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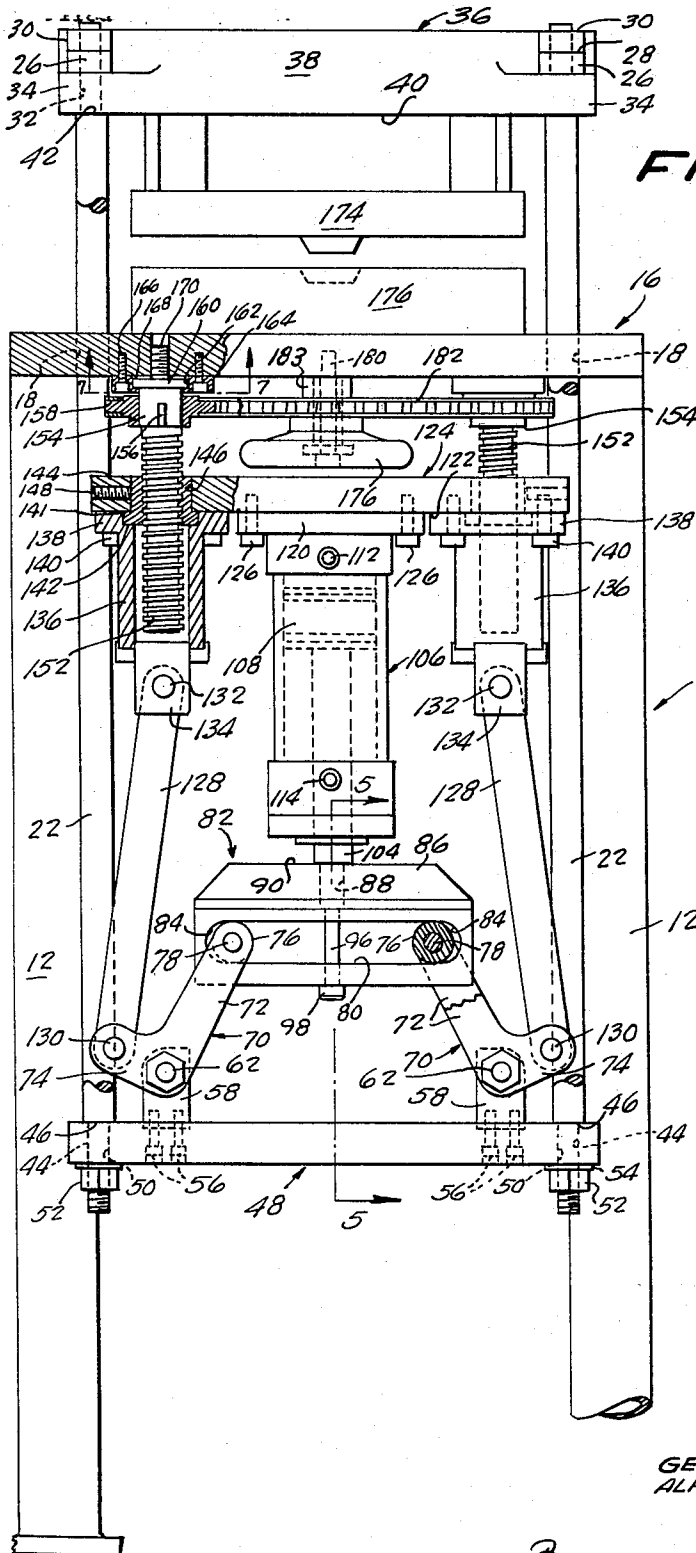


FIG. 1.

FIG. 7.

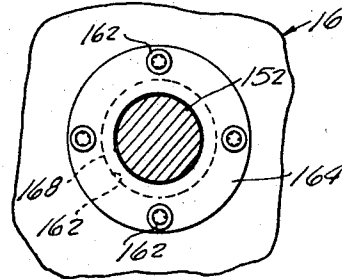
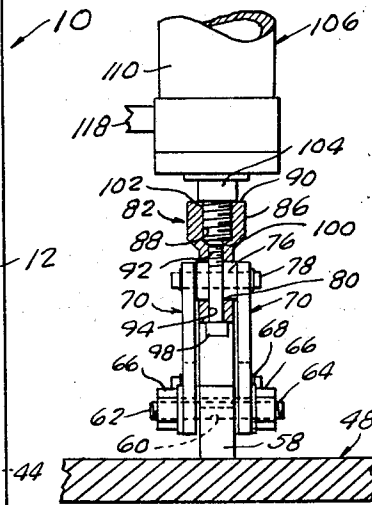


