March 15, 1932. A. A. BYERLEIN 1,849,362

PRESS

Filed Aug. 20, 1930 3 Sheets-Sheet 1

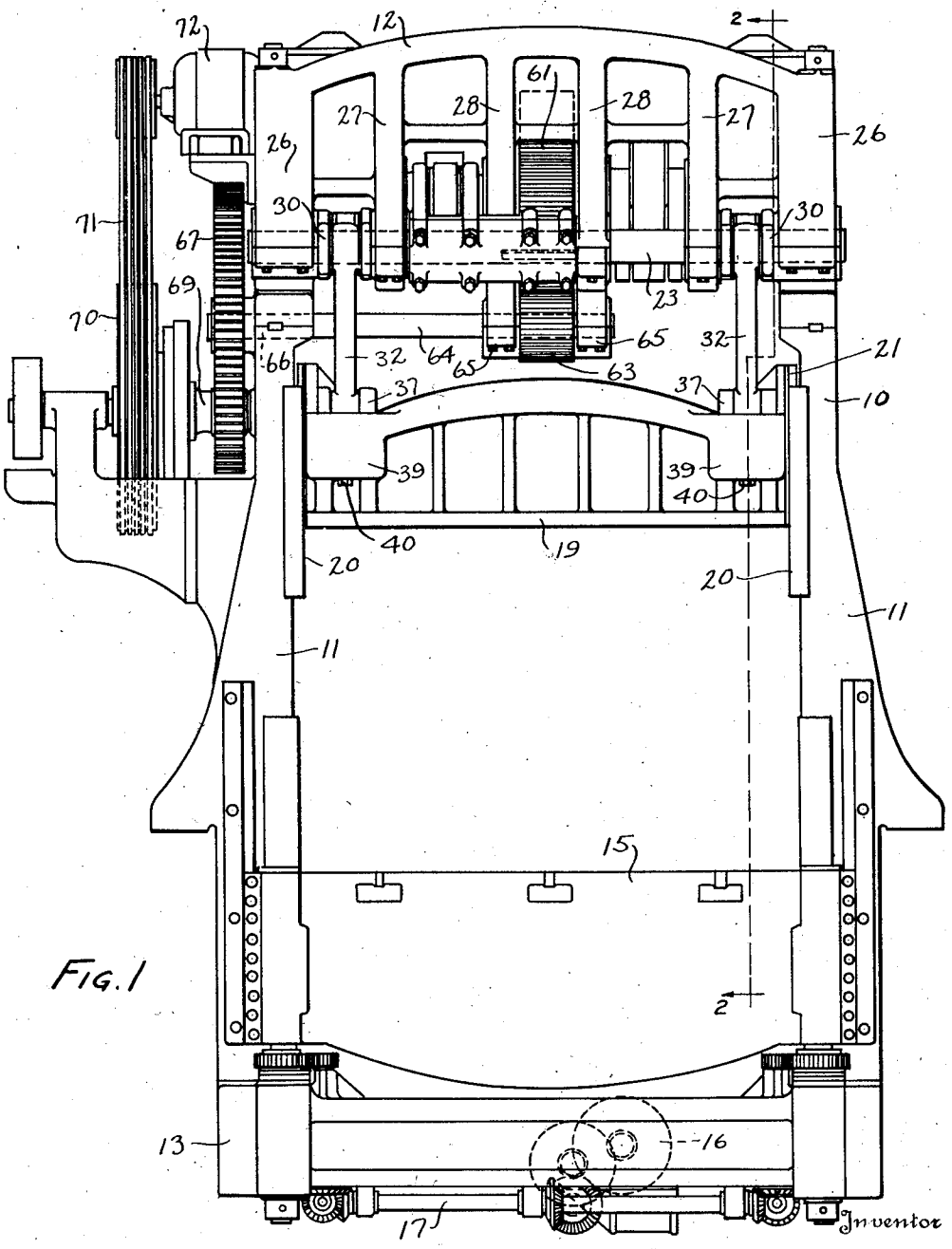



FIG. 1

