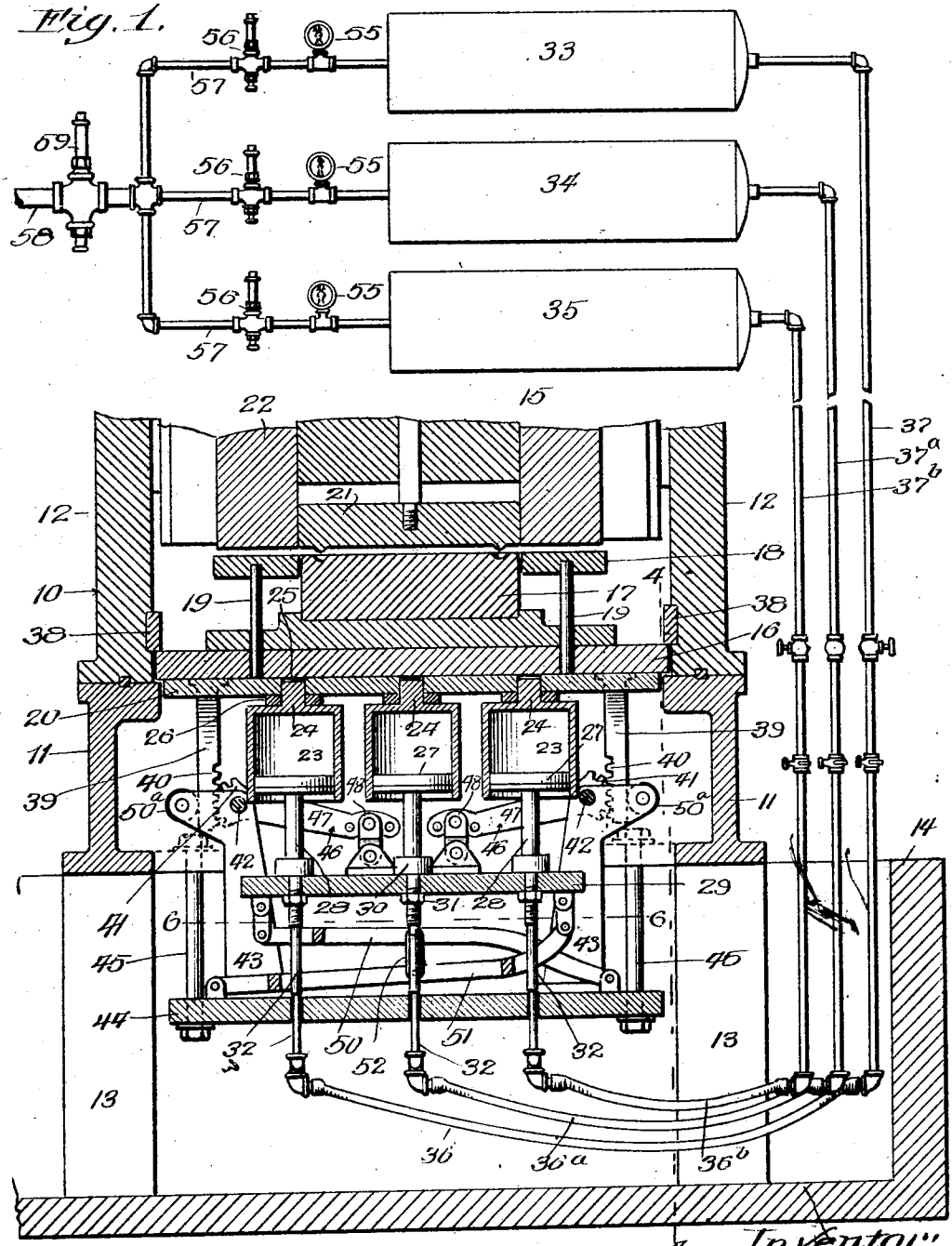
June 21, 1927. 1,633,267

J. NELSON

CUSHIONING MEANS FOR POWER PRESSES

Filed June 14, 1926 4 Sheets-Sheet 1

Fig. 1.



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June 21, 1927. 1,633,267

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CUSHIONING MEANS FOR POWER PRESSES

Filed June 14, 1926 4 Sheets-Sheet 2

Fig. 2.

