

May 12, 1942.

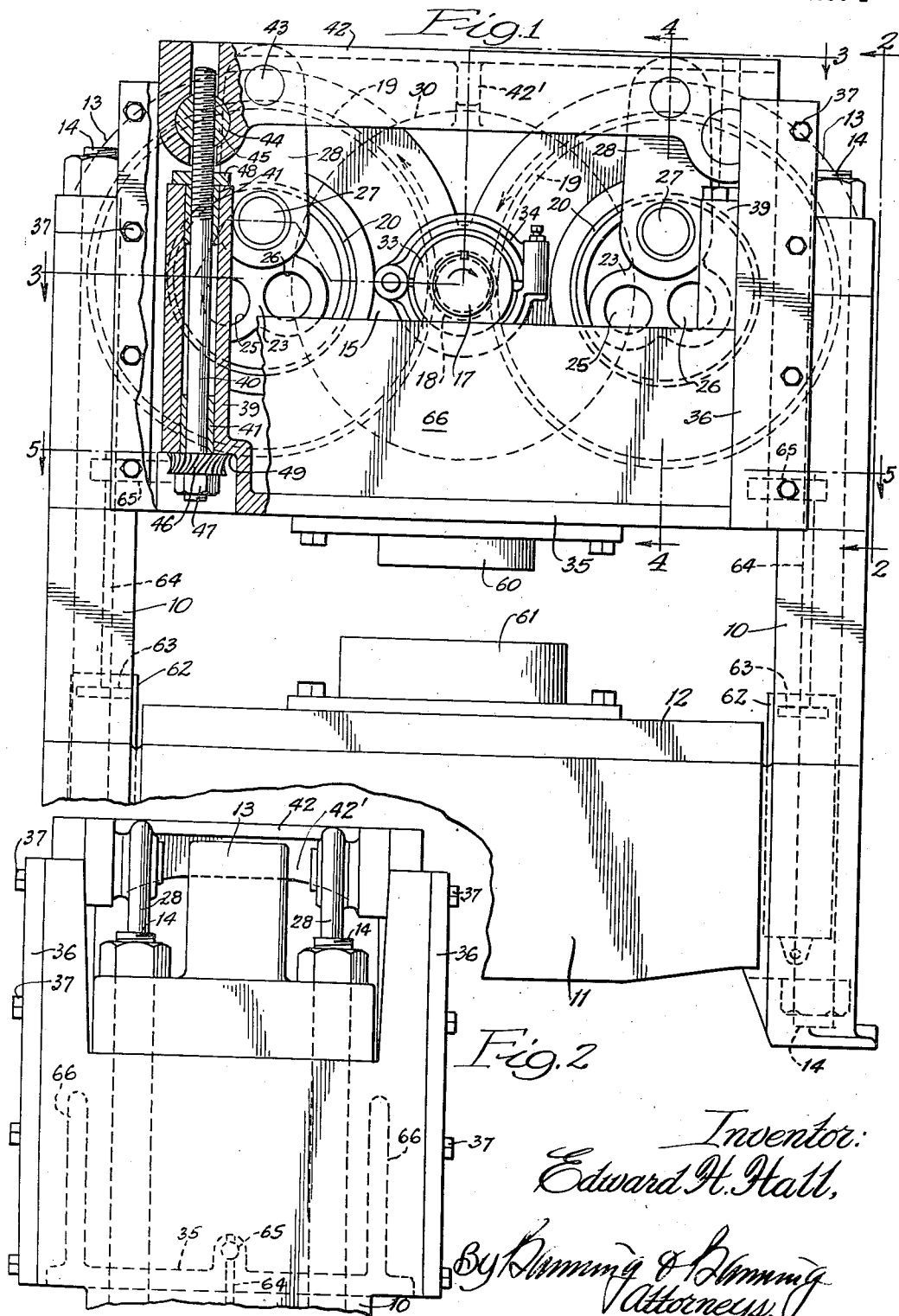
E. H. HALL

2,282,575

PRESS

Filed July 5, 1940

3 Sheets-Sheet 1



May 12, 1942.

