Sept. 23, 1941. D. GUP 2,256,740

HYDRAULIC CIRCULAR PRESS

Filed July 15, 1940 3 Sheets-Sheet 1

Fig. 1

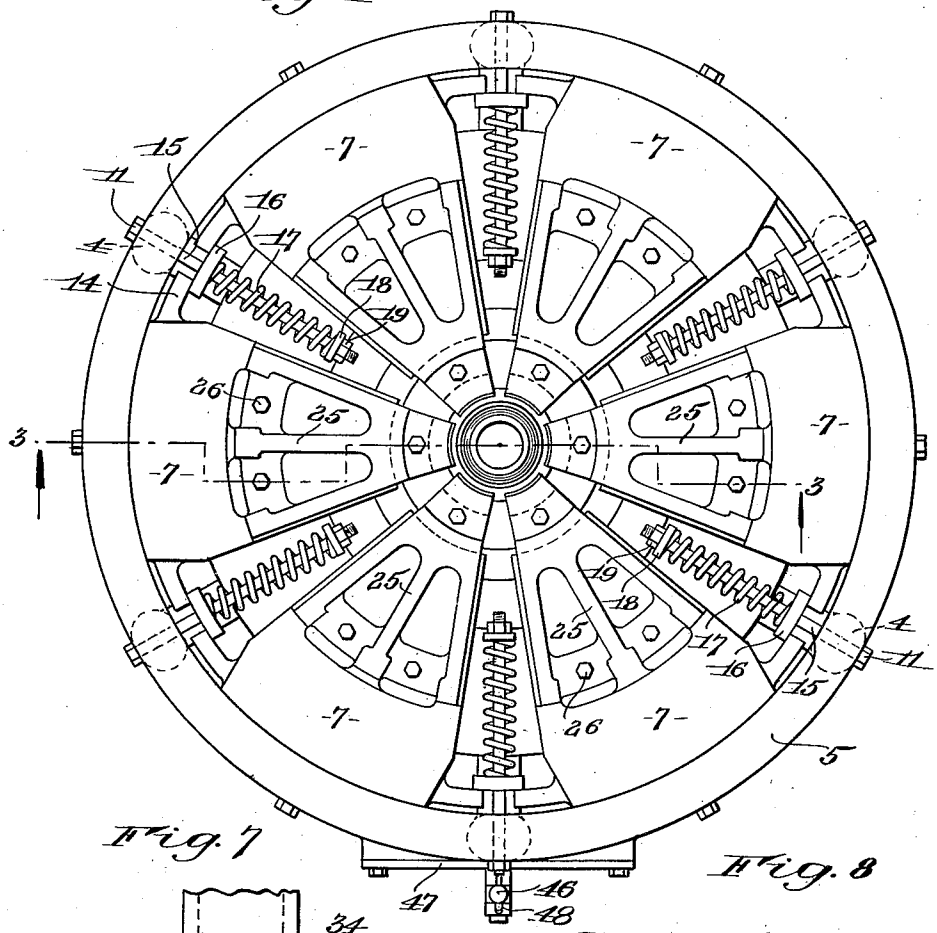


Fig. 7

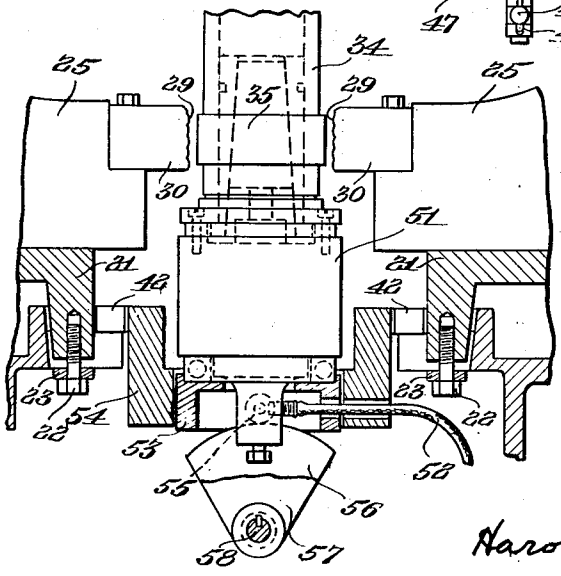
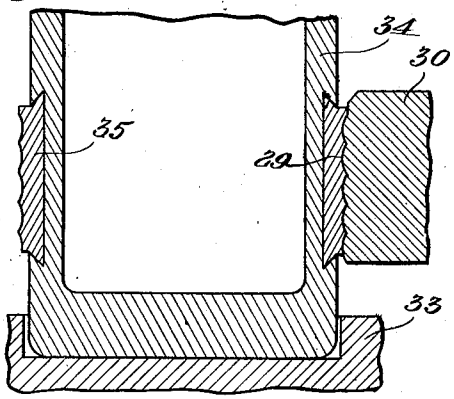