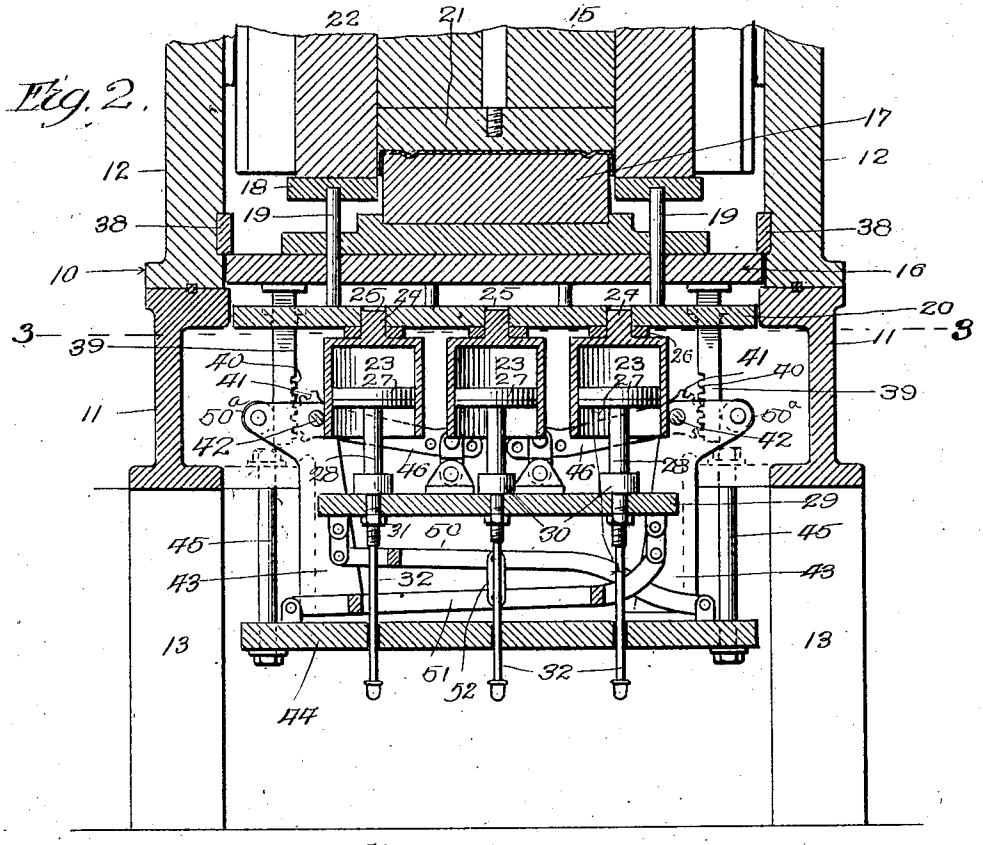
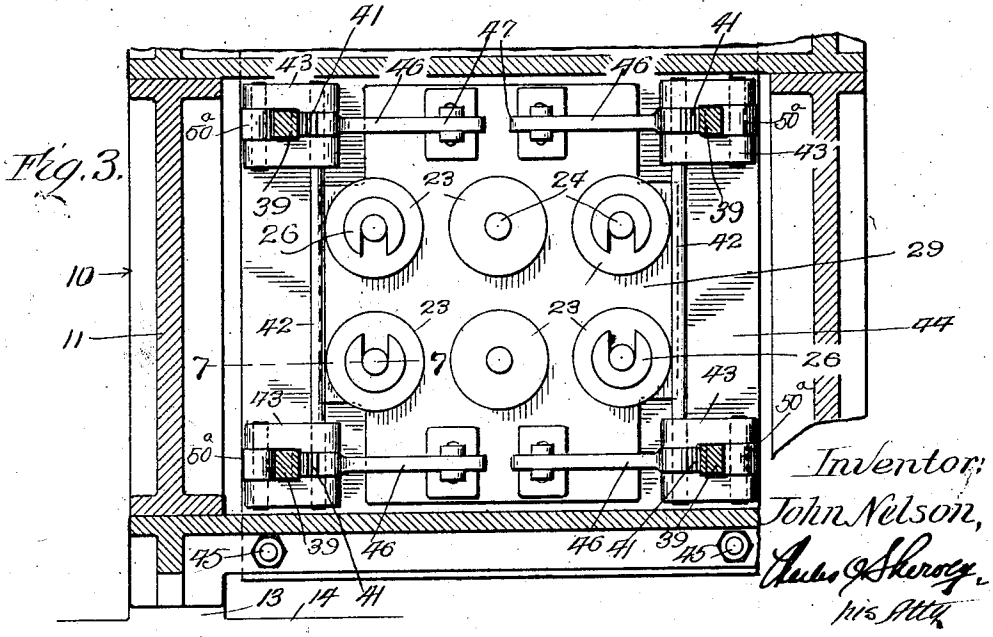


Fig. 3.



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CUSHIONING MEANS FOR POWER PRESSES

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Fig. 4.

