

Feb. 25, 1941.

R. W. GLASNER

2,233,164

PRESS

Filed June 13, 1938

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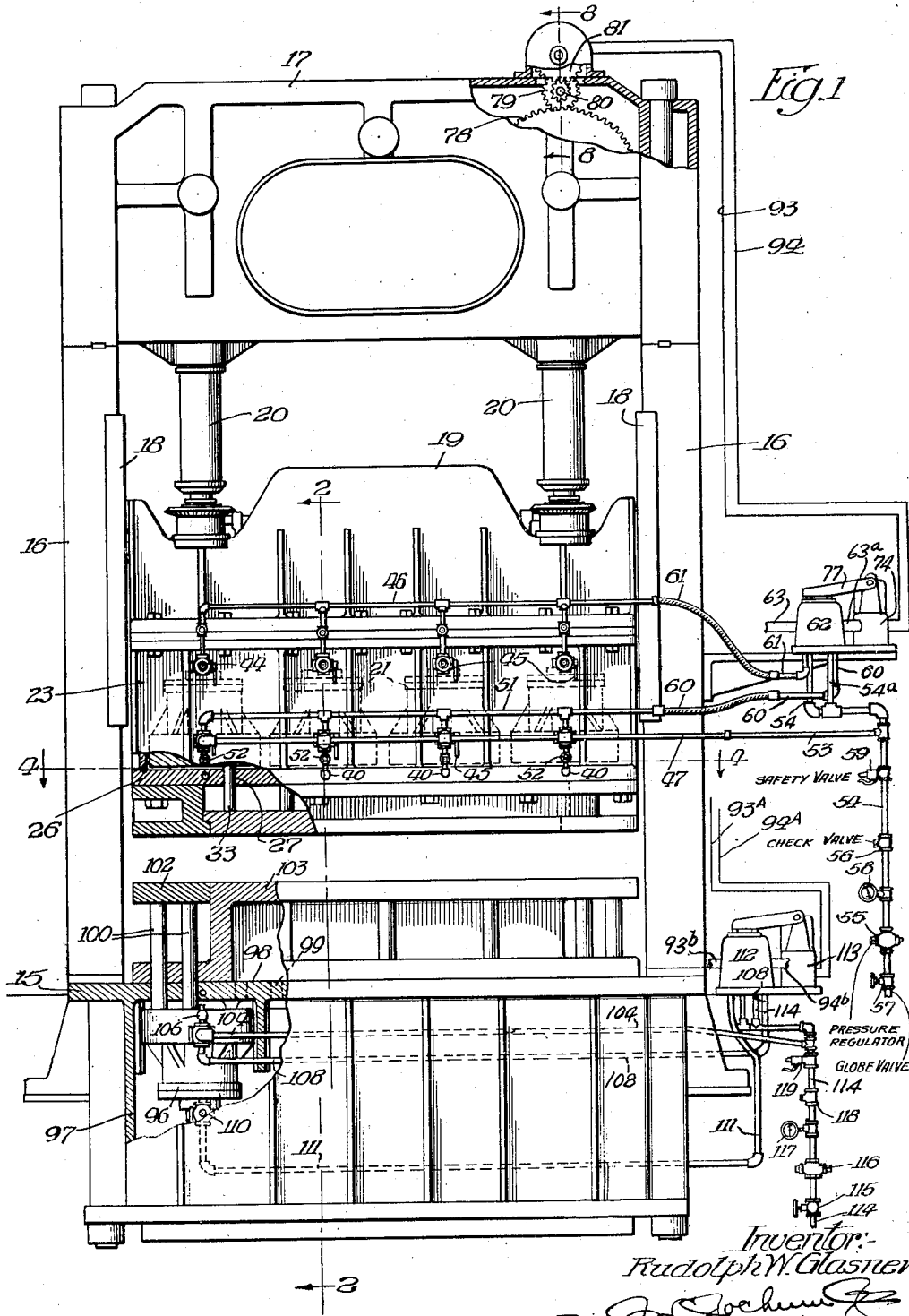