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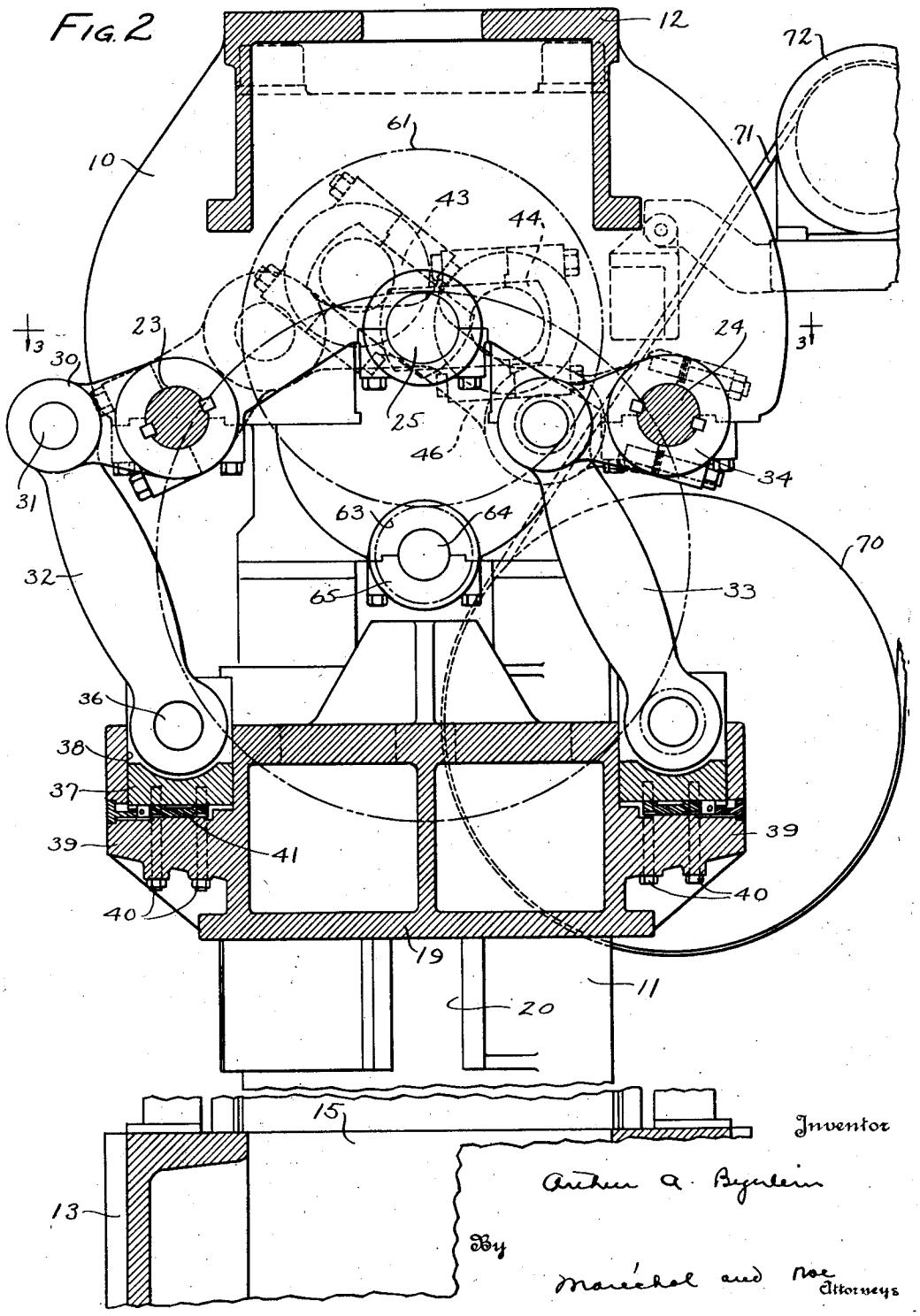
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PRESS