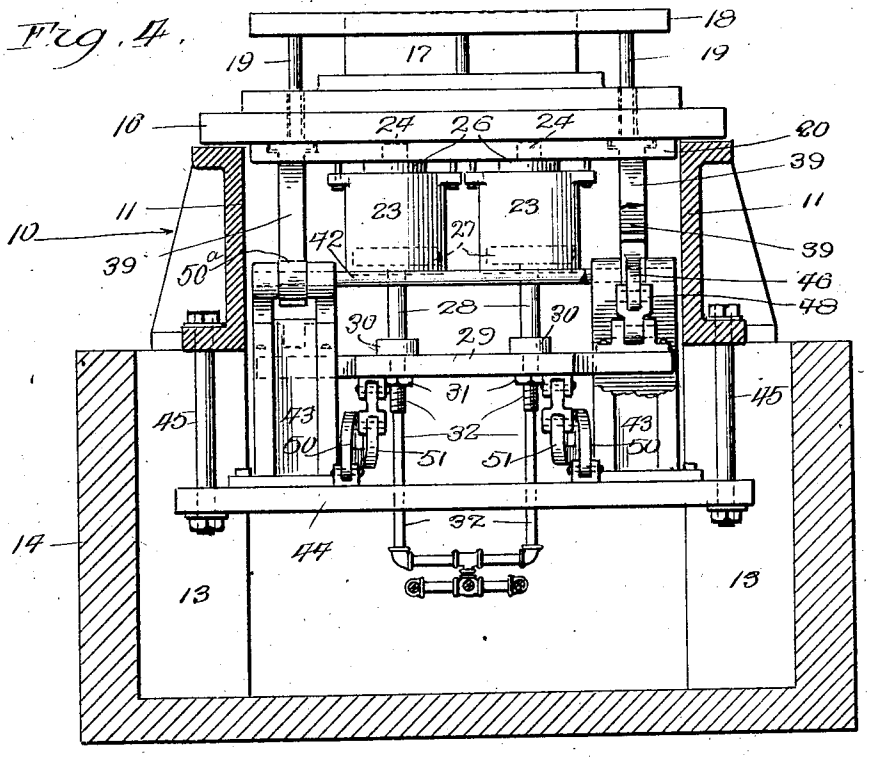
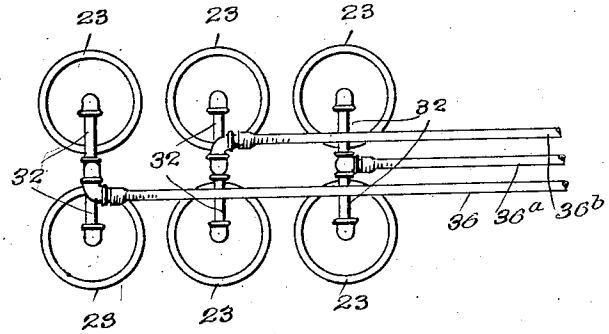


Fig. 5.



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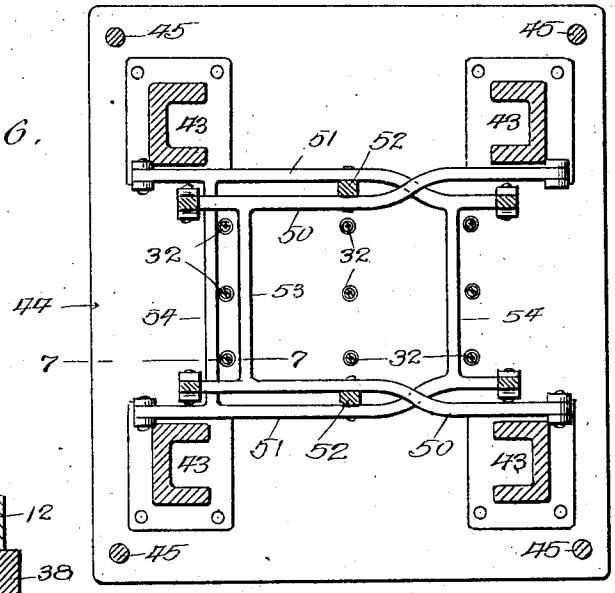
June 21, 1927. 1,633,267

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CUSHIONING MEANS FOR POWER PRESSES

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Fig. 6.