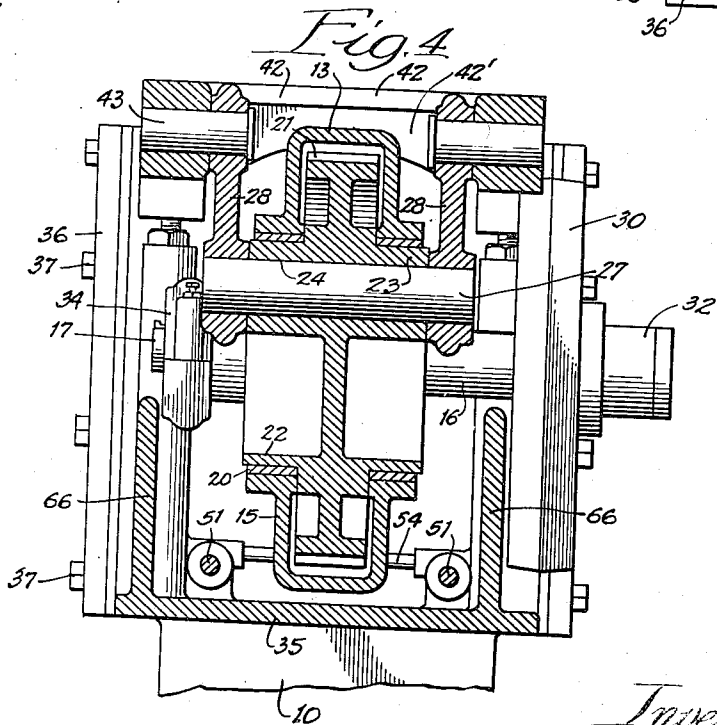
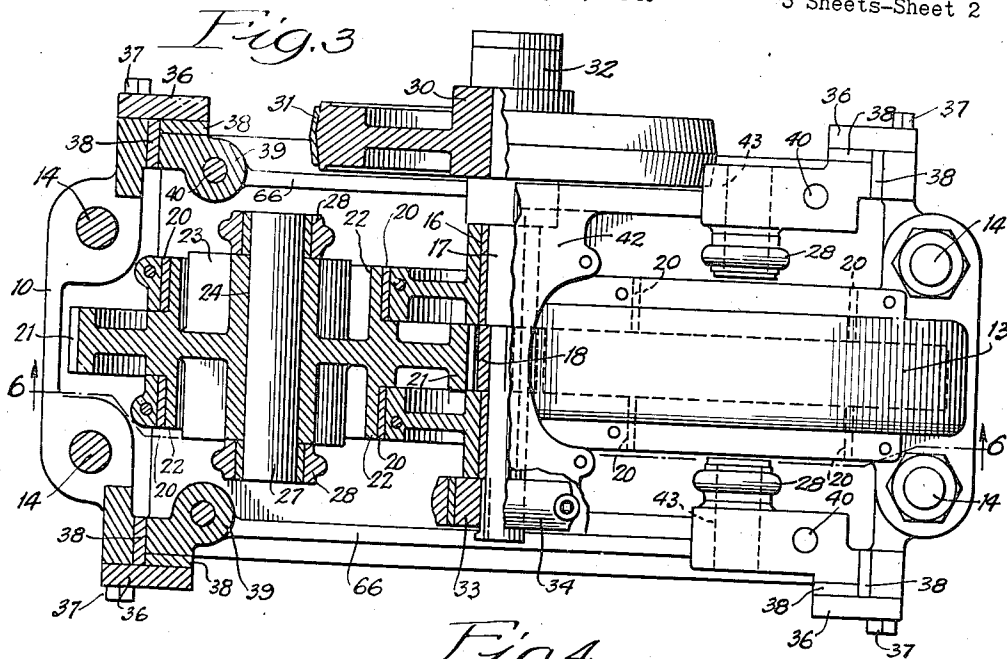
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PRESS

