This invention relates to metal drawing presses of the double-action type wherein an upper draw ring or blank holder is connected to an outer slide member; this upper draw ring being adapted to hold a blank supported by a lower draw ring while an operation is performed on the blank.

An important object of the present invention consists in the provision of a novel form of adjusting mechanism for the upper draw ring of a press indicated above, whereby there is insured uniform contact and pressure against a blank on the lower draw ring.

Another object of the invention is to provide novel adjusting means for the upper draw ring of a metal drawing press to facilitate the maintenance of uniform contact and pressure between the upper draw ring and a blank held on the lower draw ring by the said upper ring.

Another object is to provide novel adjusting mechanism which is particularly useful in connection with a double-action metal drawing press, to adjust the upper draw ring thereof in a substantially vertical direction in order to maintain uniform contact and pressure between the upper draw ring and a blank held on the lower draw ring by the upper draw ring.

A further object is to provide a novel adjusting mechanism for the upper draw ring of a metal drawing press, wherein a plurality of individually adjustable supporting members support or suspend the upper draw ring from the outer slide member of the press, each supporting or suspension member being attached adjacent the peripheral edge of the upper draw ring so that the adjustment of any one of said members will elevate or lower that side of the draw ring to which the member is attached, and thus insure uniform contact and pressure between the upper draw ring and a blank held on the lower draw ring by the upper draw ring.

A still further object is to provide a novel form of bolstering means in a metal drawing press in addition to the individual adjusting mechanism, the bolstering means being capable of bolstering the upper draw ring, in its adjusted position, against pressure during operation of the press.

Still another object is to provide individually adjustable bolstering means secured to the outer slide of a metal drawing press, the bolstering means being capable of individual adjustment to bolster the upper draw ring of the press during operation thereof, such adjustment being possible regardless of the adjusted position of the upper draw ring.

Numerous other objects and advantages of the invention will become apparent upon reading the following description taken in conjunction with the accompanying drawing in which:

Fig. 1 is a fragmentary side elevational view of a double-action metal drawing press in its open position, illustrating the construction of the adjustable connecting means and bolstering means of the present invention, certain parts being broken away for the sake of clearness; and

Fig. 2 is a plan view of one-half of the press, the view being taken substantially along the line 2—2 of Fig. 1.

A double-action metal drawing press is so-called because of its manner of operation, and generally consists of inner and outer slide members mounted for vertical movement against a lower die member. The outer slide carries a blank holder including an upper draw ring which moves downwardly into contact with a blank supported by a lower draw ring surrounding the lower die. The inner slide carries an upper die member or punch which moves downwardly against the lower die and performs an operation on the blank supported on the lower die.

Metal drawing presses, of the general character just mentioned, have been known for a long time, and the operation of presses of this kind is well known to those skilled in the art. These presses employ an outer slide which travels vertically in guideways, and one of the problems which has been encountered in the past with these presses is that some form of adjustment must be made, after continued use, to insure that the upper draw ring will have a uniform contact and pressure against the blank supported by the lower draw ring.

Hitherto, any adjustment necessarily has been made with respect to the outer slide itself, but such adjustment has proven unsatisfactory because of the so-called “wearing-in” of the guideways.

The present invention, therefore, is directed to overcoming the disadvantages inherent in conventional presses by providing individual adjusting means, whereby the outer slide may always move in identical paths, but the upper draw ring carried by the outer slide may be adjusted with respect to said outer slide.

Referring now more particularly to the drawing, the outer slide or blank holder is indicated by the numeral 1, and the inner slide is shown at 2. This inner slide 2 carries a punch 3 which is adapted to be moved downwardly into contact with a lower die 4. A lower draw ring 5 surrounds this lower die 4 and is adapted to have supported thereon a sheet or other type of metal blank which is to be operated upon by the punch.
3. The lower die 4, and lower draw ring 5, are both supported rigidly by a suitable bolster 6.

An upper draw ring 7 surrounds the punch 3 and may be secured to, or integral with, a plate or rectangularly-shaped ring 8. The ring 8 is connected to, or suspended from, the outer slide 1 by means of a plurality of adjustable suspension means, each of which suspension means being indicated generally by the numeral 9.

Metal drawing presses of this character usually provide the outer slide or blank holder 1 with an adjustment which includes a plurality of sleeves 10 receiving adjusting screws 11.

Bolstering means are also provided in the form of several jack screws, each of which is indicated generally by the numeral 12. These jack screws 12 are adapted to be moved downwardly against the upper surface of the ring 8 after said ring has been moved to its adjusted position, so that the bolstering means may serve to bolster and strengthen the ring during operation of the press when the upper draw ring 7 is in contact with the blank on the lower draw ring 5.

In the form of the invention herein illustrated, there may be a plurality of the adjusting devices or screws 9, which are spaced apart, and these adjusting devices or screws 9 are preferably located at the corners of the rectangularly-shaped ring 8. A greater or lesser number of these adjusting devices or screws 9 may be utilized, and they may be located at different places around the peripheral edge of the plate or ring 8, without in any way departing from the spirit of the invention.