FIG. 5



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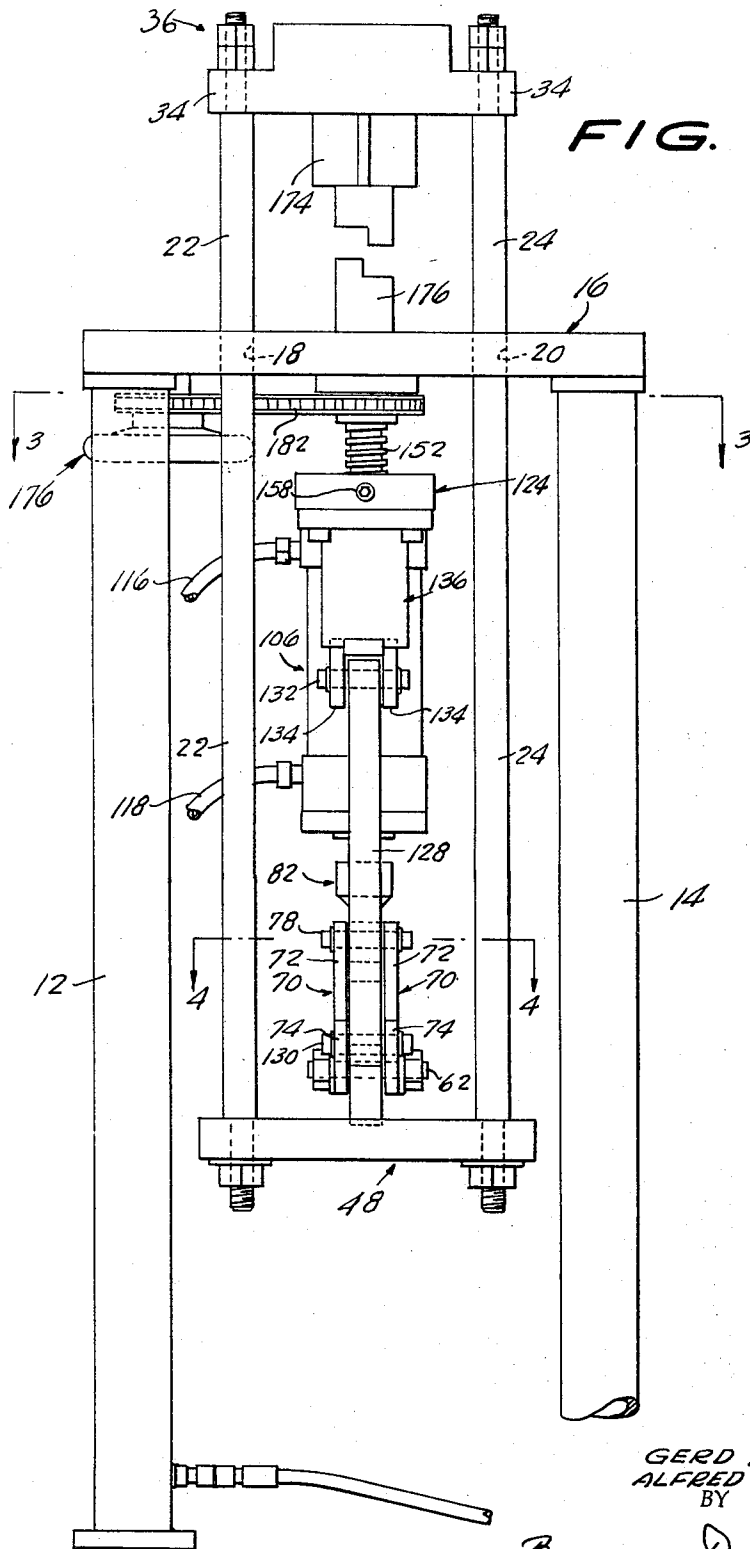
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3 Sheets-Sheet 3