Fig. 1

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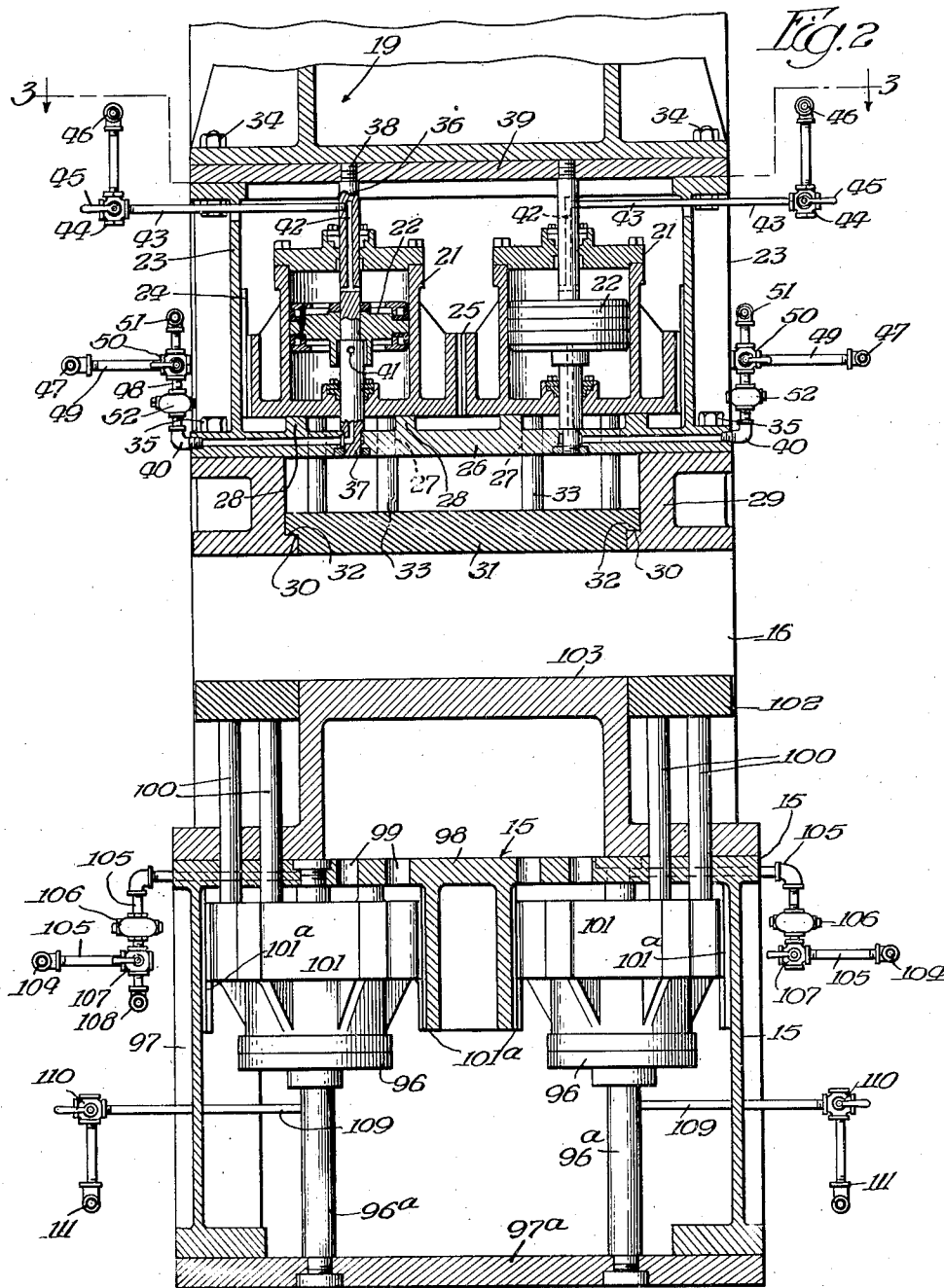
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Fig. 3.

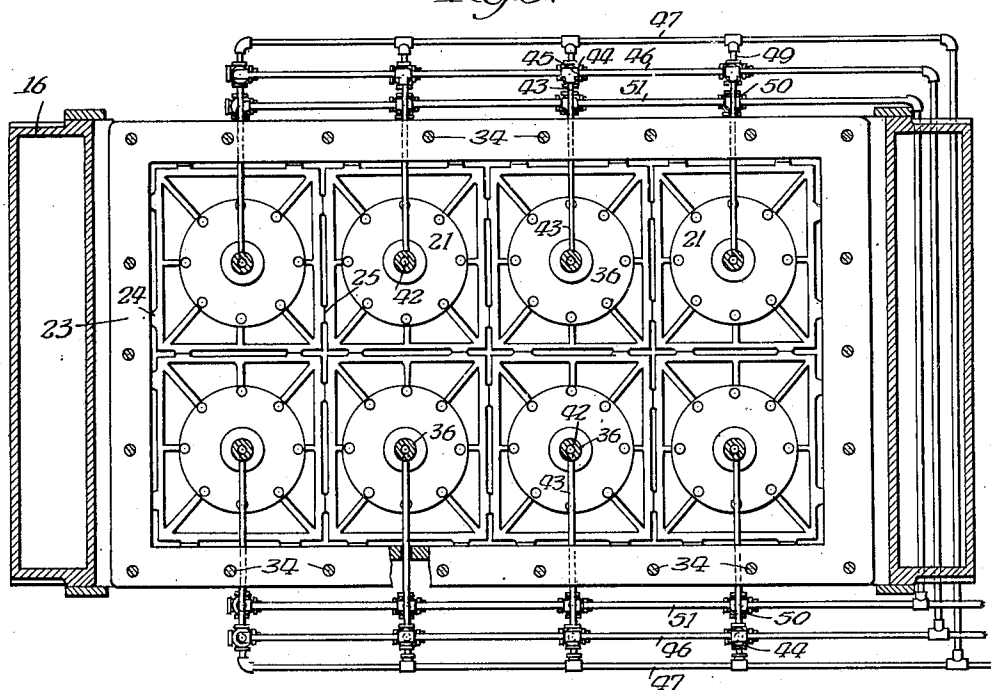
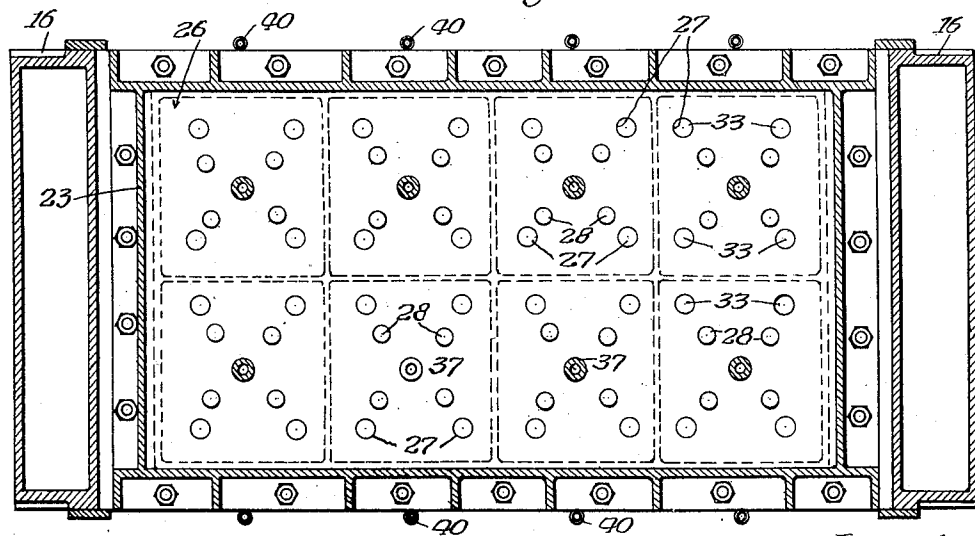