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3 Sheets-Sheet 2



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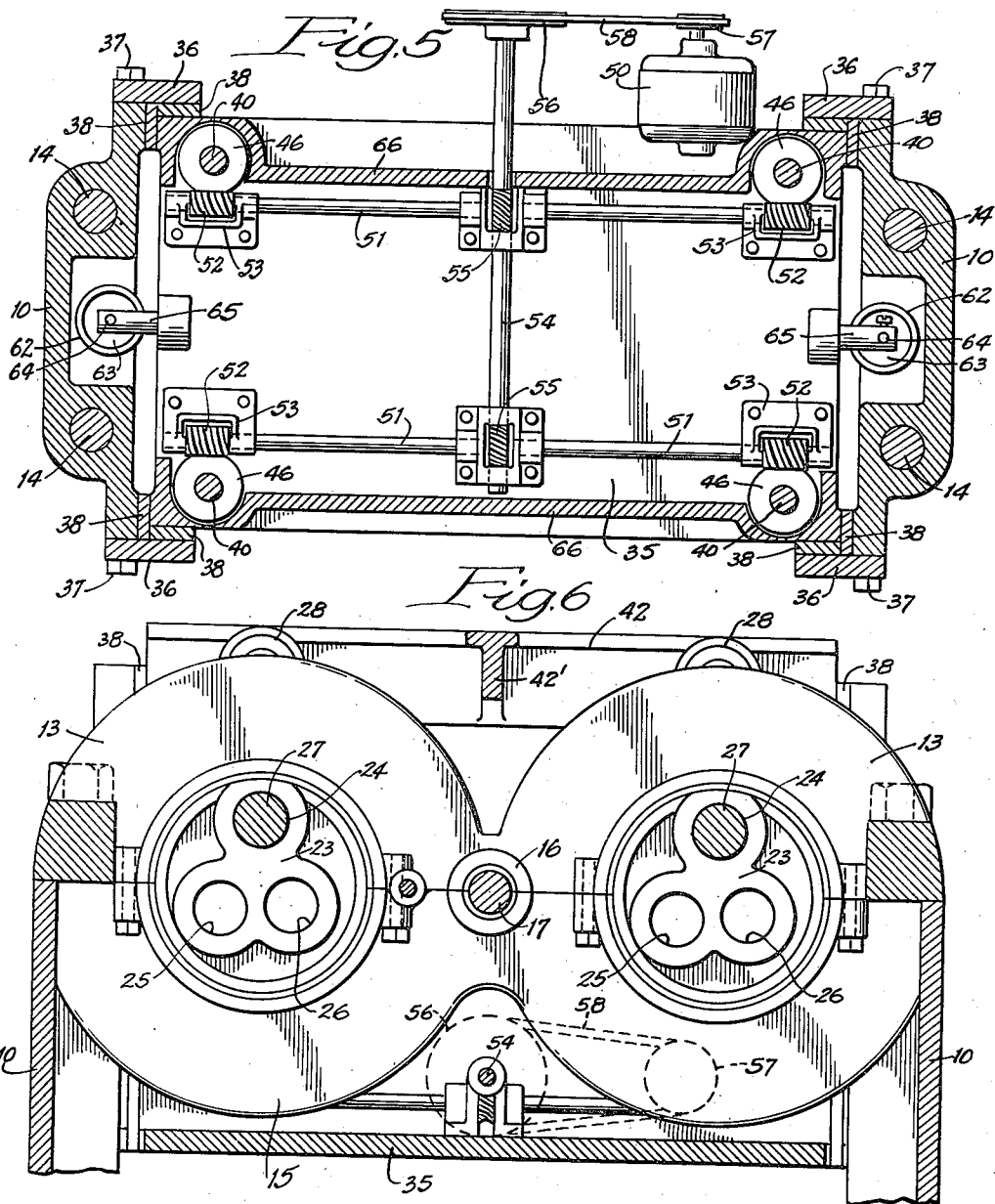
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PRESS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,282,575

PRESS

Edward H. Hall, Chicago, Ill.

Application July 5, 1940, Serial No. 343,961

7 Claims. (Cl. 113—38)

This invention relates in general to a heavy duty punch and die or stamping press of a small, compact, dwarf type which requires low head room and overhead, has an adjustable throw, a variable head or clearance, and is balanced to prevent vibration and undue wear.

An important object of the invention is in the provision of an improved arrangement of driving and operating mechanism to eliminate large projecting gears and pulleys which take up much head room and overhead space, and the location of these parts in a compact arrangement within the frame of the press where adequate corner slides are provided for the movable parts.