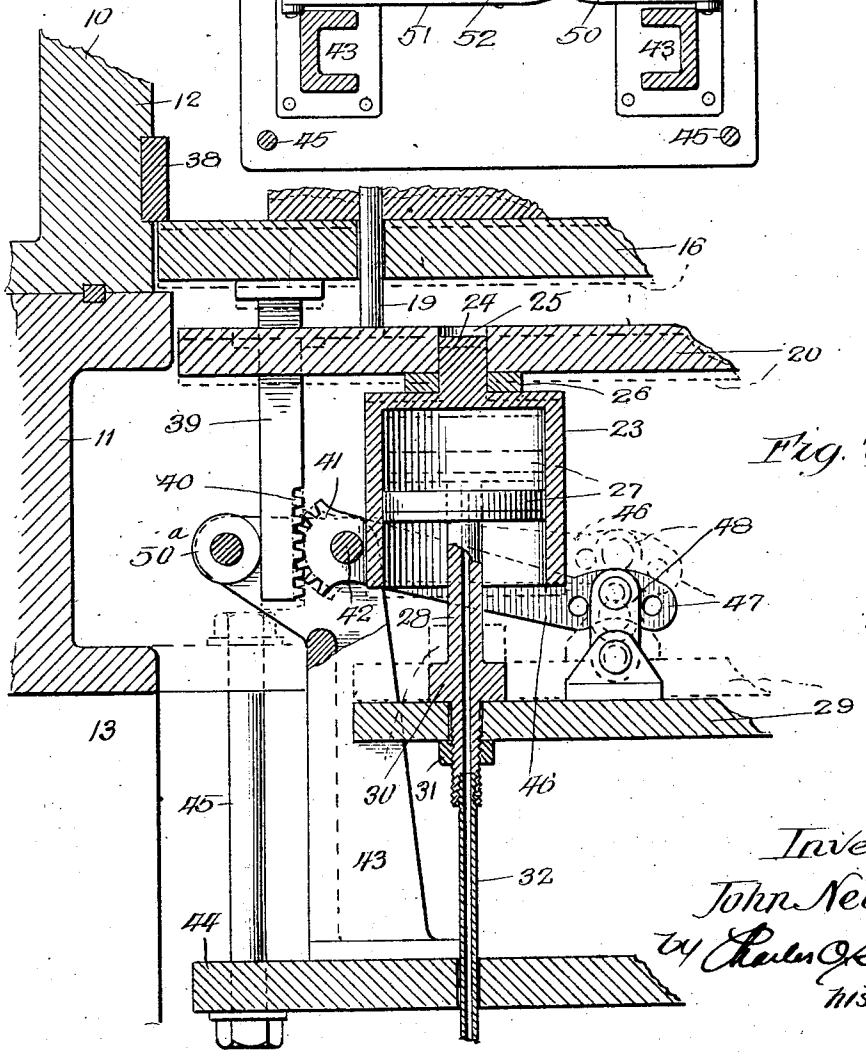


Fig. 7.

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Patented June 21, 1927. 1,633,267

UNITED STATES PATENT OFFICE.

JOHN NELSON, OF CHICAGO, ILLINOIS.

CUSHIONING MEANS FOR POWER PRESSES.

Application filed June 14, 1926. Serial No. 115,785.

This invention relates to cushioning means for power presses, and its principal object is to provide cushioning means for the bolster or other die support, normally operating to support the bolster or die support in operative position, but acting under the influence of abnormal or excessive pressure or strains, to yield and thereby prevent injury to the press. Another object is to provide bolster supporting means, movable under the application of abnormal or excessive pressure on the bolster and having means for indicating the amount of pressure exerted against the bolster, and in this manner make it possible for an attendant to determine the amount of pressure required for any given work and to ascertain the strain which a given press structure will stand. Another object is to provide pressure means for yieldingly supporting the draw ring of presses that employ a draw ring in the formation of certain work, said pressure means forming a part of and operating in connection with certain elements of the bolster cushioning means to support the bolster.

With these and other ends in view, this invention consists in a power press having a bolster or other die support, supported by a mobile element, such as a fluid, under pressure. It further consists in a fluid pressure supported bolster, having associated with the receptacle for the fluid, a pressure gauge whereby the amount of pressure exerted upon the bolster may be ascertained. It further consists in a power press having fluid pressure cushioning means for the draw ring, and mechanism co-operating therewith to support the bolster in position, but acting under the influence of abnormal or excessive pressure, to permit the bolster to yield. It further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the accompanying drawings, in which:

Fig. 1 is a view, partly in side elevation and partly in vertical section, of a power press partly broken away and equipped with cushioning means embodying a simple form of the present invention; Fig. 2 is a fragmental sectional view of the power press showing the drawing, cushioning means and other associated parts in a different position from that shown in Fig. 1; Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 2; Fig. 4 is a view, partly in end elevation and partly in vertical section, the line of section being indicated at 4—4 in Fig. 1 and certain parts being broken out to illustrate parts that would otherwise be hidden from view; Fig. 5 is a view looking from below of certain pressure cylinders and showing the arrangement of piping connections with them; Fig. 6 is a detail horizontal section taken on the line 6—6 of Fig. 1 and Fig. 7 is an enlarged detail vertical section taken on the line 7—7 of Figs. 3 and 6.