Fig. 8



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Fig. 2

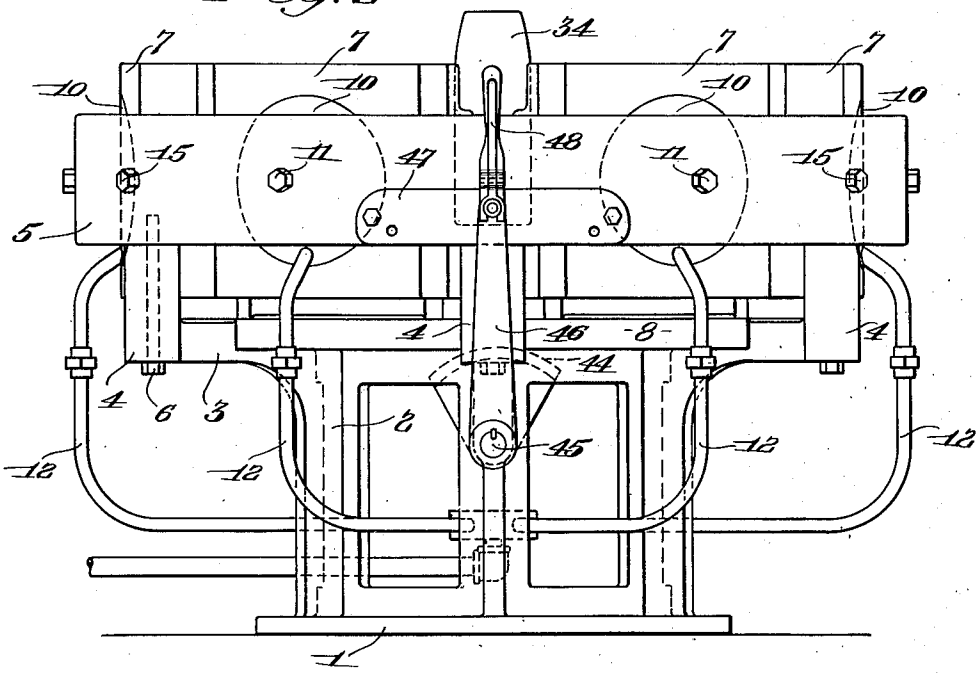


Fig. 4

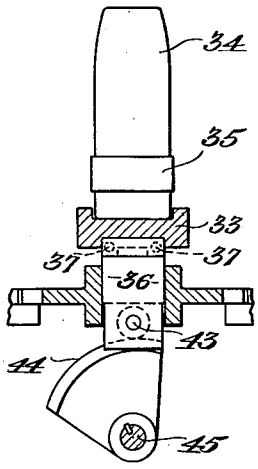


Fig. 5

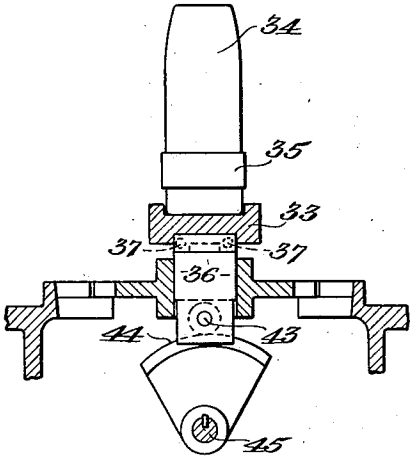