Fig. 4



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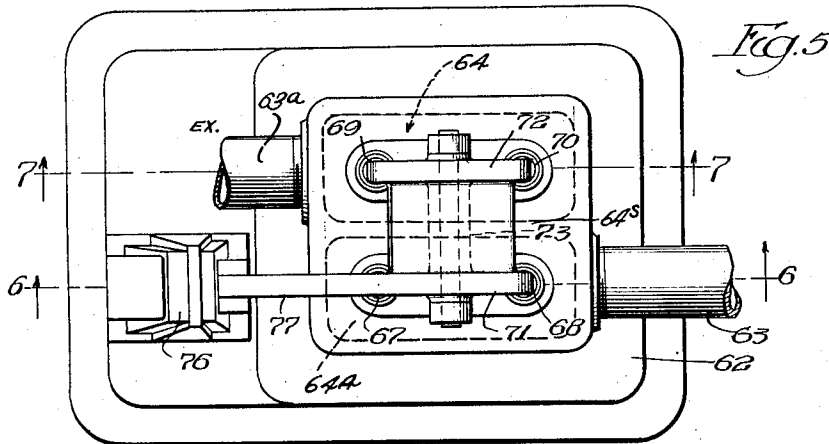


Fig. 5

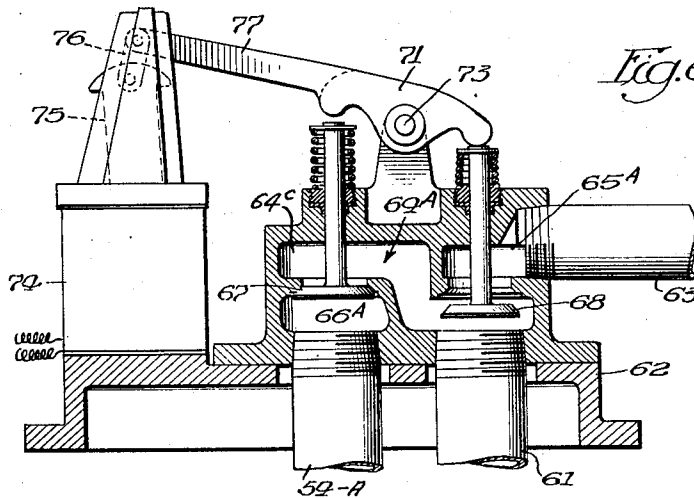


Fig. 6

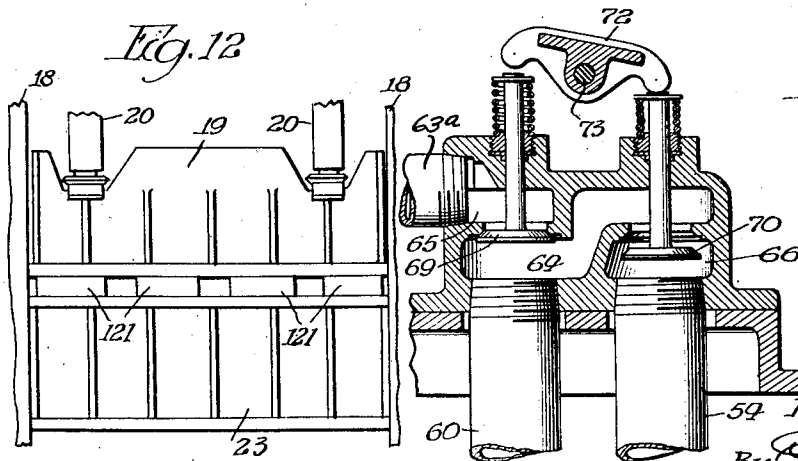
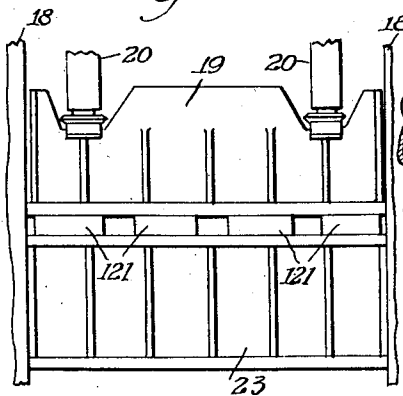