Referring to said drawings, which illustrate one embodiment of the present invention, the reference character 10 designates the body or frame of a power die press of ordinary and well known construction of which 11 designates the base or bed, and 12 the upright frame members. The press is shown as mounted on piers or columns 13 of the foundation 14 which contains the usual pit below the press. The ram is designated by the reference character 15 and is guided upon the uprights 12 in the usual manner and is reciprocated by the cranks or other operating mechanism of the press. The bolster is shown at 16 and it supports the female die 17. In certain classes of work, a draw ring 18 is employed, which is shown as supported by upright supporting members usually in the form of rods or bars 19, which rods or bars rest upon and are supported by a pressure pad 20 located below the bolster. The male dies 21, 22 are mounted on the ram as usual and co-operate with the female dies to give shape to the blank which is interposed between the two sets of dies. In general the parts thus far described are common and well known and require no detailed description so far as the specification is concerned.

The pressure pad 20 is yieldingly supported by certain elements of the pressure members, which as here shown comprise compressed air cylinders 23, and pistons 27.

As a preference the cylinders are provided with short stems or necks 24 that project up through holes 25 formed in the pressure pad and under certain circumstances may serve to aid in supporting the bolster. The cylinders 23, may bear directly against the pressure pad if desired, but for obtaining certain results I provide spacers or slotted collars 26 between the cylinders and pressure pad, which slotted collars are slipped upon the necks 24 and hold the ends of the necks 24 spaced away from the bolster 16. As above stated under certain circumstances certain of the slit collars may be removed thereby permitting the cylinders to engage the bolster directly through the interposed necks 24.

Within the cylinders 23 are pistons 27, which are mounted upon stems 28 here shown as supported by a floating platform 29. The stems 28 are shown as formed with enlargements or heads 30 that bear against the top of the floating platform 29, and below the heads, the stems are threaded and extend through holes in the floating platform and have nuts 31 threaded thereon for rigidly connecting the piston stems with said platform. In the form of the invention illustrated, the stems 28 are hollow and each has a compressed air pipe 32 threadedly secured in its lower end and connected to compressed air tanks 33, 34, 35 by flexible connections 36, 36^a and 36^b and pipes 37, 37^a and 37^b. Any desirable number of compressed air cylinders 23, may be employed and for the purposes of illustration, I have shown six of them arranged below the pressure pad and arranged in pairs, those of each pair being connected to one of the compressed air tanks and those of each other pair being connected to a separate compressed air tank. This arrangement permits greater pressure to be applied to the pressure pad at certain places than at others, which may be required under certain working conditions.

In the apparatus thus far described, whenever the draw ring 18 is moved downward, the supporting rods 19 are moved downward by the draw ring, the pressure pad 20 is moved downward and therewith the compressed air cylinders 23, which are moved downward against the pressure between the heads of the cylinders and pistons 27. The necessary pressure is thus maintained to cause the draw ring to function properly.

Occasionally two blanks are accidentally placed between the dies, or some other foreign object finds its way between the dies, with the result that when the ram comes down to perform its work, the foreign intervening matter causes abnormal strains and stresses on the crank shaft, its bearings, the frame and other parts and frequently causing permanent injury to the press. According to the present invention the bolster 16, instead of being stationary, is supported by the pressure members and certain mechanism connected therewith, and is yieldingly held upward against shoulders 38, which may be in the form of bars or keys let into the inner faces of the upright frame member 12. The mechanism for supporting the bolster in operative position will not be described.

Below the bolster are supports or posts 39 which project through openings in the pressure pad 20 and bear against the underside of the bolster. Mechanism is provided for applying force to said supports or posts 39 in an upward direction and with sufficient force to hold the bolster up in contact with the shoulders 38 against all normal working downward pressure on the bolster. In the form of mechanism illustrated for accomplishing this result the posts or uprights 39 are shown as formed with rack bars 40 which mesh with gear segments 41 that are mounted upon rock shafts 42 rotatively mounted in brackets 43 that are supported upon a stationary platform 44 which is shown as suspended from the base or bed 11 by bolts or rods and nuts 45. The gear segments are shown as comprising the short arms of levers 46, the long arms 47 of which, are connected to the floating platform 29 by links 48. For the purpose of obtaining more or less leverage the lever arms 47 have adjustable connections with the links, and as shown may be provided with a plurality of places for connection with the links 48. Guide rollers 50^a are journaled upon the brackets 43 at places opposite the gear segments 41 and operate to hold the rack bars 40 in mesh with said gear segments. As a preference the posts or uprights 39 are arranged adjacent the corners of the bolster and as shown are arranged in pairs, the two at each end of the bolster comprising a pair, and the two gear segments which mesh with the rack bars of the pair are rigidly secured upon a rock shaft 42, common to both, whereby, in case excessive pressure is brought to bear upon any corner of the bolster and that corner is depressed, a downward movement of that corner of the bolster will be transmitted to the other corner through the instrumentality of the posts, rack bars, gear segments and rock shaft.

