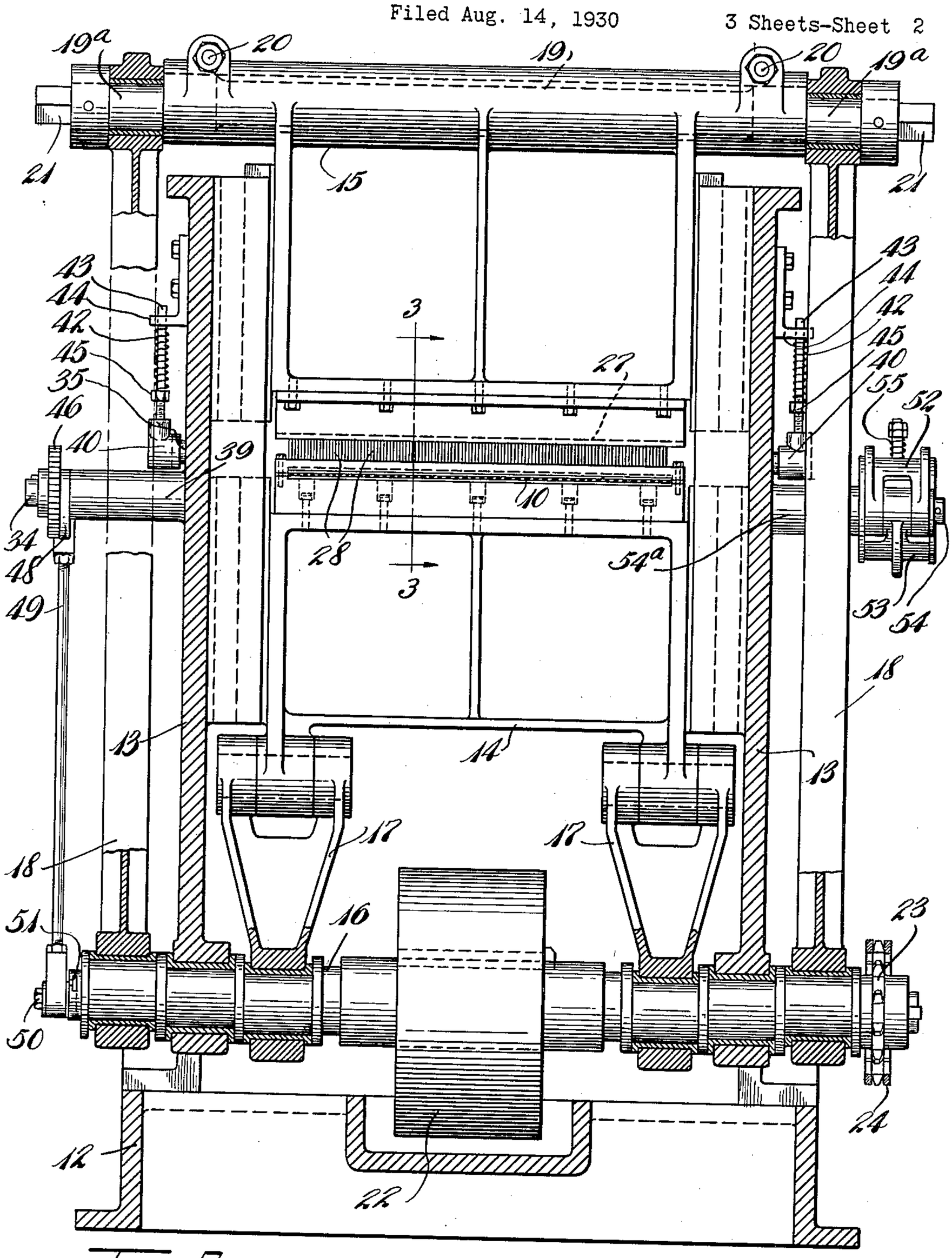

Fig-2

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Fig-3