A further object of the invention is in the provision of means for adjusting the stroke and varying the head or clearance between the bed and top piece within the frame for different types of work.

A further object of the invention is in the provision of a sturdy, heavy braced frame and movable parts with suitable and adequate bearings for a heavy duty type of work even though the parts are small, compact and easily accessible for repair and replacement as well as to facilitate access thereto for the normal and rapid operation of the press.

Other and further objects of the invention will appear in the specification and will be apparent from the accompanying drawings in which

Fig. 1 is a front elevation with parts broken away and in section showing a press in accordance with this invention;

Fig. 2 is a partial side view taken on the line 2—2 of Fig. 1;

Fig. 3 is a top view partly in section taken on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1; and

Fig. 6 is a section taken on the line 6—6 of Fig. 3.

In the ordinary punch or stamping press, the upper structure including the operating and driving mechanism is usually so large, heavy and cumbersome, that for heavy duty service, the press must be mounted in a pit, or a high ceiling or head room must be provided in order to properly install and operate the press. The present invention overcomes these objections by providing an improved arrangement of driving and operating means in a head which is adjustable both for clearance between the die parts and for length of stroke, at the same time locating the

bed and the die parts at a proper level for easy access thereto, so that a heavy duty press of this type may be installed in a minimum space, without high head room, as between floors in a building, the frame being particularly braced and reinforced to provide the maximum strength for a heavy duty press occupying a similar floor space.

Referring now more particularly to the drawings, the frame comprises opposite ends 10, connected at the bottom by a bed 11 supporting a bolster 12, and connected at the top by a crown 13 having heavy end bolts 14 extending through it and through the ends 10 to the bottom thereof.

Supported in the frame at the lower side of the crown 13 is a complementary bearing member 15 which together with the crown provide spaced bearings 16 for a transverse driving shaft 17 having a pinion 18 intermediate the bearings, meshing on opposite sides with gears 19, and each mounted in bearings 20.

Each gear 19 preferably has a central toothed portion 21 meshing with the pinion 18 and circular shoulders 22 at each side thereof, mounted in the bearings 20 which are large in comparison with the size of the gear to provide adequate bearing surface for heavy duty service. Within the shouldered portion of each gear is a web portion 23 having three bearing bores 24, 25 and 26 at different distances from the center of the gear, all adapted to fit a drive pin 27 of sufficient length to extend through the gear at both ends thereof and to provide attachment for crank arms 28 connected thereto at each end. By choosing the bore in which the drive pin 27 is inserted, the stroke of the crank arm is correspondingly varied for each rotation of the gear.

At one end of the drive shaft 17 is a weighted fly wheel 30 which may be rotated by a belt 31 engaging the outer periphery or by other driving means. In its ordinary operation, the fly wheel is connected manually or automatically to the shaft 17 by a suitable clutch mechanism 32 (which forms no part of the present invention) for each actuation of the press. At the other end of the shaft 17, a friction drum 33 is attached to provide for the engagement of a frictional brake 34 for quickly retarding the movement of the driving shaft when the clutch 32 disconnects it from the driving fly wheel.

An upper die plate 35 is disposed below the fixed gears and shaft connected in the frame and it is mounted to slide at the corners in angular guideways provided by the inner faces of the ends 10 and by upright corner plates 36 secured to the edges of the sides by fastening bolts 37,

and extending inwardly from the ends. Each of the inner faces at the corners is preferably lined with an adjustable bearing strip 38 which may be easily replaced, removed or shimmed for maintaining a proper bearing engagement with the corner of the plate.

Extending upwardly from the plate 35 adjacent each corner is a hollow tube 39 secured to or formed integral therewith. Extending through each tube is a bar 40 with threaded portions near the ends and bearings 41 for the bars at the top and bottom of the tubes 39.

Above the driving shaft is a power slide 42 mounted to fit closely and to move in the corner guides, connected adjacent each corner to the upper end of one of the crank arms 28 by a stub shaft or pin 43 so that the movement of the two gears 19 will cause a corresponding level movement of the power slide by its connection with the crank arms 28. This movement is communicated to the lower die plate 35 by engagement of the upper ends of the connecting bars 40 with the power slide which consists in providing a bore 44 for the upper end of each bar adjacent the corner thereof having a transverse intersecting circular opening 44 in which a circular member 45 is seated having threads through which the upper threaded end of each of the bars is inserted.