It will be observed that the pressure within the cylinders 23 tends to force the cylinders upward and the pistons downward. As a consequence the floating platform 29 is pressed in a downward direction and the long arms 47 of the levers 46 are thereby forced in a downward direction, thereby forcing the short arms or gear segments 41 of the levers 46 in an upward direction and therewith forcing upward the rack bars 40 and posts or uprights 39, which because of

their engagement with the underside of the bolster 16 force it upward against the shoulders 38. Inasmuch as the pressure within the cylinders 23, is calculated to properly cushion the draw ring and is not sufficient of itself to properly support the bolster, the long arms 47 of the levers 46 are made several times the length of the short arms of said levers in order to obtain sufficient leverage to provide the necessary force to properly support the bolster during all normal working conditions.

Inasmuch as it sometimes occurs that an abnormal pressure is applied to one end only of the bolster, and as it is important that the bolster yield evenly at all places, I have provided parallel movement mechanism between the floating platform 29 and stationary platform 44 which may comprise bars 50, 51 pivotally connected between their ends by links 52, and pivotally connected at these ends with the two platforms. There are two parallel bars 50 which are rigidly connected together by a cross bar 53 and two bars 51 rigidly connected by cross bars 54. One end of each bar is pivotally connected to the floating platform and the other end to the stationary platform. The parallel movement mechanism described is common and well known and is chosen for the purposes of illustration only. Its function is to give a parallel movement to the floating platform in case excessive pressure is applied to one end only of its bolster.

As has been previously described the several pairs of fluid pressure cylinders, are respectively connected to compressed air tanks 33, 34, 35. Compressed air is supplied to said tanks from a suitable source, and if desired each tank may be equipped with a pressure gauge 55 and a pressure regulating valve 56, which instruments may be placed on the compressed air pipes 57 which lead to the several tanks. If desired the main compressed air pipe 58, which leads from the compressor or other source of compressed fluid, may have a pressure regulating valve 59 therein and the pipes 57 may be coupled to the main pipe 58 at a point between the pressure regulating valve 59 and the tanks.

In connection with the pressure gauges, a chart or charts may be employed which may be calibrated to show the tonnage indicated by the pressure gauges, namely the tonnage which the bolster will support without yielding.

In the operation of the cushioning means illustrated, the proper pressure being supplied to the compressed air tanks, the compressed air enters the pressure cylinders 23, and forces the pistons 27 downward and the cylinders 23 upward, thereby depressing the floating platform 29, swinging down the long arms 47 of the levers 46, and moving the gear segments 41 upward, which in turn lift the rack bars 40 and posts or uprights 39, thereby moving the bolster, and parts carried thereby upward until the bolster encounters the shoulders 38, where it is held until depressed by the application of abnormal downward pressure thereon. The upward pressure of the fluid on the cylinders, raises them and therewith the pressure pad and draw ring, bringing the pressure pad into contact with the lower side of the bolster. This is the position of the parts when the press is at rest. A blank being placed on the female die and draw ring, the press is started and the ram is brought down, the male dies engaging the blank and performing whatever work is to be done. In certain kinds of work the pressure cylinders, merely hold the draw ring up against the blank with sufficient force to permit the male die to perform its work properly. In certain other operations the draw ring is moved down by certain of the male dies, against the pressure contained in the pressure cylinders. Such a position of the parts is seen in Fig. 2. In this position the draw ring 18 has been moved down from its normal position (seen in Fig. 1) and as a consequence the pressure pad 20 has been moved down by the rods 19, which support the draw ring, and the cylinders 23, have been moved downward against the pressure within them. When the ram starts on its up stroke and the down pressure on the draw ring is released, the cylinders 23, pressure pad 20, rods 19 and draw ring are forced upward by the compressed air.

