

May 26, 1942.

F. J. RODE ET AL

2,284,303

PRESS CONSTRUCTION

Filed Jan. 24, 1940

4 Sheets-Sheet 1

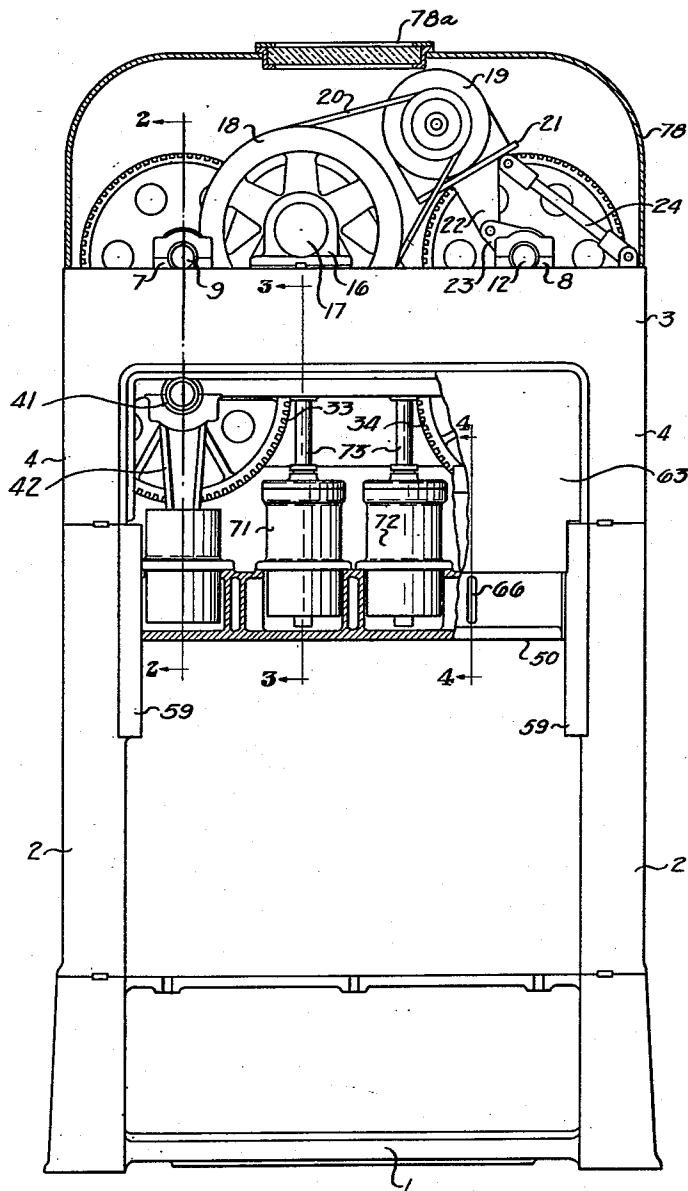


Fig. 1

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4 Sheets-Sheet 2

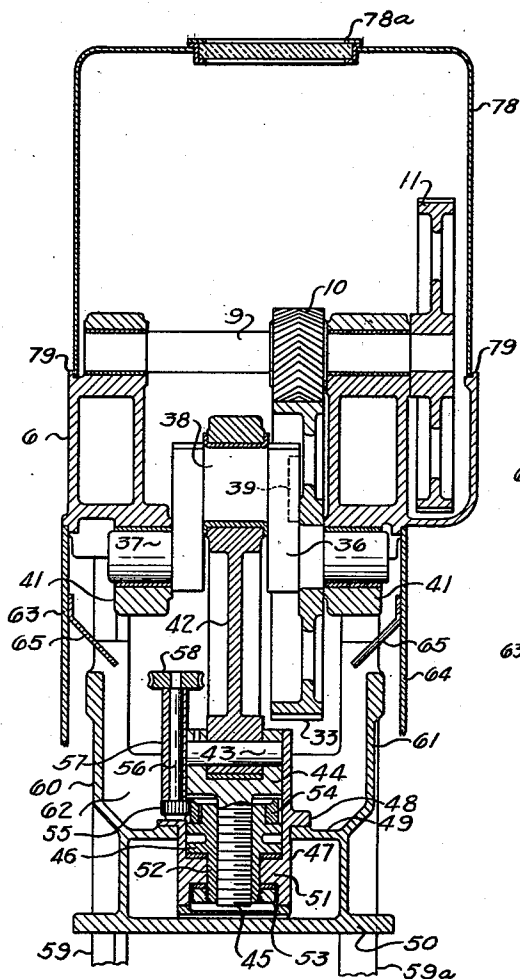


Fig. 2

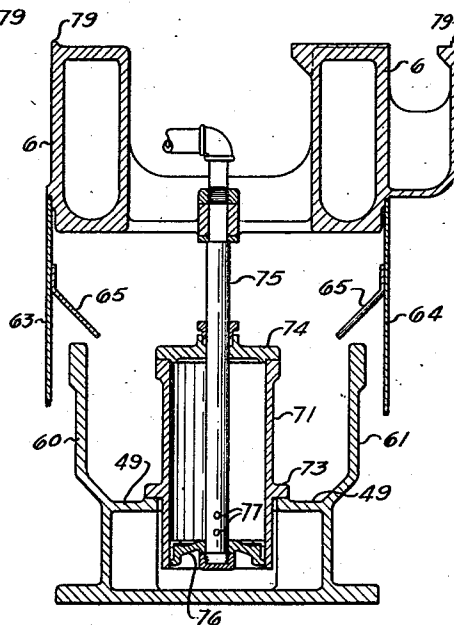


Fig. 3

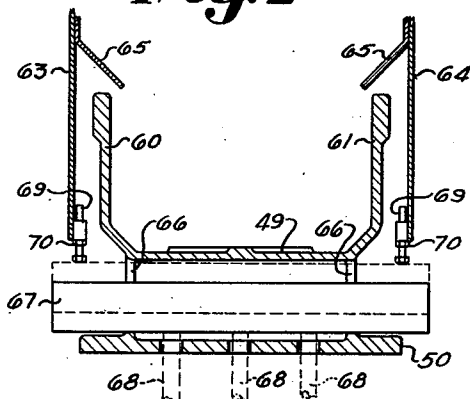


Fig. 4

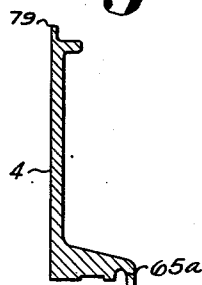