Fig. 7

Fig. 12



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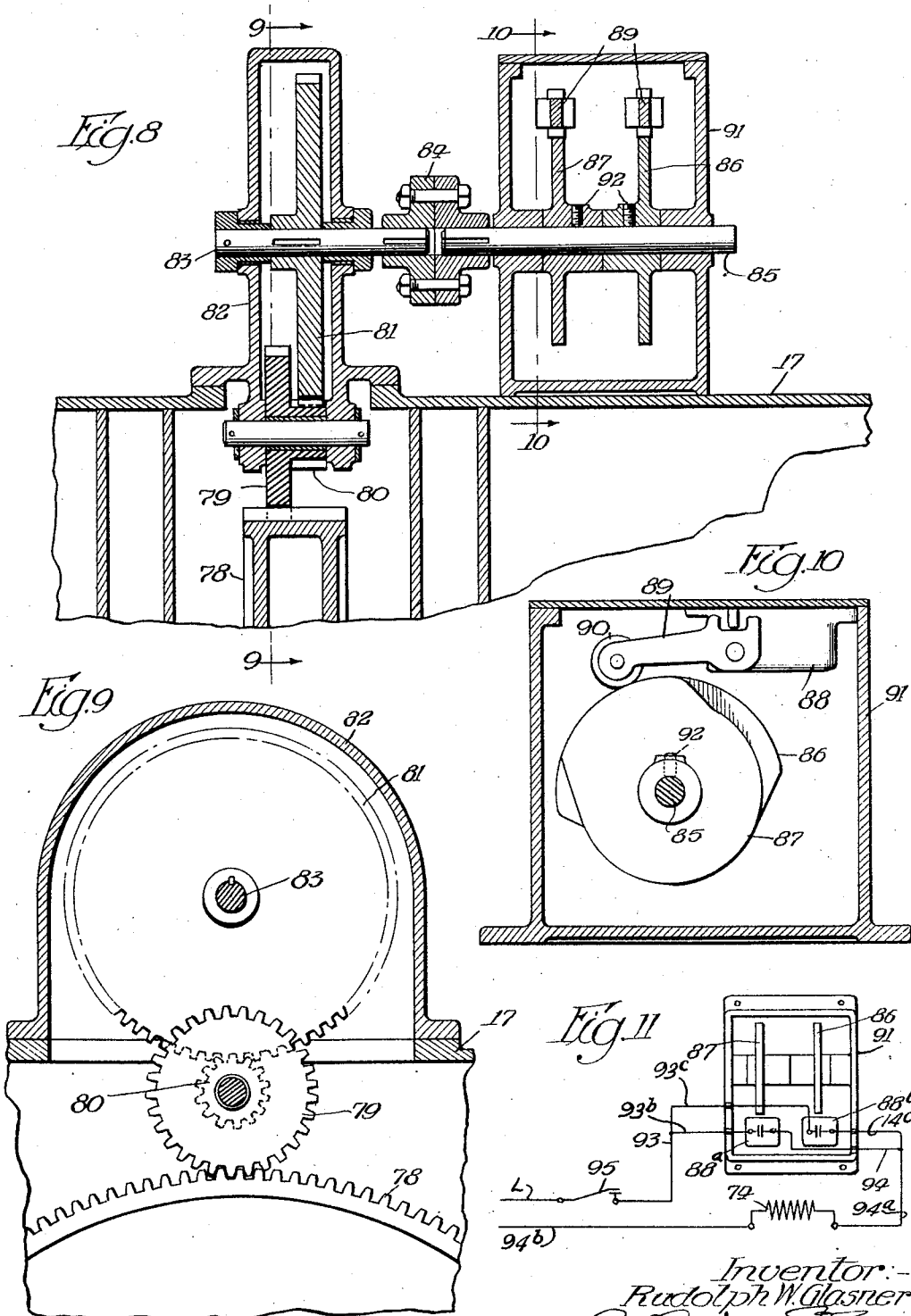
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2,233,164

PRESS

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UNITED STATES PATENT OFFICE

2,233,164

PRESS

Rudolph W. Glasner, Chicago, Ill.

Application June 13, 1938, Serial No. 213,363

6 Claims. (Cl. 113—38)

This invention relates to improvements in presses particularly adapted, though not necessarily limited in use for shaping sheet metal, and one of the objects of the invention is to provide a press slide having cushioning means carried by the slide, and which cushioning means is provided with a large unobstructed surface on the under side of the slide for die pressure pins for the upper die part, adapting the die pins to be selectively located over the entire, or over any selected portion or area, of the surface of the slide, and in any predetermined position in accordance with the particular operation to be performed or the work to be operated upon.

A further object is to provide a press slide in which the pressure surface is divided into or provided with a number of separate cushion compartments, each of the cushions being arranged and operating to exert pressure against predetermined pins or sets of pins, during different parts of the cycle of operation of the press, whereby certain of the cushions may be caused to operate to maintain a steady pressure during the entire stroke of the slide, whereas others of the cushions may be caused to operate as knock-outs at the end of the stroke, while the pressure of the cushions against the die pins during the remaining portion of the stroke may be relieved.

Furthermore, the cushions on one portion of the slide may be employed for one purpose while the cushions on another portion of the slide may be used for another purpose.

A further object is to provide in a press of this character a large slide with a practically unobstructed large surface or area adaptable for use in connection with pressure pins.

A still further object is to provide cushioning means of this character constructed as a unitary structure preferably of substantially box-like formation, adapted to be readily attached to the slide and to be as readily removed therefrom as a unit, and which cushioning means will not interfere with the regular function and operation of the power press, the cushioning means being readily adapted for use in all presses of a similar size.

A further object is to provide a cushioned box-like structure of this character which in its entirety may be raised or lowered to increase or decrease the fixed working height between the slide and the bed of the press.

A further object is to provide a cushioned box-like structure of this character which can be used for the same purposes and in the same man-

ner as the slide itself, without necessitating the removal of the structure from the slide.