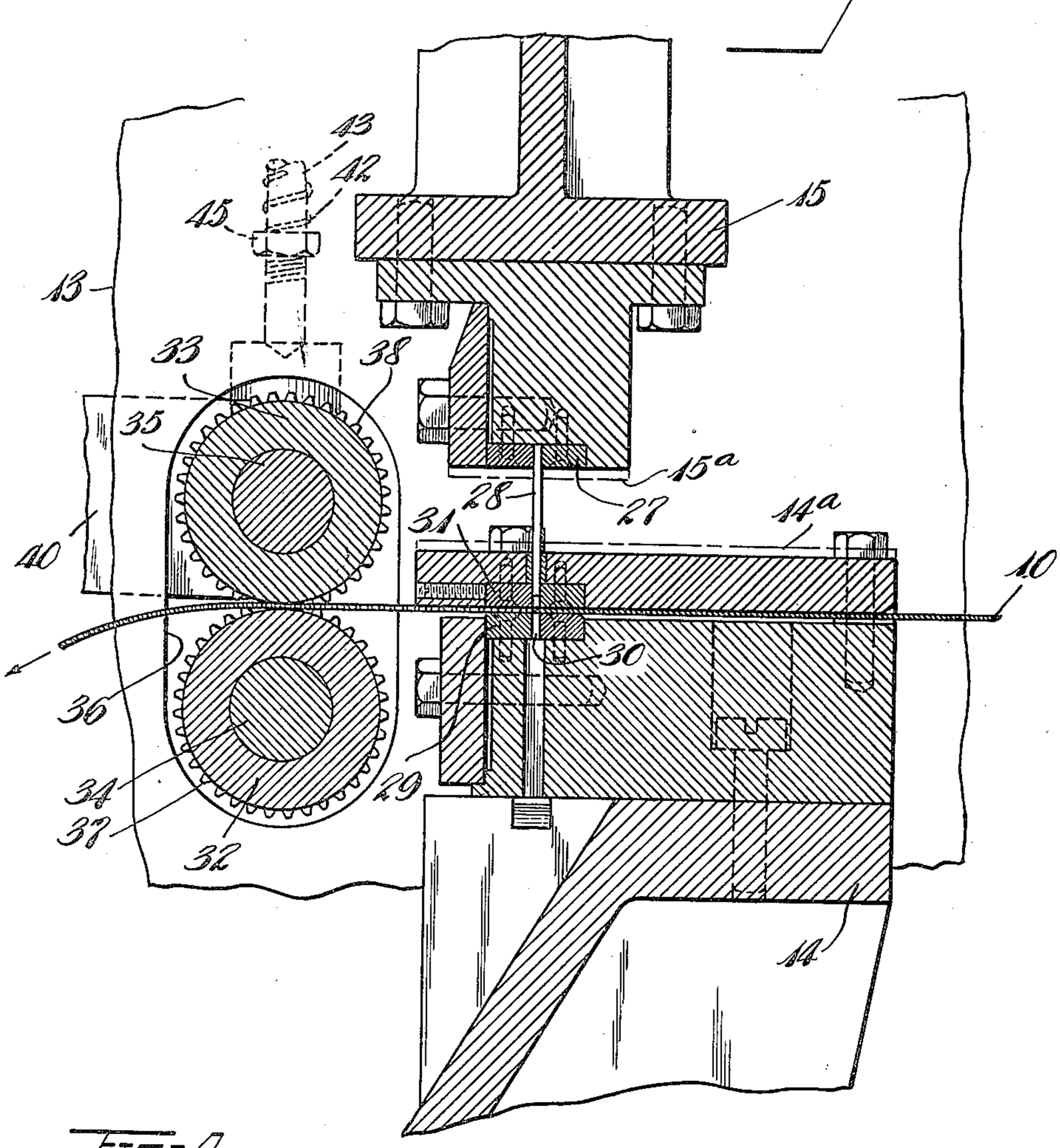
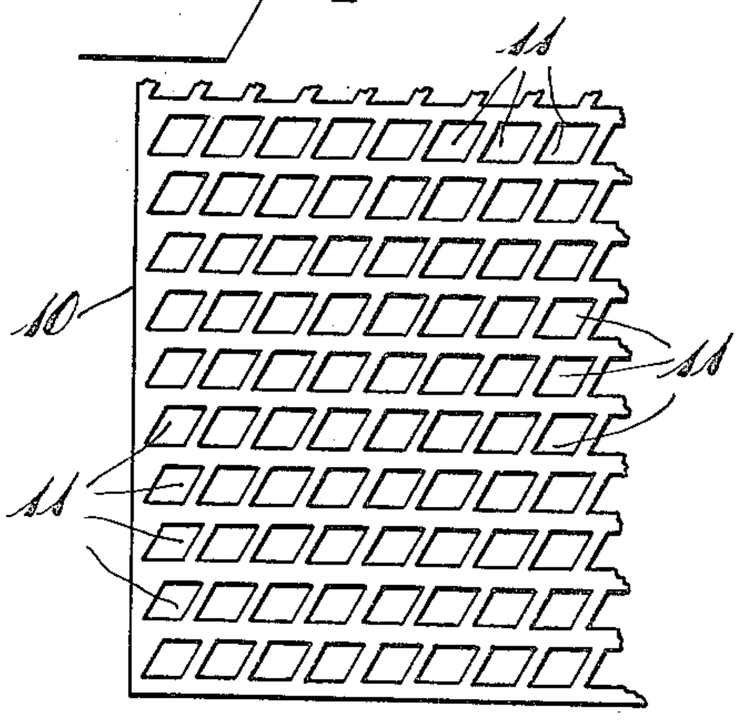