Fig. 10

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4 Sheets-Sheet 3

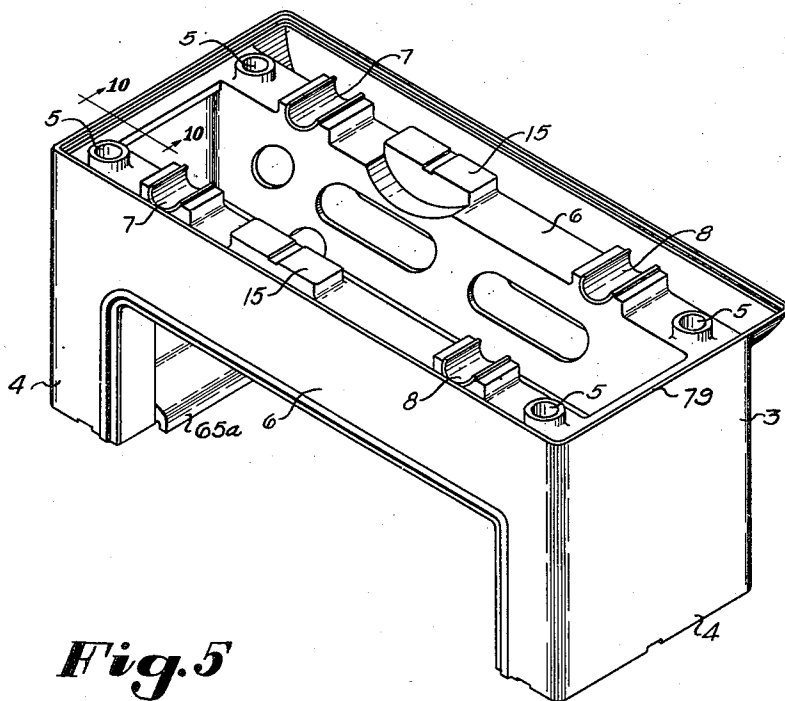


Fig. 5

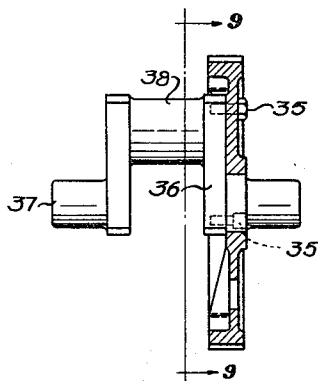


Fig. 8

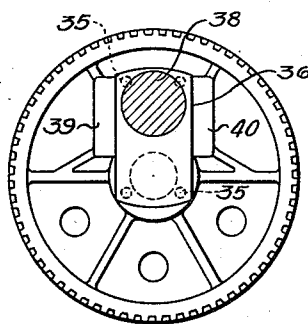


Fig. 9

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4 Sheets-Sheet 4

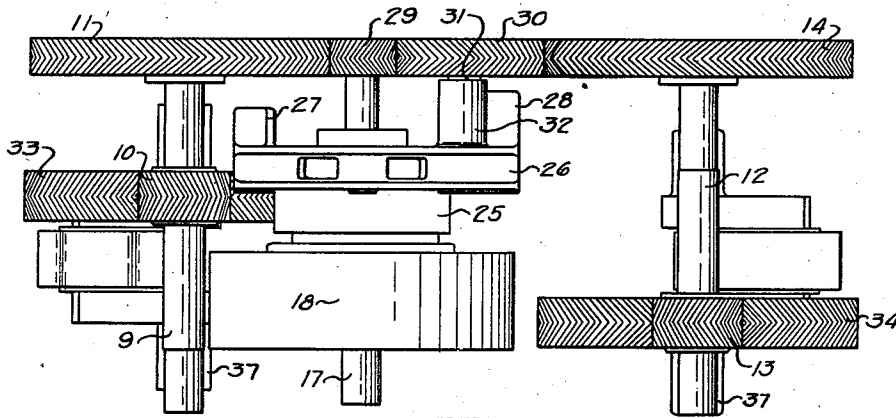


Fig. 6

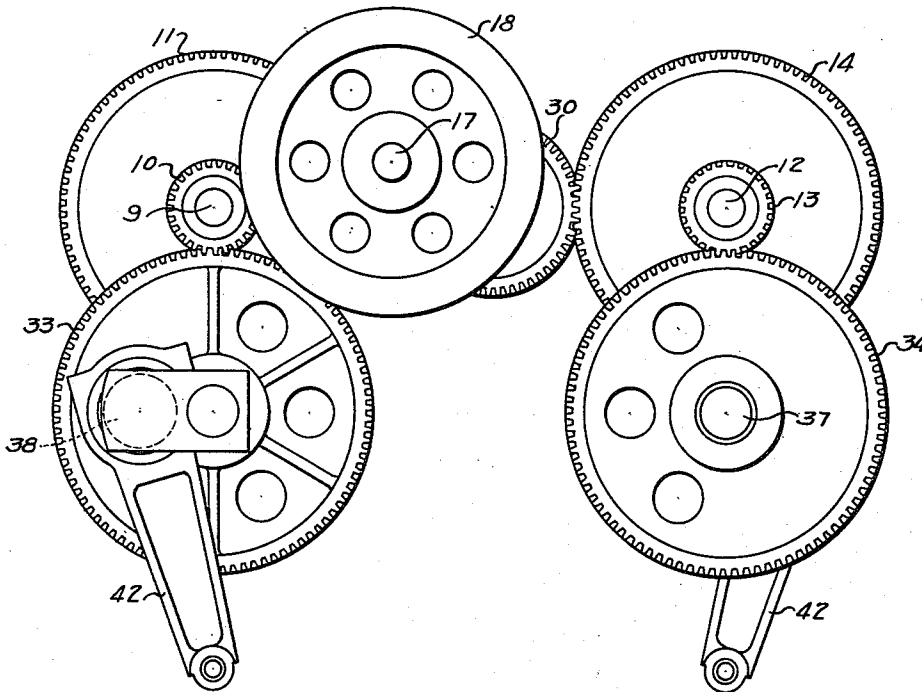


Fig. 7

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UNITED STATES PATENT OFFICE

2,284,303

PRESS CONSTRUCTION

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Application January 24, 1940, Serial No. 315,427

7 Claims. (Cl. 113—38)

This invention is directed to metal working presses and is more particularly directed to a front to back shaft press of improved design and construction.