A further object is to provide cushioning mechanism of this character in which the cushioning elements with which the pins contact will be guided in their movement and will be maintained against tilting regardless as to whether the pins are centrally located or not.

A further object is to provide in a press of this character a bed in which a plate is employed which itself is provided with a large unobstructed area in which openings are provided for the reception of die pins, and which bed is also provided with separate cushioning means adapted to be selectively controlled to obtain uniform or different pressures throughout such area, adapting the cushions in another portion to be employed for a different purpose or for exerting different pressures at different areas in the bed.

A further object is to provide improved means whereby the operation of the various cushions may be selectively controlled.

To the attainment of these ends and the accomplishment of other new and useful results, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrative of this invention, and in which

Figure 1 is a view partly in elevation, partly broken away and partly in section of a press of this character constructed in accordance with the principles of this invention.

Figure 2 is a detail vertical sectional view, on an enlarged scale, taken on line 2—2, Figure 1.

Figure 3 is a detail horizontal sectional view taken on line 3—3, Figure 2.

Figure 4 is a detail horizontal sectional view taken on line 4—4, Figure 1.

Figure 5 is a detail top plan view, on an enlarged scale of the solenoid control valve mechanism.

Figure 6 is a detail sectional view taken on line 6—6, Figure 5.

Figure 7 is a detail sectional view taken on line 7—7, Figure 5.

Figure 8 is a detail vertical sectional view, on an enlarged scale, taken on line 8—8, Figure 1.

Figure 9 is a detail vertical sectional view taken on line 9—9, Figure 8.

Figure 10 is a detail vertical sectional view taken on line 10—10, Figure 8.

Figure 11 is a diagrammatic view of a wiring diagram.

Figure 12 is a diagrammatic view of the slide of the press and of the cushion box structure secured thereto with spaces therebetween, whereby the cushion structure may be raised or lowered with respect to the slide.

In the present exemplification of this invention the cushioning units each embody two members movable relatively one toward and away from the other, such relative movement being influenced by fluid pressure, and throughout the claims the movable member will be designated as a piston, while the other co-operating member will be designated as a cylinder, which term of piston is to be construed broadly to include any form of movable member against which the pin elements that pass through the holes in the apertured plate operate, whether the piston itself operates within or outside of the cylinder member.

In the drawings the press frame consists essentially of a bed 15 suitably supported, and projecting above the bed are uprights 16 connected by a crown 17, and mounted to slide upon guides 18 supported by the uprights 16 is a slide 19, motion being imparted to the slide by means of members 20 connected to the operating mechanism which is arranged within the crown and which slide operating mechanism receives its motion from any suitable source of power, all well known in this art.

Carried by the slide 19 is a cushioning mechanism which in the present exemplification of this invention embodies a plurality of cushioning elements each comprising a cylinder 21 and a piston 22. These elements are arranged in a box-like structure or compartment designated generally by the reference numeral 23 and the cylinders, any number of which may be provided, preferably a large number, are housed within this structure, the movable element of the cylinder and piston construction being guided by means of suitable guides 24—25 so as to maintain them against tilting movement regardless as to the point at which the pressure of the die pins is exerted, that is whether such pressure is exerted at the central portion or to one side of the center.

The bottom wall of the compartment member is formed of a plate 26 provided with a large number of openings 27 therethrough, as shown more clearly in Figure 4, and which plate provides a very large and substantially unobstructed surface. The openings 27 are arranged over a large area so that the die pressure pins may be placed over substantially the entire surface of the slide to accommodate any size of die, and if desired the plate 26 may be provided on its upper surface with lugs or projections 28 which form abutments for the piston element to arrest its movement.

Carried by the plate 26 and projecting therebelow is a supporting element 29 provided with shoulders 30 against which a die carrying plate 31 is adapted to abut to limit its movement in one direction; the plate 31 being preferably provided with shoulders 32 to engage the shoulders 30.

Interposed between the plate 31 and the cylinder elements 21 are die pressure pins 33, any number of which may be provided, and these pins 33 at one end abut the plate 31 and pass freely through the openings 27 in the plate 26 and at the other ends abut the piston cylinder 21.

The cushioning element in which the cylinders and piston elements are housed constitute

a unitary structure and is secured to the slide 19 in any suitable manner, preferably by means of fastening bolts 34, thereby adapting the same to be bodily removed as a unit from the slide and as readily attached thereto.

The member or element 29 may be secured to the plate 26 in any suitable manner so as to be removed therefrom, such as by means of bolts 35.

In the present exemplification of the invention and as before stated, the cylinders 21 constitute the movable element and the piston 22 is anchored against movement in any suitable manner such as by means of a rod or member 36 to which the piston 22 is secured. This member 36 is anchored at its lower end as at 37 to the plate 26 and at its upper end as at 38, to the top member 39 of the box or chamber in which the cushioning elements are located.

In order to exert fluid pressure against the plate 31 to resist its movement by its operation upon the work, and when the slide 19 is lowered, fluid pressure from any suitable source is directed through the pipe 40 beneath the piston 22 being discharged through an opening 41 in the piston rod 36. The air or fluid on the other side of the element 22, when the element 21 is lowered will be discharged through a passage 42 into a pipe 43 and may be permitted to escape to the atmosphere through an outlet 44 controlled by a valve 45.

One group of cylinders 21 may be all connected to a common pipe or member 46 at the top of the cylinders, and a control valve 45 may be provided for each of the cylinders. Similarly all of the pipes 40 leading to the bottom of the cylinders of one group may be connected to a common fluid pressure supply pipe 47, through branches 48—49, and a control valve 50 may be provided for each of the cylinders for controlling or cutting them out from the supply of fluid, when desired.