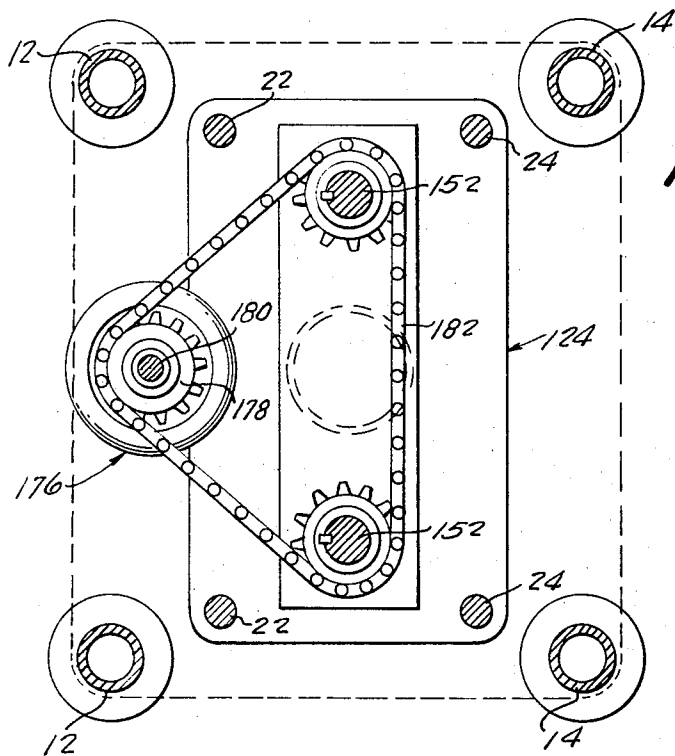


FIG. 3.

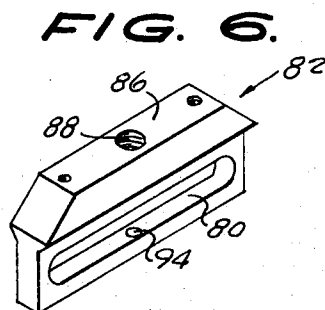


FIG. 6.

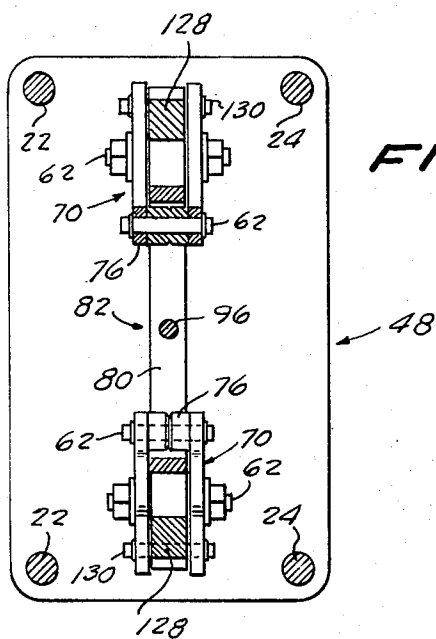


FIG. 4.

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ABSTRACT OF THE DISCLOSURE

A press comprising a support, a bed fixed on the support, a ram movably mounted on the support facing the bed and adapted to move toward and away from the bed, rod means slidably engaged on the support and fixed to the ram, an upper pressure plate positioned at the side of the bed remote from the ram, means for adjusting the upper pressure plate toward and away from the bed, a lower pressure plate positioned at the side of the upper pressure plate remote from the bed and spaced from the upper pressure plate, means articulating the lower pressure plate to the upper pressure plate, and a hydraulic cylinder fixed to the upper pressure plate having a piston rod operatively connected to said articulating means.

This invention relates to a hydraulic press, adapted especially but not exclusively, for forming and cutting metal and other materials.

The primary object of the invention is the provision of a device of the kind indicated, which is characterized by simple construction, involving a small number of uncomplicated parts, efficiency of operation, and production of high working power, wherein maximum pressure is obtained toward the end of its working stroke.

Another object of the invention is the provision of a device of the character indicated above, having a rigidly supported stationary bed or lower platen, and a movable ram or upper platen which is constructed and arranged to provide maximum free access thereto and to the bed, the upper platen or ram having a removable die-carrying member, the removability of which permits of circumposing hollow workpieces thereon for the forming or cutting thereof.