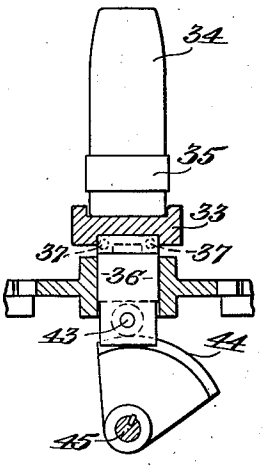


Fig. 6



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HYDRAULIC CIRCULAR PRESS

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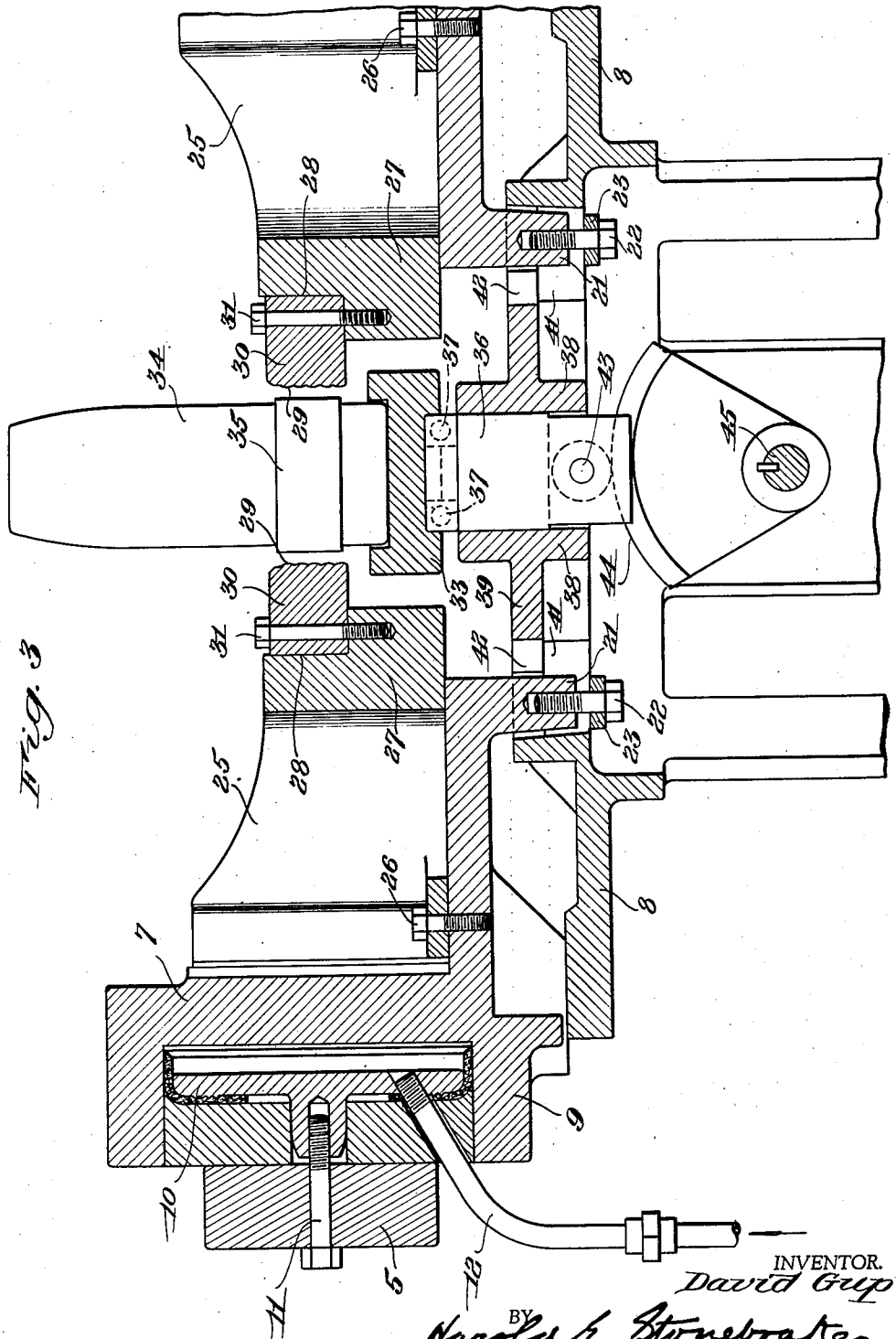