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FIG. 2




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FIG. 3

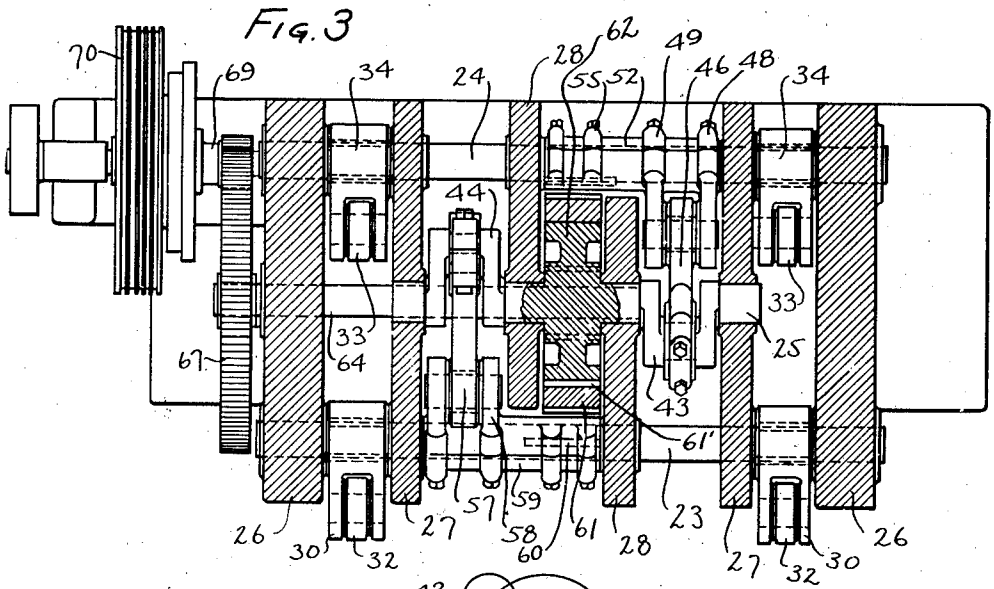



FIG. 5

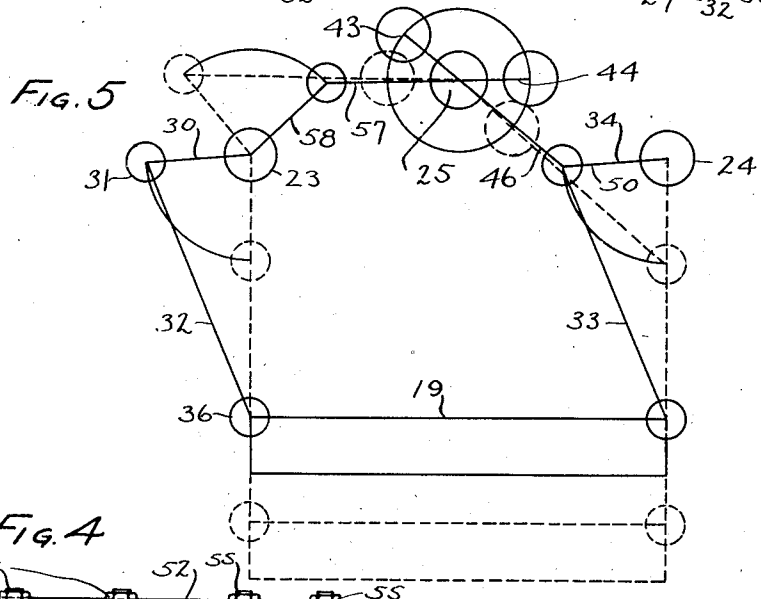
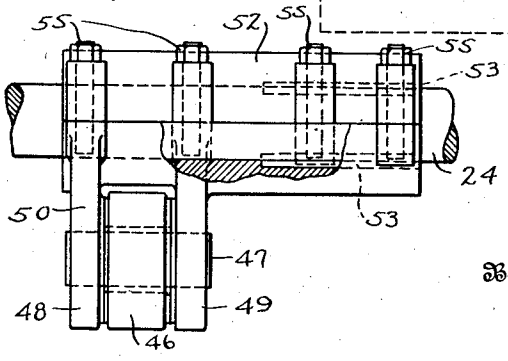



FIG. 4




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Patented Mar. 15, 1932 1,849,362

# UNITED STATES PATENT OFFICE

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## PRESS

Application filed August 20, 1930. Serial No. 476,624.

This invention relates to presses.

One object of the invention is the provision of a stamping press in which the die slide is operated so that it will be held square with the bed by the operating mechanism, even though the slide may be unevenly loaded with dies.

Another object of the invention is the provision of a stamping press, adapted for stamping sheet metal or the like, in which a slidable die carrier is operated from its opposite sides, through the intermediary of two rock shafts the centers of which are connected to two crank throws symmetrically arranged on opposite sides of the longitudinal center of the crank shaft.

Other objects and advantages of the invention will be apparent from the following description, the appended claims, and the accompanying drawings, in which—

Fig. 1 is a front elevation of a press embodying the present invention;

Fig. 2 is a vertical section through the upper portion of the press on the line 2—2 of Fig. 1;

Fig. 3 is a horizontal section on the line 3—3 of Fig. 2, taken through the crank shaft;

Fig. 4 is an enlarged detail of a rock shaft connection; and

Fig. 5 is a diagrammatic showing of the slide operating linkage, the full line showing illustrating the position of the parts when the slide is raised, and the dotted lines showing the position of the parts when the slide is in its lowermost position.

