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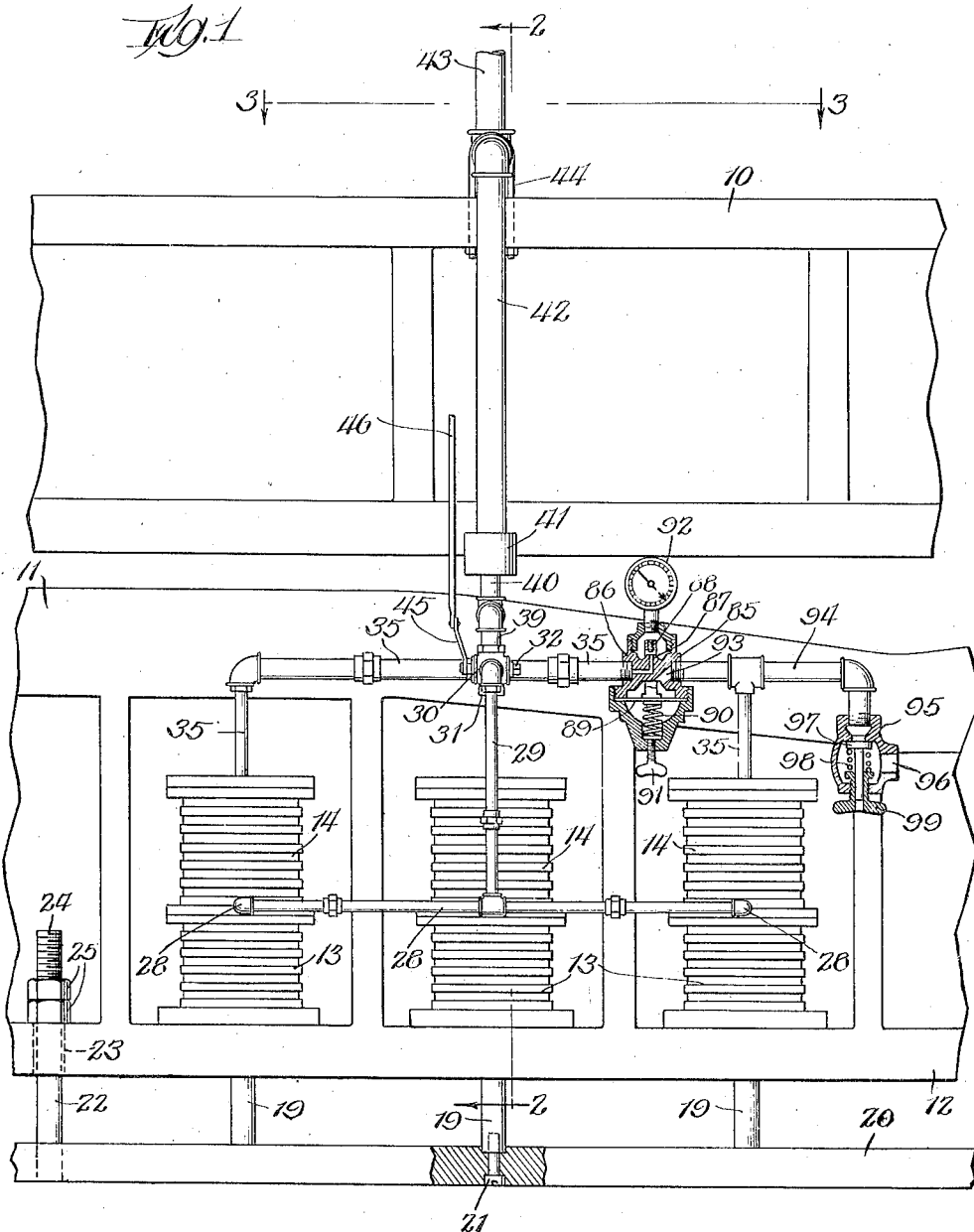
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R. W. GLASNER ET AL