Fig. 3

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2,256,740

UNITED STATES PATENT OFFICE

2,256,740

HYDRAULIC CIRCULAR PRESS

David Gup, Rochester, N. Y., assignor to The West Tire Setter Company, Rochester, N. Y., a corporation of New York

Application July 15, 1940, Serial No. 345,481

12 Claims. (Cl. 78—15)

This invention relates to a hydraulic circular press, with more particular reference to the type of mechanism employed in compressing rotating bands or rings on projectiles or shells, although applicable to any structure where considerable pressure is to be applied circularly around a cylindrical surface, and it has for one of its objects to afford a simple and practical structure whereby the position of the work relatively to the dies may be shifted easily between successive operations so as to effect pressure successively at different areas longitudinally of the work, in order to prevent excess pressure at a given point of a thin wall section.

In a more particular aspect, the invention has for its purpose to provide means for readily shifting a cylindrical work piece such as a shell or projectile axially with reference to a series of band or ring compressing dies or tools surrounding its periphery, permitting the work piece to be moved quickly in a direction transverse to the direction of movement of the dies, between successive operations of the latter.

A further purpose of the invention is to afford a simple and practical construction in a machine of this general character, that enables quick and easy replacement of a die point, where renewal or a different size die point is required, without disturbing the die or other parts of the machine, and permitting the die point to be readily and firmly secured in operative position on the die.

Another object of the invention is to provide a hydraulic circular press embodying a series of radially operating rams with a simple and improved spring-return mechanism that permits quick and easy access to the controlling springs for adjusting the tension of or replacing a particular spring, while at the same time locating the spring-control means in such relation to the rams as to effect a smoother and more efficient movement of the latter.

To these and other ends, the invention consists in the construction and arrangement of parts that will appear clearly from the following description when read in conjunction with the accompanying drawings the novel features being pointed out in the claims following the specification.

In the drawings:

Fig. 1 is a plan view of a hydraulic circular press illustrating applied thereto a preferred embodiment of the invention;

Fig. 2 is a view in side elevation;

Fig. 3 is a vertical sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a diagrammatic sectional view showing the work holder and elevating mechanism therefor in the position with the work at its highest point;

Fig. 5 is a similar view showing the elevating mechanism adjusted to move the work holder and work to an intermediate point;

Fig. 6 is a similar view showing the elevating mechanism adjusted with the work holder and work at their lowest point;

Fig. 7 is an enlarged sectional view of the work holder and elevating mechanism therefor as applied to a modified arrangement employing an expanding mandrel for the work piece, and

Fig. 8 is an enlarged detail sectional view through the work and work holder showing a die point in operative or pressing engagement.

Referring more particularly to the drawings, in which like reference numerals refer to the same parts throughout the several views, 1 designates the base of the stationary frame which also includes pedestal portions 2 and outwardly extending portions 3 carrying upstanding posts 4 upon which the ring member 5 is secured by means of the bolts 6 that extend through the posts 4 and thread into ring member 5.

7 designates each of a series of radially movable rams that travel inwardly and outwardly on the table portion 8 of the stationary frame, and include cylinders 9 that cooperate with fixed pistons 10, which are permanently attached to the aforementioned ring member 5 by means of the bolts 11, while 12 designates a fluid pipe leading through each piston 10 to the interior of the cylinder 9 for actuating the rams 7 inwardly when the fluid pressure is admitted to the cylinder, as usual in this class of machinery.