In the drawings:

FIGURE 1 is a front elevation of a device of the invention, showing the ram or upper platen elevated relative to the bed or lower platen, parts being broken away and in section;

FIGURE 2 is a right hand end elevation of FIGURE 1;

FIGURE 3 is a horizontal section taken on the line 3-3 of FIGURE 2;

FIGURE 4 is a horizontal section taken on the line 4-4 of FIGURE 2;

FIGURE 5 is a fragmentary vertical section taken on the line 5-5 of FIGURE 1;

FIGURE 6 is a perspective view of the cam block; and,

FIGURE 7 is an enlarged horizontal section taken on the line 7-7 of FIGURE 1.

Referring in detail to the drawings, the illustrated device comprises a stand 10 composed of four perpendicular corner legs, consisting of front legs 12 and rear legs 14, which are suitably fixed, at their upper ends, to the underside of a horizontal rectangular preferably solid bed or lower platen 16.

The bed 16 is formed with a pair of longitudinally aligned perpendicular bearing front bores 18, 18 which are transversely aligned with a pair of similar rear bores 20, 20 through which front and rear rods 22, 22 and 24, 24, respectively, are slidably engaged. These rods are long enough to extend above the bed 16, and to extend below the bed. These rods have reduced threaded ter-

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minals 26, on their upper ends, on which are engaged lower tightening nuts 28 and upper lock nuts 30, respectively.

The threaded terminals 26 extend upwardly through corner bores 32, formed in downwardly off-set corner flanges 34, of a rectangular ram or upper platen 36, which is smaller in area than the bed 16, and is centered relative thereto. The ram 36 has a main body portion 38 of longitudinally elongated rectangular form, whose undersurface 40 can be coplanar with the undersurface of the flanges 34. The nuts 28 and 30 are threaded down on the rod terminals 26, against the upper sides of the flanges 34, so that the flanges bear upon the shoulders 42, on the rods defined by the reduced terminals 26.

The rods 22, 22, and 24, 24 have reduced threaded terminals 44, on their lower ends, which define shoulders 46, at their upper ends. A transversely elongated rectangular lower vertically removable pressure plate 48, smaller in area than the bed 16, is formed with vertical corner bores 50, through which the lower rod terminals 44 extend, nuts 52 and washers 54 being threaded on these terminals, against the underside of the plate 48, which bears upwardly against the shoulders 46.

Upon the longitudinal centerline of the lower pressure plate 48, adjacent to the ends thereof, are fixed, as by means of studs 56, threaded upwardly through the plate 48, are upstanding pivot blocks 58, formed with transverse bores 60, through which pivot pins 62 extend.

The pivot pins 62 have threaded ends 64, on which nuts 66 are engaged, which, together with washers 68, retain bellcranks 70 on the pivot pins 62, on opposite sides of the pivot blocks 58. The bellcranks 70 are composed of relatively long vertical arms 72 and relatively short, longitudinally outwardly extending, generally horizontal arms 74, these arms being related to each other at right angles.

As shown in FIGURE 5, the longer arms 72, of the bellcranks 70, carry cylindrical cam rollers 76, between their upper ends, on axles 78, extending between and secured to these arms. The cam rollers 76 are rollably confined in a horizontal, longitudinally elongated slot 80, formed in a cam block 82, in such manner that the rollers have no vertical movement, relative to the cam block 82, but are free to roll toward and away from each other, relative to concave arcuate ends 84 of the slot 80.

The cam block 82 is of longitudinally elongated form, and has an enlarged rectangular cross section upper portion 86, which is formed with a centered perpendicular threaded counterbore 88, which opens to the flat horizontal upper surface 90 of the cam block. The upper portion 86 is further formed with a reduced diameter threaded upper bore 92, which is aligned with and opens into the bottom of the counterbore 88, and is aligned with a smooth lower bore 94, formed through the lower part of the cam block 82. A locking bolt 96, having a head 98, on its lower end, which bears against the undersurface of the cam block, extends upwardly through the lower bore 94, and is threaded up through the upper bore 92, and serves to bear lockingly against the lower end 100 of a stud 102. The stud 102 is fixed axially on the lower end of the piston rod 104 of a two-way hydraulic cylinder 106.