Referring by reference numerals to the drawings in which a preferred embodiment of the invention is illustrated, 10 designates the frame of the press, which comprises spaced apart uprights on side frames 11 which are adapted to carry the actuating mechanism and to carry the slide for vertical reciprocatory movement. The side frames 11 are interconnected at the top of the press by the arch member 12, and at the bottom of the press by the base member 13.

The bed 15 is preferably adjustably mounted so that it may be raised and lowered, and locked in any position of adjustment. It is supported adjacent its corner portions by screw devices which may be actuated simultaneously from a motor 16 which is operably connected to a pair of spaced shafts 17 each having geared connection to a pair of the adjusting screws, which are quite long so as to provide for a comparatively large range of adjustment of the bed. The bed is adapted to carry dies of suitable character which cooperate with dies carried by the slide 19 which is guided at opposite sides in the guides 20 provided on the frame side portions 11. Preferably the guides 20 are suitably recessed so as to receive projecting portions 21 on the press slide, thus definitely holding the slide with relation to the guides during reciprocation of the slide.

The press, as shown, is of the single acting type such as is used to stamp sheet metal, and is provided with a single reciprocable plunger or die slide. In large size presses of this type, with wide slides, difficulty is experienced in maintaining the slide square with the bed, as it is fast becoming the practice to assemble a number of dies in one machine, each die performing a different operation, and therefore uneven loading of the slide is the result. This uneven loading of the slide makes it difficult to insure that the slide will be maintained square with the bed at all times, in spite of the guides provided at the sides of the press frame. Heretofore these guides at the sides of the press have been depended upon to hold the slides square, in machines having a single operating shaft connected by a crank or the like which is pivoted on the center line of the slide.

In accordance with the present invention the slide is operated by two rock shafts 23 and 24 symmetrically arranged at the front

and rear of the press and on opposite sides of and symmetrically arranged with respect to the crank shaft 25 from which they are driven. The two rock shafts 23 and 24 are symmetrical in construction, each being rotatably journalled in several spaced bearings provided in the bearing portions 26, 27 and 28 of the frame arch. Adjacent each end of the rock shaft 23 is keyed an arm 30, each of the arms being connected by a suitable pivot pin 31 to a long link 32, the lower end of which is operably connected to the slide 19 at the front of the press. Similar links 33 are operably connected at the rear side of the slide and are pivoted to arms 34 which are keyed to end portions of the rock shaft 24. The slide is thus supported adjacent its four corners by four toggle linkages so that the rock shafts 23 and 24 may rotate counterclockwise to move the arms 30 and 34 into substantial alignment with the long links 32 and 33 thus moving the slide downwardly to its lowermost position where it accomplishes the desired work on a blank of sheet metal or the like.

The links 32 and 33 are operably connected in a pivotal manner to the slide, the form of connection preferred being shown in Fig. 2. The link 32 for example is pivoted by a pin 36 to a pivot block 37 which is bifurcated at its upper portion, the legs of the bifurcation straddling the lower end of the link 32. This pivot block is preferably cylindrical, and is mounted in a cylindrical bore 38 in the bracket 39 which projects towards the front of the press. The pivot block 37 is securely bolted in place by bolts 40, the upper ends of which are threaded into the bottom of the pivot block holding it down against a safety washer 41. This safety washer is generally saucer shape and is adapted to crush upon a predetermined overload so as to save the other parts of the press from injury in case undue force would be applied to the slide and the slide operating mechanism. Suitable clearance is provided between the bottom of the pivot block 37 and the bottom of the cylindrical socket so that the washer 41 may crush and permit the pivot block 37 to move downwardly with relation to the bracket 39. It will be understood, however, that during normal operation the washer 41 and the bolts 40 will hold the pivot block 37 rigidly secured in position on the slide.