The rams 7 are radially arranged as shown in Fig. 1, each ram being provided with laterally extending horizontal projections or lugs 14 for engagement with a spring-return mechanism that draws the rams back to their initial position after completion of a compressing operation when the fluid pressure is released. Each spring-return means includes a rod 15 that is attached to the ring member 5 and carries a plate 16 slidable thereon and engageable with the inner surfaces of the projections 14 on adjacent rams, each spring-return means being effective to actuate two rams on opposite sides thereof to their initial positions.

The plate 16 is actuated by a spring 17 surrounding the rod 15 and held thereagainst by

means of a plate 18 located at the inner end of the rod 15 and retained thereon by a nut 19 or other suitable means adjustable to vary the tension of the spring 17 when required.

With this arrangement, the spring-return means is located in line with the vertical center of the ring member 5 and in approximate horizontal alinement with the vertical center of the ram and die to be described presently, thus acting upon the ram and die in a most efficient manner, so as to effect a uniform and smooth movement of the same. By locating the spring-return means between adjacent rams, the parts are readily accessible to adjust and vary the tension of the springs, or to replace the latter if necessary, without removing or disturbing a ram as has been necessary in machines of previous design.

Each ram 7 is supported and slidable upon the table portion 8 of the frame, and carries a depending portion 21, see Fig. 3, that travels in a guide slot in the table portion of the frame to insure proper movement of the ram, and has attached thereto a bolt 22 which carries a gib-plate 23 held against the lower surface of the table portion and insuring proper movement of the ram when pressure is applied. Each ram 7 has fixed thereto a die designated generally at 25, see Fig. 1, and attached to the ram by means of bolts 26.

Each die 25 includes a die point seat comprising a horizontal flat, unbroken surface 27 and a vertical curved, unbroken surface 28 which is concentric with the operative surface 29 of the die point 30. The bottom surface of the die point 30 fits against the horizontal flat surface 27 of the seat while the rear surface of the die point is circularly curved and fits snugly against the curved surface 28 of the seat. The die point is removably held in place by a bolt 31 extending vertically through an opening in the body portion of the die point and engaging a threaded opening in the flat surface 27 of the seat. With this arrangement, the die point is rigidly held on the die for operative engagement with the work and is readily accessible for quick removal where it is desired to change to a die point of a different size or necessary to replace a die point, such objective being accomplished without removing or disturbing the die or any other portion of the mechanism.

Where such a machine is employed for compressing a relatively wide rotating band or ring on a shell or projectile, or where the shell includes thin side walls, it is desirable to apply pressure successively at different points endwise of the shell to secure rigidly a wide band and to avoid excessive pressure upon the walls at a given point, and to accomplish this, the invention includes mechanism for raising or lowering the work piece between successive pressure operations, thus dividing the pressure operations over different areas. This may be accomplished by providing a work holder 33, see Fig. 3, adapted to receive a shell or projectile 34, upon which is to be compressed a rotating band or ring 35 comprising the work piece. The work holder 33 is mounted on a support 36 through suitable ball bearings 37 that enable the work holder to be turned manually between successive operations, the support 36 being guided vertically in a sleeve 38, constituting part of a fixed plate 39 that is supported upon the portions 41 of the frame and provided with slots 42 to receive the depending portions 21 of the rams as they travel inwardly.

The support 36 carries an anti-friction roller 43 at its lower end which is engaged by a cam surface 44 of a cam mounted upon a shaft 45 which extends through the machine to an accessible point at the side thereof and is provided with a hand lever 46 that is shiftable by the operator to different positions and held in any position of adjustment by the index plate 47 and a cooperating locking member 48 on the hand lever 46.