Fig-4



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UNITED STATES PATENT OFFICE

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PUNCH PRESS

Application filed August 14, 1930. Serial No. 475,186.

This invention relates to presses, and more especially to punch presses adapted for continuous operation, and for continuous automatic feeding of the work therethrough.

The chief objects of the invention are to increase the output of a punch press; and to lengthen the life thereof. More specifically we aim to provide a punch press capable of operating at high speed with little or no vibration.

Of the accompanying drawings:

Fig. 1 is a side elevation of a punch press embodying our invention in its preferred form, and the work therein.

Fig. 2 is a section on line 2—2 of Fig. 1.

Fig. 3 is a section on line 3—3 of Fig. 2 on a larger scale.

Fig. 4 is a plan view on a large scale, of a portion of a sheet of material that has been perforated in our improved punch press.

Referring to Fig. 4 of the drawings, it will be seen that the sheet 10 constituting the work has been formed with a multiplicity of relatively small, closely-spaced apertures 11, 11 of parallelogram or diamond shape arranged in horizontal and vertical rows. Because of the angular contour of the apertures 11, the punches and dies required for forming the same are very difficult and expensive to manufacture, so that it is preferred practice to use but a single row of punches and dies, and to reciprocate the punches at high speed to obtain, economically, quantity production of the perforated sheets. Vibration of the punch press due to high speed operation is substantially eliminated in the apparatus constituting this invention.

Referring to Figs. 1 and 2 of the drawings, the punch press comprises a base 12, side frames 13, 13 rising therefrom, opposed press-heads 14, 15 slidably mounted for vertical movement in suitable guideways in the latter, a crank-shaft 16 journaled in suitable bearings in the lower part of the respective side frames 13, pitmen 17, 17 pivotally connecting the lower press-head 14 with the crank-shaft 16, and pitmen 18, 18 pivotally connecting the upper press-head 15 with the crank-shaft 16. The connection between the pitmen 18 and the upper press-head includes a shaft 19 which is non-rotatably clamped within the press-head by bolts 20, 20 and provided adjacent each of its ends with eccentric portions 19^a, 19^a to which the pitmen 18 are pivotally attached. The shaft 19 is provided with square ends 21, 21 to receive a suitable tool such as a wrench by which the shaft may be turned to different angular positions to provide vertical adjustment of the upper press-head 15 with relation to the lower press-head 14. The cam shaft 16 is so arranged as to impart reciprocating movement to the respective press-heads, which movement periodically carries them toward and away from each other, the extent of their respective movements being indicated by the broken lines 14^a, 15^a of Fig. 3. The cam-shaft is provided at its middle with a fly-wheel 22 and at one of its ends is provided with a sprocket 23 connected by a sprocket chain 24 with a sprocket 25 on the shaft of a motor 26, which, for convenience, may be mounted upon one of the side frames 13 at the rear thereof.

Mounted upon the lower face of the press-head 15 is a punch-plate 27 upon which is mounted a single row of downwardly extending punches 28, 28. Mounted upon the upper side of the press-head 14 is a die plate 29 having formed therein a single row of die-apertures 30 complemental to the punches 28. The punches extend through a guide or stripper plate 31 positioned above the die plate 29, and spaced therefrom to provide a passage for the sheet material 10 to be punched.