The piston rod 104 has a fixed piston 108, on its upper end, which works in the cylindrical housing 110, of the cylinder 106, between upper and lower ports 112 and 114, to which external upper and lower hydraulic lines 116 and 118, respectively, are connected. These hydraulic lines lead from a suitable source of hydraulic pressure (not shown) having appropriate valving means.

The hydraulic cylinder housing 110 has a lateral flange 120, around its upper end, which, with the upper end of the housing, abuts centrally the undersurface 122, of an

upper rectangular, relatively stationary pressure plate 124, and is secured in place, as by means of screws 126.

The bellcranks 70 are operatively connected to the upper removable pressure plate 124, by means of vertically elongated links 128, which, at their lower ends, are pivoted, as indicated at 130, to and between the outer ends of the shorter arms 74 of the bellcranks 70. At their upper ends, the links 128 are pivoted, as indicated at 132, to and between ears 134, fixed to and extending downwardly from the closed lower ends of vertical cup-shaped housings 136.

The cup-shaped housings 136 have flanges 138, around their open upper ends, through which screws 140 extend and are threaded into the upper removable pressure plate 124, at centered locations near the ends of the plate 124, with the flange 138 bearing against the underside of the plate 134.

As shown in FIGURE 1, the housings 136 are formed, to their upper ends, with internal grooves 141, in which seat lateral flanges 142, on the lower ends of tubular, internally threaded bushings 144. The tops of the bushing flanges 142 bear against the underside of the upper pressure plate 124, and the bushings 144 extend upwardly through conforming bores 146, formed through the plate 124. Horizontal lateral set screws 148, are threaded, as indicated at 150, through the ends of the plate 124, against the bushings 144 so as to preclude rotation of the bushings.

Vertical adjustment screws 152, threaded downwardly through the bushings 144 and extending downwardly into the housings 136, have cylindrical heads 154, on their upper ends, on which are circumposed, and keyed, as indicated at 156, sprocket wheels 158. The heads 154 have lateral flanges 160, at their upper ends.

The head flanges 160 are confined in annular internal grooves 162 of retainer rings 164, which bear against the undersurface of the bed 16, and are secured in place, as by means of screws 166, threaded upwardly into the bed 16. The upper ends 168 of the screw heads 154 are spaced downwardly, relative to the undersurface of the bed 16, and are held down in this relationship, by means of vertical screws 170, threaded downwardly through the bed 16, and bearing upon the upper ends 168 of the screw heads 154.

The adjusting screws 152 are adapted to be rotated, together, for producing changes in the position of the upper pressure plate 124, relative to the bed 16, and hence the starting and finishing gaps between the upper and lower dies 174 and 176, fixed to the facing sides of the ram 36 and the bed 16, respectively.

An adjusting hand wheel 176 carried a fixed sprocket wheel 178, horizontally aligned with the screw sprocket wheels 158, and is journaled on a headed screw 180, threaded into the underside of the bed 16, at a centered forward location thereon, and a sprocket chain 182 is trained around the sprocket wheels 178 and 158. The sprocket wheel 178 has an upstanding boss 183 thereon, which bears against the underside of the bed 16, and the screw 180 is adapted to be threaded upwardly, in the bed, to produce a locking frictional engagement between the boss 182 and the underside of the bed, for locking the hand wheel 176, in an adjusted position.

In use and operation, a workpiece to be formed, cut, or stamped, is introduced between the dies of the ram 36 and the bed 16, with the ram 36 in its retracted elevated position.

The gap between the dies of the ram and the bed having been predetermined by rotation of the hand wheel 176, the hydraulic control leading to the fluid lines 116, 118 is operated so as to cause the piston 108, of the hydraulic cylinder 106, to move downwardly, from the upper end of the cylinder toward the lower end of the cylinder. This movement of the piston 108 causes the cam block 82 to move downwardly, so that, as indicated by arrows in FIGURE 1, the longer vertical arms 72 of the

bellcranks 70 are moved inwardly and downwardly, and the shorter arms 74 thereof to tend to move upwardly. Upward swinging of the shorter bellcrank arms 74 being limited by the links 128 and their connections with the bed 16, through the upper pressure plate 124, the screws 152, the lower pressure plate 48 is pushed downwardly, along with the rods 22, 24, whereby the ram 36 is forced downwardly toward the bed 16, and the ram and the bed dies form, cut, or shape the workpiece therebetween.