With this mechanism, the work piece can be set for an initial compressing operation, as shown in Fig. 4, with the rotating band or ring 35 in its uppermost position. After the first compressing operation is completed, the operator shifts the cam to the position shown in Fig. 5, lowering the work piece, and can also rotate the work holder if desired, thus bringing the work piece to a slightly lower position for engagement by the die points on the next operation when pressure is applied. Similarly after the second operation, the work piece may be lowered further by shifting the controlling cam, as shown in Fig. 6, and also rotating the work further, if desired, before pressure is again applied to operate the dies, thus distributing the areas where pressure is effective over different portions of the work piece axially thereof. By dividing the effective pressure into a series of successive operations, the likelihood of excessive pressure on the shell at any one point is eliminated, and where a wide band is to be attached or pressure applied over a wide area, it is possible to obtain a firmer and stronger bond than where the total pressure must be applied at one point and in a single operation.

In some instances, it is desirable to employ an expanding mandrel for supporting interiorly a thin walled shell or projectile when pressure is applied for attaching a band or otherwise, and such a mandrel is indicated in Fig. 7, in which 51 is a fluid pressure cylinder of conventional form for controlling the expanding mandrel, pressure being applied to the cylinder through a flexible tube 52. The cylinder 51 is mounted in a support 53 on suitable ball bearings to permit turning the cylinder and the work piece carried by the mandrel. The support 53 is guided in the fixed sleeve 54, and the cylinder 51 carries at its lower end a pair of anti-friction rollers 55 arranged on opposite sides of the fluid pipe 52, the anti-friction rollers 55 being engaged by cam surfaces 56 on the cams 57 which are mounted on the cam shaft 58 for adjustment by the operator in the same manner as already described.

While the invention has been described with reference to a particular structural embodiment, it will be understood that it is susceptible of various applications and uses wherever it is desirable to apply pressure circularly around a cylindrical surface either to force a ring or band thereagainst or to compress a cylindrical surface against a body located interiorly thereof, and this application is intended to cover any modifications or changes coming within the purposes of the invention or the scope of the following claims.

I claim:

1. In a circular press, the combination with a vertically arranged ring member, a series of pistons fixedly attached to said ring member, a series of radially movable rams, each including a cylinder engaging one of said pistons and having a die mounted thereon and fluid means for actuating the cylinder and ram inwardly, of a single spring means located between each two adjacent rams and operatively connected to both

rams on opposite sides thereof for moving the rams outwardly, said spring means being located in horizontal alinement with the vertical centers of the rams and accessible between the rams from the top of the machine for adjustment.

2. In a circular press, the combination with a vertically arranged ring member, a series of pistons fixedly attached to said ring member, a series of radially movable rams, each including a cylinder engaging one of said pistons and having a die mounted thereon and fluid means for actuating the cylinder and ram inwardly, of a single spring-actuated member located laterally of and between each two adjacent rams and engageable with the rams on opposite sides thereof to actuate the rams outwardly, said spring actuated member being located in horizontal alinement with the vertical centers of the rams and accessible between the rams from the top of the machine for adjustment.

3. In a circular press, the combination with a vertically arranged ring member, a series of pistons fixedly attached to said ring member, a series of radially movable rams, each including a cylinder engaging one of said pistons and having a die mounted thereon and fluid means for actuating the cylinder and ram inwardly, of a single radially arranged rod between each two adjacent rams and located in horizontal alinement with the vertical centers of the rams, laterally extending projections on the rams, and a spring controlled member movable on said rod and engaging the inner surfaces of the projections on the two adjacent rams to move the rams outwardly, said spring controlled member being accessible between adjacent rams from the top of the machine for adjustment.

4. In a circular press, the combination with a vertically arranged ring member, a series of pistons fixedly attached to said ring member, a series of radially movable rams, each including a cylinder engaging one of said pistons and having a die mounted thereon and fluid means for actuating the cylinder and ram inwardly, projections extending laterally from opposite sides of each ram, a single radially arranged rod stationarily located between each two adjacent rams in horizontal alinement with the vertical centers of the rams, a plate movable on said rod and engaging the inner surfaces of the projections on the two adjacent rams, adjustable retaining means on the inner end of said rod, and a spring located between said adjustable retaining means and said plate and acting to move the rams outwardly, said adjustable retaining means being accessible between adjacent rams from the top of the machine for adjustment.