Wherever one of these adjusting devices 9 is to be located, there is provided a raised portion or boss 13 on the upper surface of the plate at the lower part of the outer slide 1. An insert 14 is adapted to be received within a suitable opening beneath each raised portion 13, the inserts 14 being secured in place preferably by means of screws or bolts 15. The insert 14 is internally threaded to receive an adjusting screw 16. The upper end of the screw 16 may extend upwardly into a recessed part 17 of the boss 13, thus permitting vertical adjustment of the screw 16.

A collar 18 also threadedly engages the screw 16, and the collar may be utilized to lock the screw 16 in any position to which it may be adjusted.

A knurled collar 19 also is fastened to the screw 16 for the purpose of manually turning the screw and moving it in a vertical direction. The lower end of the screw 16 terminates in a spherical portion or ball 20, which is received within a cooperating semi-spherical recess 21 in the upper surface of the ring 8. The upper half of the sphere or ball 20 may be enclosed by a block 22 which has a similar spherical recess 23 on its underside. This block 22 may be secured to the upper surface of the ring 8 by means of screws 24. The construction of the present invention, therefore, permits a vertical adjustment of the screw 16. The screw 16 will carry with it, in a side or convergent upwardly the block 22 mounted the upper draw ring 7. The mounting of the sphere or ball 20 is similar to a ball and socket construction, and permits a universal movement of the screw 16 with respect to the ring 8. Thus, if one side of the upper draw ring 7 is to be elevated or lowered, or to otherwise insure a uniform contact and pressure against the lower draw ring 5, such an adjustment will be possible through one or more screws 16 and the universal mounting of the screw, without interfering with the mounting means at the opposite side of the ring 8.

Placing a number of these adjusting devices 9 at proper locations around the peripheral edge of the ring 8, and between the adjusting devices 9, so as to give strength to the ring during operation of the press. The preferred form of each bolstering means is illustrated in Fig. 1, wherein there is shown a plurality of bosses 25 placed on the upper surface of the ring which is carried at the lower part of the outer slide 1.

A shouldered recess 26 is located below each boss 25, and the wider portion of each recess 26 is adapted to receive an insert 27 which is secured in place by securing means 28, such as the screws or bolts. The insert 27 is internally threaded to receive an adjusting screw 29, which has a collar 30 threadedly engaging it for the purpose of locking the device in any position to which it may be adjusted. A collar or flange 31 is also secured to the screw 29, whereby the screw 29 may be moved upwardly or downwardly in a substantially vertical direction.

The screw 29 terminates at its lower end in a sphere or ball 32 which is adapted to be received within a bolster block 33. This block 33 is divided into upper and lower sections which are secured together by the ball 32 by means of the bolts 34. These sections, forming the block 33, are recessed so as to provide a substantially spherical recess 35 when placed together. The ball 32 is received within the recess 35 to permit a substantially universal movement of the block 33 with respect to the screw 29.

After the ring 8 and the upper draw ring 7 mounted thereon have been moved to adjusted position by means of one or more of the adjusting devices 9, the various jack screws or bolstering devices 12 then may be moved downwardly by means of the screws 25 until the blocks 33 bear firmly against the upper side of the ring 8 in face to face engagement. In Fig. 1 the ring 8 is illustrated as being in a substantially horizontal position, but it may develop, after continued use of the machine, that some point about the periphery of the upper draw ring 7 is not exerting a sufficient pressure against the blank being supported by the lower draw ring 5 during the drawing operation, and therefore the upper draw ring 7 must be adjusted downwardly. To effect this adjustment, the appropriate adjusting device 9 will be utilized to lower that part of the upper draw ring to make the contact and the pressure uniform and correct. The ring 8 will therefore no longer be in a horizontal plane. The ball and socket construction of each adjusting device will permit this adjustment, and the similar construction of the bolstering means will permit the blocks 33 also to be moved into contact with the blank when required. The ring 8 is not positioned in a horizontal plane.

The novel adjusting device by itself, and in combination with the novel form of bolstering means, has proven satisfactory in actual practice in that it facilitates adjustment of the upper
draw ring without impairing the vertical sliding movement of the outer slide. The particular adjustment of the present invention may be made quickly and easily and has numerous advantages over those heretofore known.

Changes may be made in the form, construction and arrangement of parts from that disclosed herein without in any way departing from the spirit of the invention or sacrificing any of the attendant advantages thereof, provided, however, that such changes fall within the scope of the claim appended hereto.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

In a sheet metal drawing press, inner and outer upper slide members, an upper draw ring, a centrally apertured plate member secured to the upper edge of said upper draw ring, a plurality of horizontally spaced individually operable adjusting screw members each having one end threadedly received in the underside of said outer slide member, means for mounting the other end of each of said screw members for universal movement in said plate member, said screw members being located peripherally around said outer slide and plate members, a plurality of horizontally spaced individually operable bolstering screw members adjustably threadedly mounted in the underside of said outer slide in-

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