For feeding the sheet material 10 through the press in successive steps during the interval that the respective press-heads are farthest apart from each other, and the punches 28 are withdrawn from the dies 30, a pair of cooperating feed-rollers 32, 33 are mounted at the delivery side of the punches and dies upon respective shafts 34, 35, said feed-rollers preferably being lightly knurled or roughened to assure good frictional engagement with the work. The shafts 34, 35 extend through apertures, such as the aperture 36, Fig. 3, in the respective

side-frames 13, and the shafts are provided, adjacent their respective ends, with meshed gears 37, 38, (Fig. 3) whereby they are rotated in unison as the lower shaft 34 is driven. The lower shaft 34 is journaled in brackets 39, 39 mounted on the outer faces of the respective side frames 13, and the upper shaft 35 is journaled in the free ends of a pair of arms 40, 40 pivotally mounted at 41 upon the outer faces of said side frames. The feed-roller 33 is yieldingly urged toward the feed-roller 32 by compression springs 42, 42 which are mounted upon respective rods 43, 43 that have their lower ends engaging the free ends of the respective arms 40 with ball and socket connections, and have their other ends slidably mounted in respective brackets 44, 44 mounted upon the sides of the respective side-frames 13, the springs 42 being positioned between the brackets 44 and nuts 45, 45 on the respective rods 43. The arrangement is such that the machine readily accommodates work of a small range of thicknesses, and assures adequate driving friction of the feed-rollers with the work.

For turning the shafts 34, 35 angularly a determinate distance at timed intervals with relation to the reciprocation of the press-heads 14, 15, one end of the shaft 34 is provided with a ratchet 46 which is engaged by a spring-pressed pawl 47 mounted upon a pawl-arm 48 which is journaled on said shaft. The pawl-arm 48 is oscillated to impart intermittent rotary movement to the shaft 34 by means of a link 49 which connects the free end of the arm 48 to a crank-pin 50 mounted in an undercut slot 51 in the end of the crank-shaft 16, said slot being disposed diametrically of the shaft 16, and the crank-pin being disposed eccentrically of the shaft. The arrangement provides adjustability for varying the length of the link's stroke.

Reciprocation of the link 49 is very rapid, and to assure that the shaft 34 comes to rest at the end of each downward or operative stroke of the link, the opposite end portion of the shaft from the ratchet 46 is engaged by brake mechanism comprising a pair of jaws 52, 53 which are pivotally mounted at 54 upon a bracket 54^a and are urged yieldingly against a brake drum (not shown) on the shaft by a compression spring 55 operatively associated with their free ends as is most clearly shown in Fig. 1.

The press is provided on its work-delivery side with the usual receptacle 56 for finished work, and a receptacle 57 for the punchings struck out from the work. On the work-receiving side of the press is a horizontal support 58 for work being fed to the press, said support being substantially aligned with the punching position.

The machine is so designed that it can be operated at relatively high speed with little or no vibration, whereby the other objects set forth in the foregoing statement of objects are attained.

Modification may be resorted to within the scope of the appended claims, as we do not limit the claims wholly to the specific structure shown and described.

We claim:

1. A high-speed sheet-perforating machine comprising a pair of cooperating movable perforating members constituting a complete set of perforating dies, a single rotary element for simultaneously effecting similar opposite reciprocating movements of the perforating members, and means for intermittently feeding a sheet of material therebetween, the device being so proportioned that the inertia forces of the per- said support being substantially aligned forating members are substantially dynamically balanced and the amplitude of lateral vibration in any link member of the train connecting the perforating members to the rotary member is relatively small as compared to its mathematical length.

2. A high-speed sheet-perforating machine comprising a frame, a pair of opposed press-heads slideably mounted therein, cooperating perforating members constituting a complete set of perforating dies, one of which is mounted on each press-head, a crank shaft rotatably mounted in said frame and having diametrically opposed wrist pins, a pitman for directly actuating one of said press-heads from one of said wrist pins, and a second pitman for directly actuating the other press-head from the other wrist pin, the inertia forces of the reciprocating parts being substantially balanced, and the lateral movement of the pitmen being relatively small as compared to their length.

3. A high-speed sheet-perforating machine as defined by claim 2 including means located between one of said press-heads and its pitman for adjusting the relative relation of the perforating members.

4. A high-speed sheet-perforating machine as defined by claim 2 in which the perforating members comprise a single row of punches and dies, and including an intermittent sheet feeding mechanism for advancing a sheet of material between punching operations.

In witness whereof we have hereunto set our hands this 6th day of August 1930.

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