If all of these valves 50 are open to the cylinders the fluid will flow from the source of supply into all of the cylinders, but any one or more of the valves 50 may be set to prevent the fluid pressure from entering the respective cylinders.

A pipe 51 is also connected to pipes 40 through the medium of said branch pipes 48—49 forming (see particularly Fig. 2) an escape for the fluid from the bottom of the cylinders.

The pipe 51 as well as the pipe 49 that leads from the supply pipe 47 are both controlled by the valve 50. That is, when the valve is set to permit the fluid pressure to flow into the cylinder below the piston, the pipe 51 will be closed with respect to the cylinder. When, however, the valve 50 is set to establish communication between the pipe 51 and the cylinder, the supply of fluid pressure from the pipe 47 to the cylinder will be cut off. The pipe 51 is merely an escape pipe for the fluid from the cylinder.

If the valve 50 should be allowed to remain open, that is, to establish communication between the cylinder and the atmosphere, the only thing that would happen during the relative movements of the cylinder 21 and the piston 22 is that atmospheric air would be sucked into the cylinder and then discharged therefrom.

Arranged in each of the branch pipes 48—49 is a fluid pressure regulator 52 adapted to be set so as to obtain the desired fluid pressure in the respective cylinders, and by so adjusting or setting these pressure regulators, which may be of the ordinary and well known construction, it will

be manifest that the fluid pressure in the cylinders may be regulated so that there will be a uniform fluid pressure throughout the group, or if desired, different pressures may be obtained in predetermined ones of the cylinders.

The supply pipes 47 are connected by means of a pipe 53 to a pipe 54 which leads from the common source of fluid pressure supply. This pressure is controlled in any suitable manner such as by means of a pressure regulator 55, and in the pipe 52 may also be arranged suitable valve mechanism such as a check valve 56, a globe valve 57, and a pressure gauge 58 as well as a safety valve 59.

The supply pipe 54 is connected to the pipe 47 through the medium of the pipe 53 so that fluid pressure flowing in from the supply line 54 will enter the bottom of the cylinders to force the cylinders and the plate 31 downwardly with respect to the slide, the pressure in the cylinders being controlled by the pressure regulator valves 52.

The pipe 51 is connected by means of a pipe 60 which leads to the solenoid controlled valve.

The pipe 46 leading from the top of the cylinders is connected by means of a pipe 61 to a solenoid controlled valve mechanism 62 and leading from the solenoid controlled valve is an exhaust pipe 63.

The valve mechanism 62 as well as the control solenoid 74 (the latter to be referred to) is of a unitary construction and constitutes no part of the present invention, but is obtained by the applicant in the open market and installed as a unit in the present mechanism.

However, no particular form of such valve mechanism is necessary as any other suitable valve and control therefor which will perform and accomplish the desired results, may be employed. In order therefore to convey a complete understanding of the operation of the parts of the press mechanism with which this valve and control unit is employed, a brief description thereof will be given.

These pipes and passages are so arranged that by the operation of the solenoid valve which may be a four-way valve or a valve of any suitable construction, at a predetermined time in the operation of the press the fluid under pressure will be discharged into the bottom of the cylinders to force them downwardly and the air on the other side of the piston will be permitted to escape through the pipe 46 so as not to interfere with the operation of the cylinder.

As before stated, any one or more of the cylinders may be cut out so that the supply of fluid under pressure will not enter the particular cylinders, by the adjustment of the respective valves 50. Similarly by setting the pressure regulator valve 52 for predetermined pressures the same or different pressures may be obtained in the various cylinders.

The pipe 60 is also connected to the solenoid valve 62. In order, therefore, to control the supply of fluid to and exhaust of the fluid from the cylinders 21 it is only necessary to control the valve 62. Any form of valve control for this purpose may be employed but a simple and efficient valve embodies a valve casing having passages therein separated by a wall 64C. On one side of this wall are passages 64-65-66, and on the opposite side of this wall are passages 64A-65A-66A. Pipe 54 communicates with passage 66, pipe 60 communicates with passage 64 and pipe 63 communicates with passage 65 all on the same side of the wall 64C.

On the other side of this wall pipe 54A communicates with passage 66A, while pipe 61 communicates with passage 64A and the pipe 63 communicates with passage 65A.

Valve devices 67-68-69-70 control communicating openings between these passages and these valve devices are preferably spring controlled.

Actuating members 71-72 are mounted to rock upon a pivot 73 in such manner that when the members 71-72 are rocked the respective valves will be opened and permitted to close.

When the valves 67-70 controlling the inlet of a fluid pressure leading to the bottom of the cylinder are properly positioned, the fluid pressure will flow into the cylinder through the pipe 60, to cause a relative movement between the cylinders and pistons, and at the same time the exhaust valve 68 will be opened to permit the escape of fluid from the other side of the piston through chamber 65A and pipe 63. When the opening of these valves is reversed, fluid will be permitted to escape from the bottom side of the piston through pipe 60, chamber 64, past valve 69, through chamber 65, pipe 63A to the atmosphere, and fluid will be permitted to enter on the top side of the piston from pipe 54A, chamber 66A, past valve 67, chamber 64A and pipe 61 so as to move the cylinder in the opposite direction to assist in raising the cylinders to relieve the pressure on the plate 31. This mechanism, however, is well known in this art.

To control the flow of the fluid through this control valve it is only necessary to actuate or rock the members 71-72 and this may be accomplished by means of a solenoid 74, the armature 75 of which may be connected by means of a link 76 to an arm 77 connected to one of the members 71-72.