To adjust the position of the lower plate with respect to the power slide, each of the threaded adjustment bars 40 is provided at its lower end with a worm gear 46 attached to the bar and a threaded nut 47 for holding it in place, the bar itself being held in place in the tube 39 by a collar 48 at the top of the tube, and the worm gear and the nut being seated in a recess 49 opening at the underside of the plate 35.

All of the worm gears are connected for joint operation by a connected mechanism operated by a motor 50. A suitable mechanism is shown in Fig. 5 which comprises a pair of longitudinal shafts 51 each having worm pinions 52 at the ends, meshing with the worm gears 46, and held in place by brackets 53 secured to the carrier 35. The shafts 51 are connected for joint operation by a cross shaft 54 having a worm and pinion connection 55 therewith. At one end of the shaft 54 is a driving pulley 56 connected to a driving pulley 57 on the motor by means of a belt 58. The motor is operated in opposite directions to raise and lower the die plate 35 with respect to the power slide, thus varying the space or clearance between the die plate and the bed.

The power slide 42 has an arm extending to each corner from a central cross piece 42' so that it is substantially H-shaped in outline and the stroke thereof is varied by connecting the drive pins in the different gear bore openings. This H-shape of the power member enables it to clear the connecting crown 13 between the end plates, the cross member 42' being centrally located to fit into the space over the bearing of shaft 17 between the rounded casings of the crown which fit over the gears 19.

For any throw of the power slide, the position of the upper die plate may be varied by adjusting the supporting bars 40 in order to bring an upper die member 60 carried by the plate 35 into proper relation with the lower die member 61 carried on the bed or bolster of the press.

In operating the press, the downward movement of the power slide and the upper die member tends to produce a different strain upon the bearings and supports than the upper movement

and to assist in equalizing or compensating for this variation, a dash pot device, such as a cylinder 62 closed at the bottom and open at the top is mounted at each end of the frame and has a piston 63 movable therein by means of a piston rod 64 attached at its upper end to a projection 65 extending from the end of the upper die plate 35. The piston is intended to act as a counterbalance opposing the downward movement and permitting the upward movement of the slide and to accomplish this, the piston may fit tightly in the cylinder and operate as a pneumatic device, or it may fit more loosely with liquid in the cylinder and operate as a hydraulic device.

The die plate 35 is subjected to considerable pressure and is therefore reinforced by ribs 66 extending upwardly at the sides to a point just below the shaft 17 and connected at the ends to the tubes 39 for partially supporting them and also constituting a partial cover for enclosing the operating and driving mechanism at the front and rear of the press, thus presenting a neat appearance.

In operation, the die members 60 and 61 are placed in position, the throw and the clearance are adjusted, depending upon the nature of the work to be done, and the press is ready for operation. The rotation of the driving shaft causes movement of both of the gears 19 in the opposite direction and the power slide is reciprocated in the vertical guideways, depending upon the length of stroke imparted to the crank arms 28. By having the power shaft and the power gears all mounted in horizontal alignment, the press is made small and compact for maximum power, and by applying the power at the four opposite corners, a heavy duty service can be performed with a comparatively light and compact press. The frame being low, all of the parts are freely accessible for repair and adjustment, and for the normal operation of the machine.

While this construction is particularly adapted for so-called dwarf presses of heavy duty type, it may also be employed in larger presses for a great variety of services. By connecting the so-called power member or slide 42 which is above the driving means and the die carrier 35 which is below the said means, a two part slide is provided which not only substantially encloses the driving means, but makes possible the compact arrangement, low head room, and direct power application of this press.

I claim:

1. In a power press of the type having a vertical frame with power applying means rotatable at the top therein, a power receiving member above the said means, and a die carrier below the means connected adjacent the corners with said member; the power applying means comprising a driving pinion and horizontally opposite gears, each gear having peripheral side bearings and an unobstructed central portion provided with a plurality of holes located at different distances from the axis thereof, a crank pin for the selective insertion in one of said holes of each gear and being of such length as to extend beyond both sides thereof, and connecting arms each pivoted at one end to one extending end of the crank pin, and at the other end to the power receiving member, and means for adjusting the relative spacing of the power member and die carrier.