5. In a circular press, the combination with a vertically arranged ring member, a series of pistons fixedly attached to said ring member, a series of radially movable rams, each including a cylinder engaging one of said pistons and having a die mounted thereon and fluid means for actuating the cylinder and ram inwardly, of a single spring means located between each two adjacent rams in horizontal alinement with the vertical centers of the rams and operatively connected to the two adjacent rams for moving them outwardly, said spring means being accessible between adjacent rams from the top of the machine for adjustment.

6. In a circular press, the combination with a vertically arranged ring member, a series of pistons fixedly attached to said ring member, a series of radially movable rams, each including a cylinder engaging one of said pistons and having a die mounted thereon and fluid means for actuating the cylinder and ram inwardly, of a single radially arranged rod between each two adjacent rams in horizontal alinement with the vertical centers of the rams, laterally extending projections on the rams, and a spring controlled member movable on said rod and engaging the inner surfaces of the projections on the two adjacent rams to move the rams outwardly, said spring controlled members being accessible between adjacent rams from the top of the machine for adjustment.

7. In a circular press, the combination with a vertically arranged ring member, a series of pistons fixedly attached to said ring member, a series of radially movable rams, each including a cylinder engaging one of said pistons and having a die mounted thereon and fluid means for actuating the cylinder and ram inwardly, a single spring controlled means located between each two adjacent rams in horizontal alinement with the vertical centers of the rams and operatively connected to the two adjacent rams for moving them outwardly, each die having a seat including a horizontal flat surface and a vertical curved surface, a removable die point having a curved rear surface and positionable against said flat and curved surfaces respectively of the die, and an attaching bolt extending vertically through an opening in the die point and threaded into said seat for holding the die point in position, said spring controlled means being accessible between adjacent rams from the top of the machine for adjustment.

8. In a circular press, the combination with a series of radially movable rams, each having a die secured thereto and fluid means for actuating the ram inwardly, spring means located between adjacent rams and operatively connected thereto for moving them outwardly, of a vertically movable work holder, a support for the work holder, and a cam on which the support rests, said cam being movable to different positions to raise or lower the support and maintain the work at any selected elevation within the limits of the cam.

9. In a circular press, the combination with a series of radially movable rams, each having a die secured thereto and fluid means for actuating the ram inwardly, of a vertically movable work holder, a support on which the work holder is rotatably mounted, and a cam for elevating or lowering the support to maintain the work at any selected elevation within the limits of the cam.

10. In a circular press, the combination with a series of radially movable rams, each having a die secured thereto and fluid means for actuating the ram inwardly, of a vertically movable work holder, a support on which the work holder is rotatably mounted, a vertical guide for the support, an anti-friction roller at the lower end of the support, and a cam engaging said roller and movable to different positions for maintaining the support and work holder at any selected elevation within the limits of the cam.

11. In a circular press, the combination with a series of radially movable rams, each having a die secured thereto and fluid means for actuating the ram inwardly, of a vertically movable work holder, a support on which the work holder is mounted, and a cam operatively associated with the support and movable to raise or lower the

support and maintain work at any selected elevation within the limits of the cam.

12. In a circular press, the combination with a series of radially movable rams, each having a die mounted thereon and fluid means for actuating the ram inwardly, spring-controlled means for moving the rams outwardly, each die having a seat including a horizontal flat surface and a vertical curved surface, a removable die point having a curved rear surface and positionable against said flat and curved surfaces of the seat, the portions of the die both above and below said flat surface being of greater depth than the die point, said die portion below said flat surface having a threaded opening therein, the die point having an opening alined with said threaded opening in the die when the curved surface of the die point is in contact with the curved surface on the die, and a removable bolt extending vertically through said opening in the die point and having threaded engagement with the opening in the die.

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