In case an abnormal or excessive pressure is placed upon the bolster, as for instance if two blanks are accidentally placed between the dies and the ram is brought down, instead of placing an abnormal strain on the press, springing the crank shaft or breaking some part of the press, the bolster is depressed against the action of the cushioning means. Such a position of the parts is illustrated in dotted lines in Fig. 7 where the pressure pad is shown normally depressed in full lines due to the ordinary action of the draw ring. The bolster is shown in normal position in full lines and in depressed position, by the dotted lines. It will be observed that when the bolster is depressed, the long arm 47 of the lever 46 is swung upward, thereby raising the floating platform 29 and therewith the pistons 27 against the pressure in the cylinders 23. As soon as the abnormal pressure on the bolster is removed the pistons 27 are depressed and the bolster restored to normal position through the instrumentality of the floating platform 29, levers 46 and posts 39.

It will be understood that by setting the respective pressure regulating valves, 56, the pressure in any pair of cylinders 23 may be varied to suit any peculiar requirement.

Furthermore that with the use of the pressure regulating valve 59 on the main compressed air pipe 57, the valves 56, may be neutralized and an equal pressure may be had in all of the tanks and all of the pressure cylinders 23, thereby distributing the pressure equally on the pressure pad and on the bolster.

Under certain conditions it may be found advantageous to supply greater upward pressure on the bolster and less upward pressure on the draw ring. Any of the split collars 26 may be removed from its cylinder 23, thereby permitting the neck 24 of the cylinder to engage with the under side of its bolster thus applying the pressure of that cylinder to the bolster, and relieving the pressure pad of the pressure. This may be done at any desired places whereby additional pressure may be supplied to the bolster at the desired place and the pressure correspondingly removed from the pressure pad.

I claim as new, and desire to secure by Letters Patent:

1. In a power press, the combination with the bolster and ram members of a press, of means to resist breaking down of the press under abnormal pressure between the bolster and ram members and comprising fluid pressure operated cushioning means having one element thereof connected to one of said members and acting to unyieldingly hold said member in fixed position against a maximum predetermined pressure between said members, but capable of yielding when said member is subjected to an abnormal pressure by the other member in excess of said maximum predetermined pressure.

2. In a power press, the combination with a normally unyielding bolster and the ram of a press, of means to resist breaking down of the press under abnormal pressure between said bolster and ram and comprising fluid pressure operated bolster supporting means for unyieldingly holding said bolster in fixed position and against a maximum predetermined pressure by the ram, but capable of yielding when said bolster is subjected to an abnormal pressure by the ram in excess of said maximum predetermined pressure.

3. In a power press, the combination with a normally unyielding bolster and the ram of a press, of means to resist breaking down of the press under abnormal pressure between said bolster and ram and comprising pressure operated cushioning means, bolster supporting elements actuated thereby and connected to said bolster and unyieldingly supporting the same in fixed position against a maximum predetermined pressure, but capable of yielding under the influence of an abnormal pressure by said ram in excess of said predetermined maximum pressure.

4. In a power press, the combination with a normally unyielding bolster and the ram of a press, of means to resist breaking down of the press under abnormal pressure between said bolster and ram and comprising fluid pressure operated bolster supporting means for unyieldingly supporting the bolster in fixed position against a predetermined maximum pressure, but capable of yielding under the influence of an abnormal pressure in excess of said predetermined maximum pressure, said pressure operated means having a pressure gauge associated therewith and indicating the pressure applied to the bolster.

5. In a power press, the combination with a normally unyielding bolster and the ram of a press, of bolster supporting mechanism for normally unyieldingly holding said bolster in fixed position and including force multiplying levers, fluid pressure cushioning members and operative connections between said fluid pressure cushioning members and force multiplying levers, said fluid pressure cushioning members acting to permit the bolster to yield under the influence of abnormal pressure thereon by the ram in excess of a maximum predetermined pressure.

6. In a power press, the combination with a normally unyielding bolster and the ram of a press, of bolster supporting uprights, force multiplying levers supportingly engaging said uprights, fluid pressure cushioning members, operative connections between said fluid pressure cushioning member and force multiplying levers and an abutment member for said bolster, said fluid pressure cushioning members operating to unyieldingly hold said bolster up in fixed position against said abutment member against a maximum predetermined downward pressure thereon.

7. In a power press, the combination with the ram, bolster and pressure pad of a press, of combined bolster and pressure pad supporting members, comprising levers operatively connected to the bolster, and fluid pressure members having elements engaging the pressure pad and other elements operatively connected to said levers, and an abutment for said bolster, said fluid pressure members operating to yieldingly support the pressure pad against a predetermined downward pressure, and operating to support the bolster against a higher predetermined downward pressure.