In metal working presses of the type referred to it has been found necessary to restrict the size of the parts, while in many cases at the same time increase the operating capacity. This has been particularly true in installations replacing older machines where the allowable space requirements were set. For instance, the overall height of a press is in many cases governed by the crane clearance in the plant where it is used. In like manner the floor area and hence the position of the side frames is controlled by the space required for adjacent machines with due regard to the bringing of material to the press and the taking away of the finished product.

A so-called stream line appearance in which most of the working parts are concealed and wherein the press provides a smooth symmetrical appearance is a prerequisite of a commercially satisfactory machine at the present day.

Similarly, the capacity of the presses required has constantly increased as larger and larger articles are drawn. This has been particularly true insofar as the slide stroke is concerned because of the advances in deep drawing which are of recent achievement.

The general object of our invention therefore has been to provide a press which combines unusual features of strength and flexibility with light weight and space conserving construction. Still another object of the invention has been to provide slide reciprocating mechanism, parts of which are readily removable to facilitate repairs and rebuilding. Still another object of the invention has been to provide a satisfactory lubricating system in connection with the crown and reciprocating slide. A still further object has been to provide a crown construction which is cast in one piece and possesses great strength. A still further object of the invention has been to achieve a so-called streamlined appearance in which there are no unsatisfactory projecting parts.

A press of the general nature set out will preferably have on the exterior a generally box-like appearance formed by smoothly merging the side frames, the base and the crown, which latter is of generally rectangular construction. The crown is surmounted by a cover which is removable and which is provided with an air filter in the upper face thereof to filter air which is forced

out of and drawn into the crown, due to reciprocation of the slide. In the same connection a semi-seal is established between the die slide and the crown to provide the sucking action above referred to.

The crown itself consists of a one-piece casting with two or more girders cast therein and extending from right to left of the press. The right to left girders merge with a pair of front to back girders to form sides of the crown. The crown is preferably provided at its lower ends with plate members extending downwardly to totally enclose all projections of gears and the like and to shed oil thrown thereon back into the slide.

The press is of the type generally known as a front to back machine in which the main connection shaft axis or axes extend from the front to the back of the press. These shafts are removable from the under side to facilitate repairs and while the construction shown refers to a double crank press, it will be readily understood in the art that any construction from a single crank to a four-point press is within the scope of our present invention. In order to conserve space in the construction of the machine and to permit the building of narrow right to left machines, the crankshafts are formed in such a way that the main driving gears are staggered with respect to each other, as will be hereinafter apparent. Wider machines can be built with the main driving gears in line with each other, if desired.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawings and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various means in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a front elevation of the press, with portions broken away to better illustrate the slide reciprocating mechanism and other features;

Fig. 2 is a fragmentary cross-sectional view of the press taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary cross-sectional view of the press taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary cross-sectional view of the press, taken on the line 4—4 of Fig. 1;

Fig. 5 is a perspective view of the crown;

Fig. 6 is a plan view of the press slide actuating mechanism;

Fig. 7 is a front elevation of the slide actuating mechanism;

Fig. 8 is a view, partly in elevation and partly in section, showing the combined crankshaft and gear for driving the same;

Fig. 9 is a cross-sectional view, taken on the line 9-9 of Fig. 8;

Fig. 10 is a detail section of the crown construction as indicated by the lines 10-10 in Fig. 5.

Referring more particularly to the drawings, the press will be seen to comprise a bed 1, which is adapted to support a bed plate or die (not shown), spaced uprights 2 mounted on the bed, and a crown 3 having spaced depending side portions 4 mounted on the uprights 2.