2. In a power press of the type having a vertical frame with means forming inner angular guides at the upper corners thereof, rotatable power

means mounted in the portion of the frame included by said guides, a power member slidable in the guides above the power means, a die carrier slidable in the guides below said power means, the power means including a central driving pinion and opposite horizontal gears meshing therewith and spaced from the sides and corners of the frame; the power member having a cross-piece connecting two opposite sides extending to the corners, and the crosspiece being located at the transverse center of the frame to extend into the central space between the gears and over the pinion; means adjustably connecting the power member and die carrier for movement together in the guides; and means connecting the gears and the power member limiting the stroke of the latter by the movement of the cross-piece into said space between the gears.

3. In a dwarf power press of the type having an open frame with opposite sides and bearing plates attached to the inner edges of the sides near the top forming inner angular corner guideways, power means comprising a central driving pinion and meshing gears at each side of the pinion spaced from the edges of the frame, a power member above and a connected die carrier below the gears movable in said corner guideways, crank arms extending from both sides of each gear to the inner sides of the power member, and adjusting bolts near the corners connecting the power member and the die carrier for movement together in the guides, the bolts being free from the sides of the gears and the power member having spaces to receive the upper portions of the gears therein to move it close to the power means in operating the press.

4. In a dwarf press, end frames having attached side plates forming inner angular guides at the corners near the top of the frame, a crown bearing member connecting the tops of the end frames with a low portion in the center between the end frames, driving means comprising a pinion and shaft across said center and gears in the bearing member at opposite sides of said center meshing with the pinion, a power member above the driving means having side portions extending into said corner guides connected by a central crosspiece, the upper portion of the gears extending between the side portions and the crosspiece extending into the said low portion when the power member is lowered, a die carrier below the driving means having corner bearing portions engaging the said angular corner guides, means connecting the power member and die carrier for moving them together in the guides, and means connecting the gears and the power member for moving it close to the driving means in operating the press.

5. In a dwarf power press of the type having an upright frame with spaced end plates connected across the top and bearing plates secured

at the edges of end plates to provide inside angular guides at the corners adjacent the top of the frame; rotatable power means within the frame portion enclosed by the guides and including driving gears extending upwardly at each side of the center, an H-shaped power member above the power means and a connected die carrier below the power means together slidable in the guides, crank means connecting the gears to the inner sides of the H-member, the upper portions of the gears extending into the inner spaces of the H-member in the lowered position thereof, thereby maintaining the power means and the connected power member and die carrier in vertical close spaced relation during operation thereof.

6. In a power press of the type comprising a frame having end plates connected between their opposite edges by a crown member, a driving shaft and pinion and gears meshing therewith on opposite sides of the pinion mounted for joint operation in the crown member, the crown member having projections following the contour of the gears and having a depressed portion intermediate them; a power member and bearings in which it is slidable at the corners of the frame and having central end recesses, and a cross piece extending transversely at the center to clear the projections of the crown member when it is lowered, and means comprising crank arms directly connected at opposite sides and eccentrically of the gears with the adjacent extremities of the power member at the opposite sides of the end recesses near the corners for reciprocating the power member.

7. In a power press of the type comprising a frame having guideways at the corners, driving means mounted between the guideways at ends of the frame and spaced from the corners, a power member slidable in the guideways having end opening recesses and overlying the driving means, a die carrier also slidable in the same guideways below the driving means, connecting means between the power member and the die carrier adjacent the corners of the frame extending clear of the driving means, crank arms from the driving means to the power member connected at the inner sides of the recesses adjacent the corners thereof for reciprocating it and the carrier in the guideways, the said connecting means including a tubular projection at each corner of the carrier, connecting bolts extending therethrough, and a strengthening rib extending between the tubular means at opposite ends at each side of the carrier free from the engagement with the driving means therebetween, the power member and die carrier substantially enclosing the driving means which reciprocate them.

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