The connection from the crank shaft 25 to the rock shafts 23 and 24 is symmetrically arranged with respect to these shafts and to the press. The crank shaft 25 has two crank throws 43 and 44 which are arranged symmetrically on the crank shaft equal distances from the longitudinal center of the shaft. These two crank throws are shown between the two bearing portions 27 and 28 on each side of the press and it will thus be evident that they are close to the center of the press but symmetrically arranged on opposite sides of the center. Connected to the crank throw 43 is a crank arm 46, the other end of this crank arm being pivotally connected by a pin 47 between the two sides 48 and 49 of an arm 50. The arm 50 is a rigid part of a thick sleeve 52, see Fig. 4, this sleeve being keyed to the rock shaft 24 by the keys 53 and 54. As shown, the thick sleeve 52 is slit longitudinally, the two split portions being securely held together by suitable bolts 55. The length of the sleeve is such that it extends over to and past the center of the rock shaft, and the keys 53 and 54 instead of running the full length of the sleeve merely key the central portion of the rock shaft to the end of the sleeve. This end of the sleeve where it is keyed to the center of the rock shaft has a snug fit, while the portion of the sleeve adjacent the arm 50 has a running fit on the rock shaft. The connection between the crank arm 46 and the rock shaft 24 is therefore at the center of the rock shaft so that the forces may be symmetrically distributed from the center of the rock shaft to the two toggle systems of the slide that it operates. It will thus be apparent that the center of the rock shaft is connected to a point on the crank shaft which is some distance from the center thereof, but as the crank shaft operates the two rock shafts from the two crank throws symmetrically arranged with respect to the longitudinal center of the crank shaft, the crank shaft itself symmetrically distributes the power to the rock shafts, and the power is applied to the center of both rock shafts and from that point the drive is symmetrical to the toggle connections of the slide. The connection from the crank throw 44 to the rock shaft 23 is similar in arrangement to the connection between crank throw 43 and rock shaft 24, the connection comprising the crank arm 57, arm 58 on sleeve 59 keyed at 60 to the center of rock shaft 23.

It will be apparent that when the crank shaft 25 rotates clockwise as viewed in Figs. 2 and 5, the rock shaft arms 34 and 30 will be swung downwardly in a counterclockwise direction, and equal amounts, the pressures and angular relationships of the shafts and the arms being symmetrically in balance so that the front and rear of the slide may be moved downwardly exactly equal amounts and with exactly equal forces. Thus there will be no possibility of the square attitude of the slide with respect to the bed being disturbed.

In Fig. 5 the position of the parts is shown in full lines, corresponding to the raised position of the slide, which also corresponds to the position of the parts in Figs. 1 and 2. Both rock shafts 23 and 24 rotate in the same direction,—that is counterclockwise, during downward movement of the slide, as the crank shaft rotates clockwise. The position of the parts when the slide is at its lowermost position is shown in dotted lines in Fig. 5. When the

slide is down it will be noted that the toggle linkages connecting the rock shafts to the slide are aligned, and also that the crank throws of the crank shaft are aligned with the respective crank arms which connect them to the rock shafts, so that a great deal of power can be applied to the slide at the time the slide die is operating on the blank.

The crank shaft 25 is driven by a large gear 61 which is suitably fixed, as by a key 61', to an extending hub portion 62 of the crank shaft formed adjacent the central portion thereof between the bearing portions 28, and is thus equally positioned from the two crank throws of the crank shaft. The crank shaft is preferably formed as a single integral member; the center hub portion being of sufficient diameter that the gear 61 attached thereto may be passed over a crank throw in assembling it to the crank shaft. The gear 61 meshes with a drive pinion 63 keyed to a shaft 64 which is rotatably mounted in bearing portions 65 and journalled in the portion 66 of a side frame 11. On the outer end of shaft 64 is a large gear 67 which meshes with a pinion on a shaft 69 rigid with a drive wheel 70. The shaft 69 is provided on the exterior of the side frame and the wheel 70 is connected by suitable power transmission 71 to an electric motor 72. It will be understood that when the motor 72 is in operation power is supplied to the center of the crank shaft by the gear 61 to effect up and down movements of the slide.

While the form of apparatus and the method herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus or method, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a press, a frame, a slide reciprocally operable therein, a shaft journalled in said frame, driving means operably connected to said shaft, a pair of rock shafts mounted in said frame, means connecting spaced points on each rock shaft to the slide, and means operably connecting the center of a rock shaft to a point on said first named shaft spaced from the center thereof, said last named means having a power transmitting connection point to the rock shaft which is equally spaced from the first named spaced points.

2. In a press of the single acting type, a frame, a single slide reciprocally operable directly in the frame and adapted to be unevenly loaded, a shaft journalled in said frame, driving means operably connected to said shaft, a pair of rock shafts mounted in said frame, means symmetrically connecting said first named shaft to the center points of each of said rock shafts for moving said rock shafts equally in the same direction to effect downward movement of the slide and for moving said rock shafts in the opposite direction to effect upward movement of the slide, and means operably connecting said rock shafts to the slide.