Because of the above described arrangement of the cam block slot 80, the bellcrank rollers 76 engaged therein, and the greater length of the long arms 72, of the bellcranks 70, relative to the shorter arms 74 thereof, the greatest working force of the ram 36 is minimal, at the outset of its downward movement, and greatest as the ram reaches its final depressed working position.

It is to be noted that the ram 36 is adapted to be removed from the upper ends of the rods 22, 24, to permit of placing a tubular workpiece thereon, after which the ram is restored on the rods and the device operated to work on the workpiece. It is also to be noted that the only limitations to complete access to the bed 16 and ram 36, and the space therebetween, are the upper portions of the rods 22, 24.

What is claimed is:

1. A device of the character described, comprising a support, a bed fixed on the support, a ram movably mounted on the support and facing the bed and adapted to move toward and away from the bed, and operating means mounted on the said support and operatively connected to the ram, wherein said operating means comprises rod means slidably engaged on the support and fixed to the ram, an upper pressure plate positioned at the side of the bed remote from the ram, means mounting the upper pressure plate on the bed, said mounting means comprising means for adjusting the upper pressure plate toward and away from the bed, a lower pressure plate positioned at the side of the upper pressure plate remote from the bed, said lower pressure plate being spaced from the upper pressure plate, means articulating the lower pressure plate to the upper pressure plate, and a hydraulic cylinder fixed to the upper pressure plate, said hydraulic cylinder having a piston rod operatively connected to said articulating means.

2. A device of the character described, comprising a support, a bed fixed on the support, a ram movably mounted on the support and facing the bed and adapted to move toward and away from the bed, and operating means mounted on the said support and operatively connected to the ram, wherein said operating means comprises rod means slidably engaged on the support and fixed to the ram, an upper pressure plate positioned at the side of the bed remote from the ram, means mounting the upper pressure plate on the bed, said mounting means comprising means for adjusting the upper pressure plate toward and away from the bed, a lower pressure plate positioned at the side of the upper pressure plate remote from the bed, said lower pressure plate being spaced from the upper pressure plate, means articulating the lower pressure plate to the upper pressure plate, and a hydraulic cylinder fixed to the upper pressure plate, said hydraulic cylinder having a piston rod operatively connected to said articulating means, said piston rod extending from the hydraulic cylinder toward said lower pressure plate.

3. A device of the character described, comprising a support, a bed fixed on the support, a ram movably mounted on the support and facing the bed and adapted to move toward and away from the bed, and operating means mounted on the said support and operatively connected to the ram, wherein said operating means comprises rod means slidably engaged on the support and fixed to the ram, an upper pressure plate positioned at the side of the bed remote from the ram, means mounting the upper pressure plate on the bed, said mounting means comprising means for adjusting the upper pressure plate toward

and away from the bed, a lower pressure plate positioned at the side of the upper pressure plate remote from the bed, said lower pressure plate being spaced from the upper pressure plate, means articulating the lower pressure plate to the upper pressure plate, and a hydraulic cylinder fixed to the upper pressure plate, said hydraulic cylinder having a piston rod operatively connected to said articulating means, said piston rod extending from the hydraulic cylinder toward said lower pressure plate, said articulating means comprising a cam block fixed to said piston rod said cam block being formed with a transverse cam slot roller means confined and rollable along said cam slot said articulating means being operatively connected to said roller means.