The bed, uprights, and crown are adapted to be rigidly but removably secured together by means of vertically extending tie rods and nuts (not shown), such tie rods passing through openings 5 in the crown.

The crown is rectangular in form and includes a pair of spaced stress-carrying members 6, each provided with longitudinally spaced bearings 7 and 8. Journalled on the bearings 7 is a shaft 9 having keyed thereto at a point adjacent the rear member 6 a herringbone pinion 10, and provided at its rear end with a gear 11, also of the herringbone type. Journalled on the bearings 8 is a shaft 12 having keyed thereto at a point adjacent the front member 6 a herringbone pinion 13, and provided at its rear end with a gear 14, the pinion 13 and gear 14 being identical in size with the pinion 10 and gear 11 respectively.

The members 6 are also provided at points intermediate the bearings 7 and 8 with pads 15 upon which are mounted pedestal bearings 16 in which is journalled a drive shaft 17. The shaft 17 has rotatably mounted thereon a flywheel 18, which is driven by an electric motor 19 through the intermediary of an endless belt 20, the motor being supported by a bracket 21 having depending legs 22 which are pivotally secured to arms 23 which extend from the crown. The tension of the belt 20 may be adjusted by moving the motor 19 about its pivotal mounting, and for this purpose, a turnbuckle 24 is provided which is pivoted at one end to the crown 6 and at the other end to the bracket 21.

In order to start and stop the press, a fluid operated compound clutch and brake unit 25 is provided on the shaft 17, the brake housing being indicated at 26 and being supported as by means of rearwardly extending brackets 27 and 28, which are adapted to be mounted on the rear member 6 of the crown. The flywheel idly rotates on the shaft but when engaged by the clutch, which is keyed to the shaft, acts to drive the latter and, through it, the balance of the press mechanism. When the clutch is released, a spring actuated brake locks the shaft with respect to the press frame in a manner well understood in the art and as shown and described in our U. S. Patent No. 2,009,301, issued July 23, 1935.

The shaft 17 has secured to its rear end a pinion 29 which is in driving engagement with the gear 11, and also drives the gear 14 in the opposite direction from the gear 11, as by means of an intermediate idler gear 30. The gear 30 is mounted on a stub shaft 31 which is journalled in a hollow rearward extension 32 of the brake housing 26.

The pinions 10 and 13 are in driving engagement with larger gears 33 and 34 respectively, which are secured, as by bolts 35 to the cheeks 36

of crankshafts 37, the crankpins of which are designated by the reference numeral 38. Each gear includes a pair of spaced shoulders or ribs 39 and 40, which are formed integrally with the gear and snugly engage the crankshaft cheek 36 at opposite sides thereof. To this end, the opposite faces on the interior surfaces of the ribs are accurately machined to receive with a minimum of clearance the crankshaft cheek, the outer faces of which have been similarly machined to fit between the ribs. As a result of the foregoing construction, greatly increased strength in the drive mechanism, and elimination of deflection and torsion in the crankshaft is attained, the stresses between the gears and the crankshaft being absorbed by the cheeks and ribs and the bolts 35 merely serving to retain the parts in assembled relation.

Each of the crankshafts 37 is journalled in bearings 41 which are secured to the lower faces of the members 6 of the crown, as shown in Figs. 1 and 2.

Pivotally secured to each of the crankpins 38 is a crank or connection 42, the lower end of which is in turn pivotally secured to a pin 43 which extends transversely of a screw 44 having a depending threaded shank 45 which is in threaded engagement with a nut 46. The bolt and nut are disposed within a cylindrical sleeve 47 having an outwardly extending flange 48 intermediate its ends, whereby the sleeve may be bolted or otherwise secured to the web 49 of the upper die slide 50 of the press. The sleeve 47 has an inwardly extending flange 51, through which a reduced portion 52 of the nut 46 extends, and to which a second nut 53 is secured, the flange 51 being interposed between the nuts 46 and 53, as shown in Fig. 2.