The solenoid is controlled from a moving part of the press mechanism preferably from one of the operating gears 78, that is arranged within the crown 17 of the press. This gear 78 meshes with an idler gear 79 having a pinion 80 connected thereto for rotation therewith and this pinion 80 in turn meshes with a gear 81 arranged in a suitable housing 82 mounted upon any suitable portion of the press.

The gear 81 is connected to a shaft 83 suitably supported and this shaft in turn through the medium of suitable coupling 84 is connected to a shaft 85 upon which latter cam devices 86-87 are secured for rotation therewith. These cam devices 86-87 control suitable switch mechanism diagrammatically illustrated and indicated by the reference numeral 88, and the switch devices 88 are preferably of the normally closed type, of any well known construction, and embody actuating arms 89 each of which carries a roller 90 that is adapted to contact the periphery of the respective cams 86-87. The switch mechanism and the cam devices are preferably located within an enclosing housing 91.

As the cams are rotated they will actuate the respective arms 89 and the cams may be set at any desired position with respect to each other and rotatably adjusted about the shaft 85 in any suitable manner, being preferably held in their adjusted or set positions by means of fastening devices 92 such as screws or the like.

These cams should be set to energize and de-energize the solenoid at any desired times or points in the cycle of operation of the press. The setting of the cams determines the position of the pressure pad relative to the position of the

slide and should it be desired to vary the time of operation of the switch devices by the cams, it is only necessary to advance or retard the cams by loosening the fastening devices 92 and rotatably adjust the cams about the shaft 85 and secure them in their adjusted position.

By the provision of two switches 88 with a cam device for operating each switch, it is possible to vary the duration of time which the solenoid 74 will be energized, as it may be desired to vary the action of the cylinders with respect to the cycle of operation of the press.

By the provision of two cams it will be manifest that they may be rotatively displaced with respect to each other so as to selectively alter the time of their operation to actuate the respective switches. Each cam operates one of the arms 89 of the respective switches by reason of the cams engaging the rollers 90.

For instance when one cam (87) is set to the desired relative position with relation to the cam 86, (reference being had to the wiring diagram Figure 11) current will flow from the supply line L through the switch 95, thence through line 93, line 93B, through switch 88A, which will be in closed position by reason of the low portion of the cam being in contact with the roller 90, thence through line 94, line 94A, solenoid 74, back through line 94B.

Should the cam 86 be set with relation to the cam 87, so that it will operate its switch at the same time that the cam 87 operates its respective switch, the current will flow through both switches 88A and 88B.

Should, however, cam 86 be set so as to operate its switch 88B in advance of or later than the operation of the cam 87 of its switch 88A the current through the solenoid 74 will then be as follows: from line L through switch 95, line 93, line 93C, switch 88B, line 94C, line 94A, through solenoid 74 and back to line 94B.

When, however, one of the cams 86—87 operates to open one of the switches, the current will then flow through the other closed switch and maintain the solenoid 74 energized until the high portions of both cams open the respective switches. The solenoid will then be de-energized and the valve mechanism will be accordingly operated.

Should it be desired to extend, during the cycle of operation of the press, the time that the solenoid shall remain energized, it is only necessary to rotatively adjust the cams 86—87, one with respect to the other so that the low portions of the cams will operate for the desired length of time on the rollers 90 of the switch arms 89 before the high portions of the cams operate upon the switches.

The switch devices control the solenoid 74 through the conductors 93—94 and the circuit through these conductors may be controlled by a suitable switch device 95 preferably in the form of a push button.

Thus it will be seen by setting the cams 86—87 and when the press is in operation the flow of the fluid under pressure to the cylinders will be controlled.

The fluid pressure regulating devices 52 being set, the action of the cylinders themselves will be controlled with the result that any one or more of the cylinder devices may be rendered active or inactive and varying pressures may be provided in the different cylinders according to the nature of the work to be performed and the work being operated upon.

In the bed 15 of the press, cushioning devices 96 similar to the cushioning devices on the slide may be provided and these cushioning devices 96 may be arranged in a housing or box-like construction 97, one wall 98 of which is provided with a large number of openings 99 (see particularly Figure 2) through which pressure pins 100 loosely pass and are so positioned that any number of pins may be employed according to the area or size of the work holder. In Figure 2 the die 103 extends over some of these openings, but it is to be understood that the openings shown as being covered by this die are for use when this particular die is removed and a smaller die and larger holder are employed. These pins engage 15 and rest upon the movable element 101 of the cushioning devices 96 and support a work clamping or holding member 102. The work holding member 102 co-operates with a die 103 mounted upon the press bed and also with the member or element 29 which is carried by the slide, for clamping and holding the work therebetween while it is being formed over the die 103 by the die carried by the member 31.

The bed of the press is divided into a number of compartments or chambers in which the movable elements 101 are located and suitable guiding means 101a may be provided for guiding the movable element 101 and for preventing the same from tilting in the event that pressure should be applied thereto to one side of the center. The stationary element, in this instance the piston, of the cushioning devices is anchored to the base 97 of the chamber or box-like construction in which the cushioning elements are arranged, by means of anchor members 96a to which the pistons are connected.

Fluid pressure is supplied to the cushioning devices 96 in a manner similar to the manner in which it is supplied to the cylinders 21. That is, by means of a pipe 104 leading from the source of fluid pressure supply. Leading from the pipe 104 are branch pipes 105 which discharge into the top of the cushioning device 101, and pressure regulating valves 106 may be provided in the branch pipes and are individual to the cylinders for controlling or regulating the pressure therein. Control valves 107 serve the purpose of cutting off the respective cylinders when it is desired to render such cylinders inactive and an exhaust outlet pipe 108 is controlled by the valve 107.