3. In a press, a frame, a slide reciprocally operable therein, a shaft rotatably mounted in said frame, driving means operably connected to said shaft, a pair of rock shafts mounted in said frame on opposite sides of said first named shaft and parallel therewith, means connecting spaced points on each rock shaft to the slide, and means operably connecting the center of each rock shaft to points symmetrically arranged on opposite sides of the longitudinal center of said first named shaft.

4. In a single acting press of the character described, a frame, a single die carrying slide reciprocally operable therein and adapted to be unevenly loaded, a driving shaft journalled in said frame, driving means independently connecting said shaft to spaced points on opposite sides of said slide, said driving means being symmetrically arranged to provide an exactly balanced driving force from said shaft to each point of said slide.

5. In a single acting press of the character described, a frame, a single die carrying slide reciprocally operable therein, a drive connection at each corner of said slide, a driving shaft journalled in said frame, drive means independently connecting said shaft to the drive connections on opposite sides of said slide, said driving means comprising similar lever systems symmetrically arranged to provide a balanced driving force from said driving shaft to each corner of said slide.

6. In a stamping press of the character described, a frame, a die slide reciprocally operable therein, a shaft rotatably mounted in said frame, driving means operably connected to said shaft, a pair of rock shafts mounted in said frame, means connecting spaced points on each rock shaft to corner portions of the die slide, and link means directly connecting each rock shaft to said first named shaft.

7. In a stamping press of the character described, a frame, a die slide reciprocally operable therein, a shaft rotatably mounted in said frame, driving means operably connected to said shaft, a pair of rock shafts mounted in said frame, means connecting spaced points on each rock shaft to corner portions of the die slide, and a link directly connecting each rock shaft to said first named shaft.

8. In a stamping press of the character described, a frame, a die slide reciprocally operable therein, a shaft rotatably mounted in said frame, driving means operably connected to said shafts, a pair of rock shafts mounted in said frame on opposite sides of said first named shaft and parallel therewith, means connecting spaced points on each rock shaft

to corner portions of the die slide, and a link directly connecting each rock shaft to said first named shaft.

9. In a press, a frame, a slide reciprocally operable therein, a crank shaft rotatably mounted in said frame and having a pair of crank throws symmetrically positioned on opposite sides of the longitudinal center of the crank shaft, driving means operably connected to the crank shaft, a pair of rock shafts mounted in the frame, means connecting spaced points on each rock shaft to the slide, and means operably connecting the center of each rock shaft to a crank throw of the crank shaft.

10. In a press, a frame, a slide reciprocally operable therein, a crank shaft rotatably mounted in said frame and having a pair of crank throws symmetrically positioned on opposite sides of the longitudinal center of the crank shaft, driving means operably connected to the crank shaft at the center of the press, a pair of rock shafts mounted in the frame on opposite sides of the crank shaft, means connecting each rock shaft to the slide and means operably connecting the center of each rock shaft to the crank throws of the crank shaft.

11. In a press, a frame, a slide reciprocally operable therein, a crank shaft rotatably mounted in said frame and having a pair of crank throws symmetrically positioned on opposite sides of the longitudinal center of the crank shaft, driving means operably connected to said crank shaft, a pair of rock shafts mounted in the frame on opposite sides of the crank shaft and parallel therewith, means symmetrically arranged on each crank shaft connecting end portions thereof to the slide, means fixedly secured at the center of each rock shaft and having an arm at one side of the connection to the rock shaft, and a crank arm directly connecting said mentioned arm to the crank shaft.

12. In a press, a frame, a slide reciprocally operable therein, a shaft operably connected to said slide, and means fixed to said shaft at its longitudinal center and having an arm laterally offset with respect to the point of connection to the shaft for driving the center of the shaft from a point axially displaced from the center.

13. In a single action press, a frame, a single slide reciprocally operable in said frame, operating means for said slide including a link, a pivot block pivotally connected to said link, said pivot block being fixed to said slide, and a crushable washer between the pivot block and the slide and operating under compression during application of force through said link to the slide to effect downward movement of the slide, the washer being adapted to crush upon predetermined overload to prevent injury to the slide and the slide operating mechanism.

14. In a single action press, a frame, a single slide reciprocally operable in said frame, operating mechanism for said slide including a link, a pivot block pivotally connected to said link, bolts holding the pivot block down to the slide, and a crushable washer adapted to crush upon predetermined overloads interposed between the pivot block and the slide.

In testimony whereof I hereto affix my signature.

ARTHUR A. BYERLEIN.