For the purpose of varying the adjustment of the upper die slide 50, means are provided for effecting relative axial movement between the bolt 44 and the nut 46. Such means comprises a gear 54 which is keyed to the upper end of the nut 46, and a pinion 55 mounted on a shaft 56 journalled in a bearing portion 57 of the sleeve and provided at its upper end with a worm gear 58. The gear 58 is adapted to be driven by an electric motor (not shown) which is mounted within the slide 50, through the intermediary of a worm (not shown).

The slide 50 is mounted for vertical reciprocatory movement between ways or gibs 59 and 59a which are secured to the uprights 2 of the press. The slide further includes upward extensions 60 and 61 at the front and rear which, together with end walls 62 which interconnect the extensions 60 and 61, form a receptacle or sump into which oil may drain, as will be presently explained.

Cover plates 63 and 64 are secured to the crown at the front and rear of the press, and are effective to conceal as well as protect the operating mechanism. Means are also provided, in the form of plates 65, secured to the plates 63 and extending angularly thereto, for deflecting oil which drops from the operating mechanism of the press into the upper die slide 50.

Extending through slots 66 in the slide 50, and transversely of the press, as shown in Fig. 4, are knockout bars 67, which are operatively connected to knock-out pins 68 extending downwardly through the slide and the upper die (not shown). On the down stroke of the slide the bars are in the position shown in the dotted line position in Fig. 4. In the event that the work sticks to the upper die, it will be stripped from

such die at the conclusion of the up stroke of the slide, due to the engagement of the bars 67, when in the position shown in dotted lines, by screws 69, which are mounted on the rear surfaces of the plates 63 and 64 and project beyond the lower edges of the latter. The screws 69 are vertically adjustable, and are adapted to be locked in adjusted position by means of lock-nuts 70.

Means are also provided for counterbalancing the upper die slide, so as to reduce, as far as is practicable, the energy required of the cranks in elevating the slide at the conclusion of the pressure or work stroke. Such means is best illustrated in Figs. 1 and 3, and comprises a pair of cylinders 71 and 72, provided with flanges 73 whereby the cylinders are rigidly secured to the web 49 of the slide 50, and covers 74, through which conduits 75 extend, such conduits being rigidly secured to the crown in the manner shown in Fig. 3. Each of the conduits 75 has secured to its lower end a piston 76 which forms an airtight seal with the cylinder wall, and is also provided with perforations 77 which communicate the conduits with the interior of the cylinder. The conduits 75 are connected at their upper ends with a compressed air reservoir (not shown), which may be mounted within the crown.

On the down stroke of the slide 50, the air within the cylinders is forced by piston 76 through conduit 75 to the reservoir or expansion tank. When the down stroke is completed and the slide is free to rise, the air flows back into the cylinder and acts against the cylinder 71 to raise the slide to its up position, thus taking the burden of lifting of the slide from the cranks.

Mounted on the crown is a removable cover 78, such cover serving only to enclose and protect portions of the slide actuating mechanism, but being effective also to shed oil back into the crown, leakage of oil at the joint between the crown and cover being prevented by means of a flange 79 extending around the crown adjacent the cover.

Mounted in the upper flat portion of the cover 78 is an opening which is partially filled by a filter mat 78a (Fig. 1). This mat permits passage of air therethrough, but acts to remove impurities and the like to keep the parts inside of the crown free from extraneous dirt.

In the operation of the press, oil from within the slide 50 is pumped through an oil filter to the various bearings and other points at which lubrication is required. More oil is pumped than required, part going to lubricate the parts and the excess oil returning to the slide through an overflow pipe. The upper portions of the crown are so designed as to facilitate such return flow, the plates 65, together with oil deflector 65A, being also highly effective for this purpose.

The operation of the press will be clearly understood from the foregoing description, so that further amplification thereof is believed unnecessary. Several advantages of the press may, however, be stressed, among which are:

(1) The novel mounting for the crankshafts to produce a balanced stroke and a better distribution of the working stresses.

(2) The elimination of torsion in the crankshafts.

(3) The ability to remove the crankshafts from the under side of the crown. This may be effected by lowering the slide 50, disconnecting the pistons from the slide, and removing the

bearing caps 41. This saves a considerable amount of time and labor over other known constructions.