Leading to the cylinders 96 on the other side of the piston is a pipe 109 having a control valve 110 for each of the cylinders and this control valve 110 in turn controls an exhaust outlet pipe 111.

The supply of fluid to the cushions in the bed of the press is controlled by an operating or control valve 112 which may be similar in construction to the valve 62 that controls the cylinders on the slide and this valve 112 is operated by a solenoid 113, and pipes 93b and 94b for the valve 112 correspond to the pipes 63 and 63a of the valve mechanism 62. This valve and control unit 112—113, like the valve and control unit 62—74, constitute no part of the present invention and is also obtained by the applicant in the open market and installed as a unit in the present press mechanism.

The supply line 114 may be the same as the line 54 or if desired a separate line, and in this line 114 if a separate line, may be arranged a globe valve 115, a pressure regulator 116, a pressure gauge 117, a check valve 118, and a safety valve 119.

The pipe 111 leading from the cylinder below the piston is connected to the valve 112 while the pipe 104 leading from the other side of the piston is connected to the supply line 114 and the pipe 108 is connected to the valve 112, and similarly an exhaust pipe leads from the control valve.

The solenoid 113 controlling the valve 112 may be operated by cam mechanism similar to the cam mechanism 86-87 and may be driven from the same or from a different part of the press.

With this construction, and if it is desired that the slide and bed cushions be timed together, only one of these control valve mechanisms will be necessary, whereas if it is desired that the cushions in the slide be timed differently from the cushions in the bed, and additional control valve mechanism as shown in the drawings may be provided. However, if two control valves are provided, one for the slide cushions and one for the bed cushion, one may be rendered inactive with respect to the other or the cushion in the bed may be timed differently from the cushions in the slide.

In Figure 12 there is diagrammatically illustrated the slide 19, and the cushioned box-like structure 23, with spacer blocks or members 121 therebetween all held in assembled relation in any desired or suitable manner, adapting the cushioned box-like structure to be raised or lowered in its entirety to increase or decrease the fixed working height between the slide 19 and the bed of the press. Obviously with such a construction the fluid pressure connections will be either flexible or made to accommodate the length to suit, by means of ordinary pipe unions or connections.

While the preferred form of the invention has been herein shown and described it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims without departing from the spirit of the invention.

What is claimed as new is:

1. In a press, a bed, a cushion slide reciprocal toward and away from the bed, the die supporting surface of the bed and the lower surface of the cushion slide being each provided with a large number of die pin receiving holes therethrough throughout the area thereof, and die pins adapted to be selectively positioned and being changeable respectively with relation to the holes in the bed and cushion slide whereby said pins will be directly engageable at different locations with one of the dies or work engaging members.

2. In a press, a bed, a cushion slide reciprocal toward and away from the bed, the die supporting surface of the bed and the lower surface of the cushion slide being each provided with a large number of die pin receiving holes therethrough throughout the area thereof, die pins adapted to be selectively positioned and being changeable respectively with relation to the holes in the bed and cushion slide whereby said pins will be directly engageable at different locations with one of the dies or work engaging members, and cushion elements in the bed and the cushion

slide, said elements cooperating with the respective die pins, said die pins being separate from the cushion elements.

3. In a press, a bed, a cushion slide reciprocal toward and away from the bed, the die supporting surface of the bed and the lower surface of the cushion slide being each provided with a large number of die pin receiving holes therethrough throughout the area thereof, and die pins adapted to be selectively positioned and being changeable respectively with relation to the holes in the bed and cushion slide, the cushion of the slide being of box-like construction attachable to and detachable from the slide in its entirety as a unitary structure.

4. In a press, a bed, a cushion slide reciprocal toward and away from the bed, the die supporting surface of the bed and the lower surface of the cushion slide being each provided with a large number of die pin receiving holes therethrough throughout the area thereof, die pins adapted to be selectively positioned and being changeable respectively with relation to the holes in the bed and cushion slide whereby said pins will be directly engageable at different locations with one of the dies or work engaging members, and cushion elements in the bed and the cushion slide, said elements cooperating with the respective die pins, said die pins being separate from the cushion elements, said die pins being freely removable while the cushion elements remain operatively mounted respectively with relation to the bed and cushion slide.

5. In a press, a bed, a cushion slide reciprocal toward and away from the bed, the die supporting surface of the bed and the lower surface of the cushion slide being each provided with a large number of die pin receiving holes therethrough throughout the area thereof, die pins adapted to be selectively positioned and being changeable respectively with relation to the holes in the bed and cushion slide whereby said pins will be directly engageable at different locations with one of the dies or work engaging members, cushion elements in the bed and the cushion slide, said elements cooperating with the respective die pins, said die pins being separate from the cushion elements, and means for selectively rendering said elements active or inactive.

6. In a press, a bed, a cushion slide reciprocal toward and away from the bed, the die supporting surface of the bed and the lower surface of the cushion slide being each provided with a large number of die pin receiving holes therethrough throughout the area thereof, die pins adapted to be selectively positioned and being changeable respectively with relation to the holes in the bed and cushion slide whereby said pins will be directly engageable at different locations with one of the dies or work engaging members, cushion elements in the bed and the cushion slide, said elements cooperating with the respective die pins, said die pins being separate from the cushion elements, and means for selectively rendering said elements active or inactive, the last recited means embodying valve mechanisms individual to the said cushion elements.

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