4. A device of the character described, comprising a support, a bed fixed on the support, a ram movably mounted on the support and facing the bed and adapted to move toward and away from the bed, and operating means mounted on the said support and operatively connected to the ram, wherein said operating means comprises rod means slidably engaged on the support and fixed to the ram, an upper pressure plate positioned at the side of the bed remote from the ram, means mounting the upper pressure plate on the bed, said mounting means comprising means for adjusting the upper pressure plate toward and away from the bed, a lower pressure plate positioned at the side of the upper pressure plate remote from the bed, said lower pressure plate being spaced from the upper pressure plate, means articulating the lower pressure plate to the upper pressure plate, and a hydraulic cylinder fixed to the upper pressure plate, said hydraulic cylinder having a piston rod operatively connected to said articulating means, said piston rod extending from the hydraulic cylinder toward said lower pressure plate, said articulating means comprising a cam block fixed to said piston rod, said cam block being formed with a transverse cam slot, roller means confined in and rollable along said cam slot, said articulating means being operatively connected to said roller means, said articulating means comprising transversely spaced bellcranks pivoted on the lower pressure plate, at opposite ends of the cam block, said bellcranks having relatively long arms carrying said roller means at the outer ends thereof, said bellcranks having relatively short arms, and links pivoted at one end to the outer ends of the short arms, and at their other ends to the upper pressure plate.

5. A device of the character described, comprising a support, a bed fixed on the support, a ram movably mounted on the support and facing the bed and adapted to move toward and away from the bed, and operating means mounted on the said support and operatively connected to the ram, wherein said operating means comprises rod means slidably engaged on the support and fixed to the ram, an upper pressure plate positioned at the side of the bed remote from the ram, means mounting the upper pressure plate on the bed, said mounting means comprising means for adjusting the upper pressure plate toward and away from the bed, a lower pressure plate positioned at the side of the upper pressure plate remote from the bed, said lower pressure plate being spaced from the upper pressure plate, means articulating the lower pressure plate to the upper pressure plate, and a hydraulic cylinder fixed to the upper pressure plate, said hydraulic cylinder having a piston rod operatively connected to said articulating means, said piston rod extending from the hydraulic cylinder toward lower pressure plate, said articulating means comprising a cam block fixed to said piston rod, said cam block being formed with a transverse cam slot, roller means confined in and rollable along said cam slot, said articulating means being operatively connected

to said roller means, said articulating means comprising transversely spaced bellcranks pivoted on the lower pressure plate, at opposite ends of the cam block, said bellcranks having relatively long arms carrying said roller means at the outer ends thereof, said bellcranks having relatively short arms, and links pivoted at one end to the outer ends of the short arms, and at their other ends to the upper pressure plate, said short arms extending outwardly relative to the long arms in directions away from the ends of the cam block.

6. A device of the character described, comprising a support, a bed fixed on the support, a ram movably mounted on the support and facing the bed and adapted to move toward and away from the bed, and operating means mounted on the said support and operatively connected to the ram, wherein said operating means comprises rod means slidably engaged on the support and fixed to the ram, an upper pressure plate positioned at the side of the bed remote from the ram, means mounting the upper pressure plate on the bed, said mounting means comprising means for adjusting the upper pressure plate toward and away from the bed, a lower pressure plate positioned at the side of the upper pressure plate remote from the bed, said lower pressure plate being spaced from the upper pressure plate, means articulating the lower pressure plate to the upper pressure plate, and a hydraulic cylinder fixed to the upper pressure plate, said hydraulic cylinder having a piston rod operatively connected to said articulating means, said adjusting means comprising screw means threaded through the upper pressure plate, said screw means being journaled on the bed and being rotatable relative thereto.

7. A device of the character described, comprising a support, a bed fixed on the support, a ram movably mounted on the support and facing the bed and adapted to move toward and away from the bed, and operating means mounted on the said support and operatively connected to the ram, wherein said operating means comprises rod means slidably engaged on the support and fixed to the ram, an upper pressure plate positioned at the side of the bed remote from the ram, means mounting the upper pressure plate on the bed, said mounting means comprising means for adjusting the upper pressure plate toward and away from the bed, a lower pressure plate positioned at the side of the upper pressure plate remote from the bed, said lower pressure plate being spaced from the upper pressure plate, means articulating the lower pressure plate to the upper pressure plate, and a hydraulic cylinder fixed to the upper pressure plate, said hydraulic cylinder having a piston rod operatively connected to said articulating means, said adjusting means comprising screw means threaded through the upper pressure plate, said screw means being journaled on the bed and being rotatable relative thereto, a hand wheel journaled on the bed, said hand wheel having a sprocket wheel fixed thereon, sprocket wheel means fixed on the screw means, and a sprocket chain trained around the hand wheel sprocket wheel and the sprocket wheel means of the screws.

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