(4) The provision of the box-type crown with well-proportioned and designed stress-carrying members, elimination of excess weight and functioning to enclose a large part of operating mechanism.

(5) The offset or staggered arrangement of the large driving gears, as shown in Fig. 6, thereby permitting the construction of a relatively narrow press.

(6) The provision of the removable cover plates on the crown for guarding the mechanism and slide during the movement of the latter, and the provision of means for deflecting the oil to the slide.

(7) The provision of work knockout means on the cover plates.

Other modes of applying the principle of our invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

We therefore particularly point out and distinctly claim as our invention:

1. In a press of the class described, a frame comprising a bed with spaced uprights thereon and a crown carried by said uprights, a pair of crankshafts carried by said crown and extending from front to back of said press, a pair of back shafts mounted above respective crankshafts in the same vertical plane therewith, a drive shaft interposed between said back shafts, a main gear carried by and keyed to each crankshaft, said main gears lying in different vertical planes, pinions carried by respective back shafts and engaging said main gears respectively, a pair of large gears carried by each of said back shafts and lying in the same common plane, a pinion carried by said drive shaft and engaging one of said large gears and an intermediate gear interposed between and in mesh with said other large gear and said drive pinion.

2. In a press of the character described having a base, spaced uprights mounted on said base, a crown of one-piece construction mounted on said uprights, in combination spaced hollow stress carrying members on said crown extending from side to side thereof, bearings in the lower part of said hollow members for receiving a pair of crankshafts having their axes extending from the front to the rear of said crown, a crankshaft operating gear carried by each of said crankshafts, one of said gears lying in a plane offset from that of the other gear, each of said gears being disposed within said crown, and bearing caps removable from the underside of said crown to support said crankshafts.

3. In a press of the character described having a base, spaced uprights mounted on said base, a crown of one-piece, hollow stress carrying members on said crown and extending from side to side thereof, bearings in the lower part of said hollow members for receiving a pair of crankshafts having their axes extending from the front to the rear of said crown, a crankshaft operating gear carried by each of said crankshafts, one of said gears lying in a plane offset from that of the other gear, each of said gears being disposed within said crown, a cover removably mounted on said crown completely enclosing the operating gear exposed above said crown.

4. A press of the character described, a base,

spaced uprights mounted on said base, a crown carried by said uprights, a slide movable relatively to said crown, said slide having upwardly extending walls to form a receptacle, actuating means for said slide mounted in said crown, means for lubricating said actuating means, plates removably secured to said crown and extending down to cover said extending walls and deflecting plates projecting from said cover plates at an angle to the latter for directing oil from the actuating means into said receptacle.

5. In a machine tool of the class described, a frame comprising a bed with spaced uprights thereon and a substantially rectangular crown carried by said uprights, said crown comprising a one-piece casting with a hollow reinforcing structure extending along the front and rear thereof, bearings formed in said reinforcing structure on the under side of said crown and extending front to back of said press to support an operating shaft of said tool and directly receive the operating stresses from said shaft, depending side portions shaped to rest on said uprights, said side portions merging with said hollow structure to form a C-shaped frame when viewed in front elevation, and an upwardly opening trough-shaped projection extending along the outside of the casting to hold lubricant for a working part extending into the region of said trough.

6. A press of the character described, a base, spaced uprights mounted on said base, a crown carried by said uprights, a slide movable relatively to said crown, said slide having upwardly extending walls to form a receptacle, actuating means for said slide mounted in said crown, means for lubricating said actuating means, plates carried as a part of said press and extending down to cover said extending walls and a deflecting plate carried by a stationary part of said press and extending downwardly to terminate within the confines of said extending walls for directing oil from the actuating means into said receptacle.

7. A press of the character described, a base, spaced uprights mounted on said base, a crown carried by said uprights, a slide movable relatively to said crown, said slide having upwardly extending walls to form a receptacle, actuating means for said slide mounted in said crown, means for lubricating said actuating means, plates removably secured to said crown and extending down to cover said extending walls and a deflecting plate carried by a stationary part of said press and extending downwardly to terminate within the confines of said extending walls for directing oil from the actuating means into said receptacle.

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