8. In a power press, the combination with the ram, bolster and pressure pad of a press, of combined bolster and pressure pad supporting members, comprising upright bolster supports, levers supportingly engaging said supports, and fluid pressure members having elements engaging the pressure pad and other elements operatively connected to said levers, and an abutment for said bol-

ster, said pressure members operating to yieldingly support the pressure pad against a predetermined downward pressure, and operating to support the bolster against a higher predetermined downward pressure.

9. In a power press, the combination with the ram, bolster and pressure pad of a press, of combined bolster and pressure pad supporting members, comprising upright bolster supports, rack bars thereon, levers having gear segments meshing with said racks, fluid pressure members having elements supportingly engaging said levers, and an abutment for said bolster, said fluid pressure members operating to yieldingly support said pressure pad against a predetermined pressure, and operating to support said bolster against a higher predetermined downward pressure.

10. In a power press, the combination with the ram, bolster and pressure pad of a press, of combined bolster and pressure pad supporting members, comprising upright bolster supports, levers supportingly engaging said supports, fluid presure cylinders supportingly engaging said pressure pad, pistons in said cylinders and stems for said pistons, a floating platform secured to said piston stems and operatively connected to said levers, an abutment for said bolster, and means for supplying fluid under pressure to said cylinders.

11. In a power press, the combination with the ram, bolster and pressure pad of a press, of combined bolster and pressure pad supporting members, comprising upright bolster supports, rack bars on said supports, levers having gear segments thereon meshing with said rack bars, fluid pressure cylinders supportingly engaging said pressure pad, pistons in said cylinders and stems for said pistons, a floating platform secured to said piston stems and operatively connected to said levers, an abutment for said bolster, and means for supplying fluid under pressure to said cylinders.

12. In a power press, the combination with the ram, bolster and pressure pad of a press, of combined bolster and pressure pad supporting members, comprising stationarily supported brackets, levers fulcrumed on said brackets and supportingly engaging said supports, a floating platform to which said levers are operatively connected, fluid pressure members, having elements yieldingly supporting said pressure pad and other elements secured to said platform, and an abutment member for said bolster, said pressure members operating to yieldingly support said pressure pad against a predetermined downward pressure and operating to support said bolster against a higher predetermined downward pressure.

13. In a power press, the combination with the ram, bolster and pressure pad of a press, of combined bolster and pressure pad supporting means, comprising fluid pressure cylinders and pistons therein, power multiplying connections between the pistons and bolster, constructed and arranged to support said bolster against a predetermined downward pressure thereon, said cylinders being normally arranged to yieldingly support said pressure pad against a predetermined downward pressure, and having means arranged to transfer pressure from the pressure pad to the bolster, and means for supplying fluid under pressure to said pressure cylinders.

14. In a power press, the combination of the ram, bolster and pressure pad of a press, of cushioning means for the bolster and pressure pad, comprising fluid pressure members, each having two movable elements, one element thereof being provided with means for engagement with the pressure pad and the other element being provided with power multiplying means connected with the bolster for permitting the bolster to yield under abnormal pressure.

15. In a power press, the combination with the ram, bolster and pressure pad of a press, of fluid pressure operated cushioning means for the bolster and pressure pad, comprising fluid pressure members having power multiplying connections with the bolster and direct connections with the pressure pad for permitting the bolster to yield under abnormal pressure, and means for supplying fluid under pressure to said pressure members.

16. In a power press, the combination with the ram, bolster and pressure pad of a press, of fluid pressure operated cushioning means for the bolster and pressure pad, comprising fluid pressure members, having power multiplying connections with the bolster, and operative connections with the pressure pad for permitting the bolster to yield under abnormal pressure and means for separately supplying the individual pressure members with fluid under pressure.

17. In a power press, the combination with the ram, bolster and pressure pad of a press, of fluid pressure operated cushioning means for the bolster and pressure pad, comprising pressure members, arranged in groups and having power multiplying connections with the bolster and operative connections with the pressure pad for permitting the bolster to yield under abnormal pressure and means for separately supplying the groups of pressure members with fluid under pressure.

18. In a power press, the combination with a normally unyielding bolster and the ram of a press, of fluid pressure operated cushioning means for unyieldingly holding the bolster in fixed operative position against a maximum predetermined pressure and permitting it to yield under abnormal pressure, and parallel movement mechanism connected

to said bolster and operating to guide movement thereof in parallel lines.

19. In a power press, the combination with a normally unyielding bolster and the ram of a press, of fluid pressure operated cushioning means for unyieldingly holding said bolster in fixed operative position against a maximum predetermined pressure and permitting it to yield under abnormal pressure, and guiding means associated with said bolster operating to guide the same to move in parallel lines.

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