BLANK HOLDER

Filed Feb. 18, 1922

6 Sheets-Sheet 1



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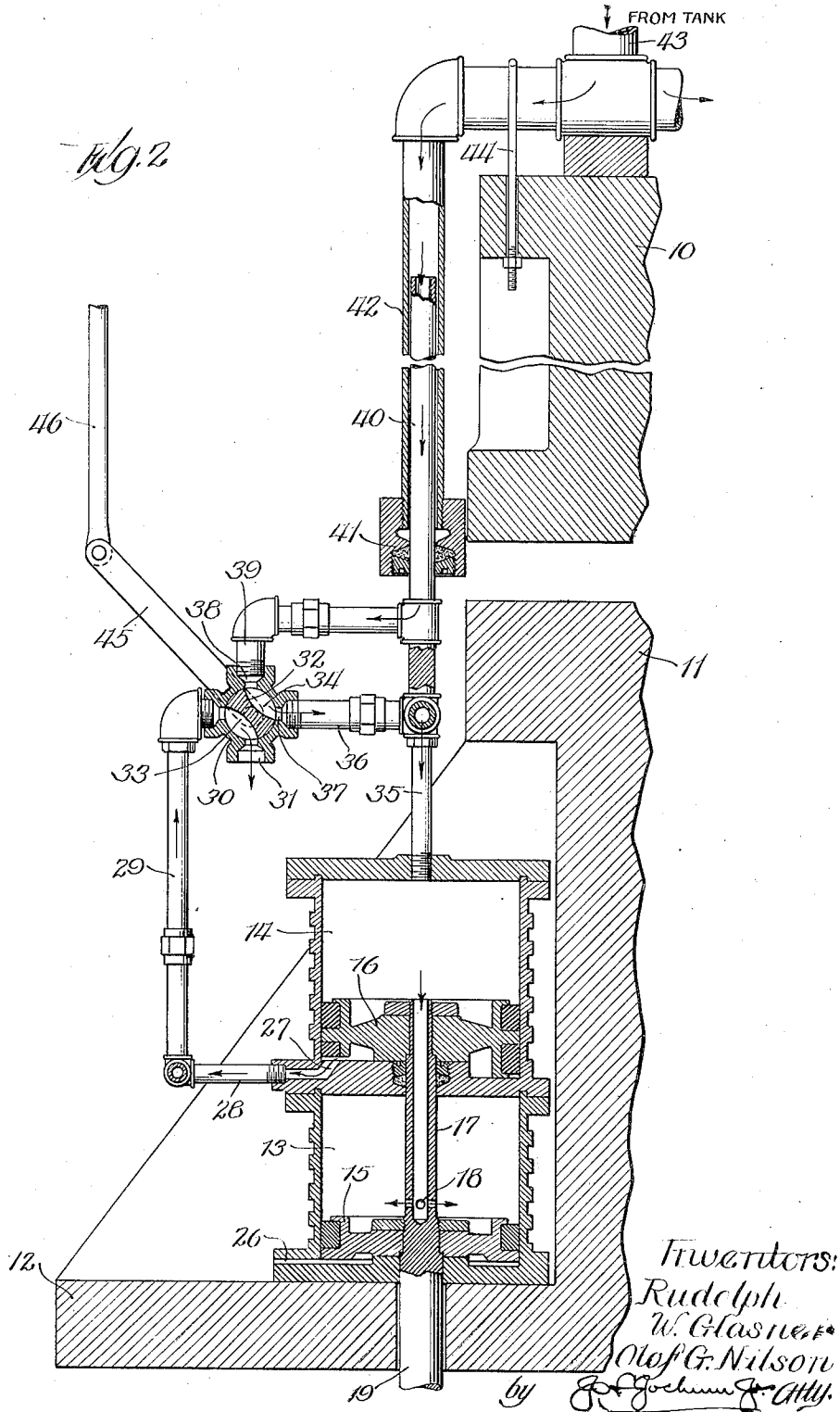
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BLANK HOLDER

Filed Feb. 18, 1922

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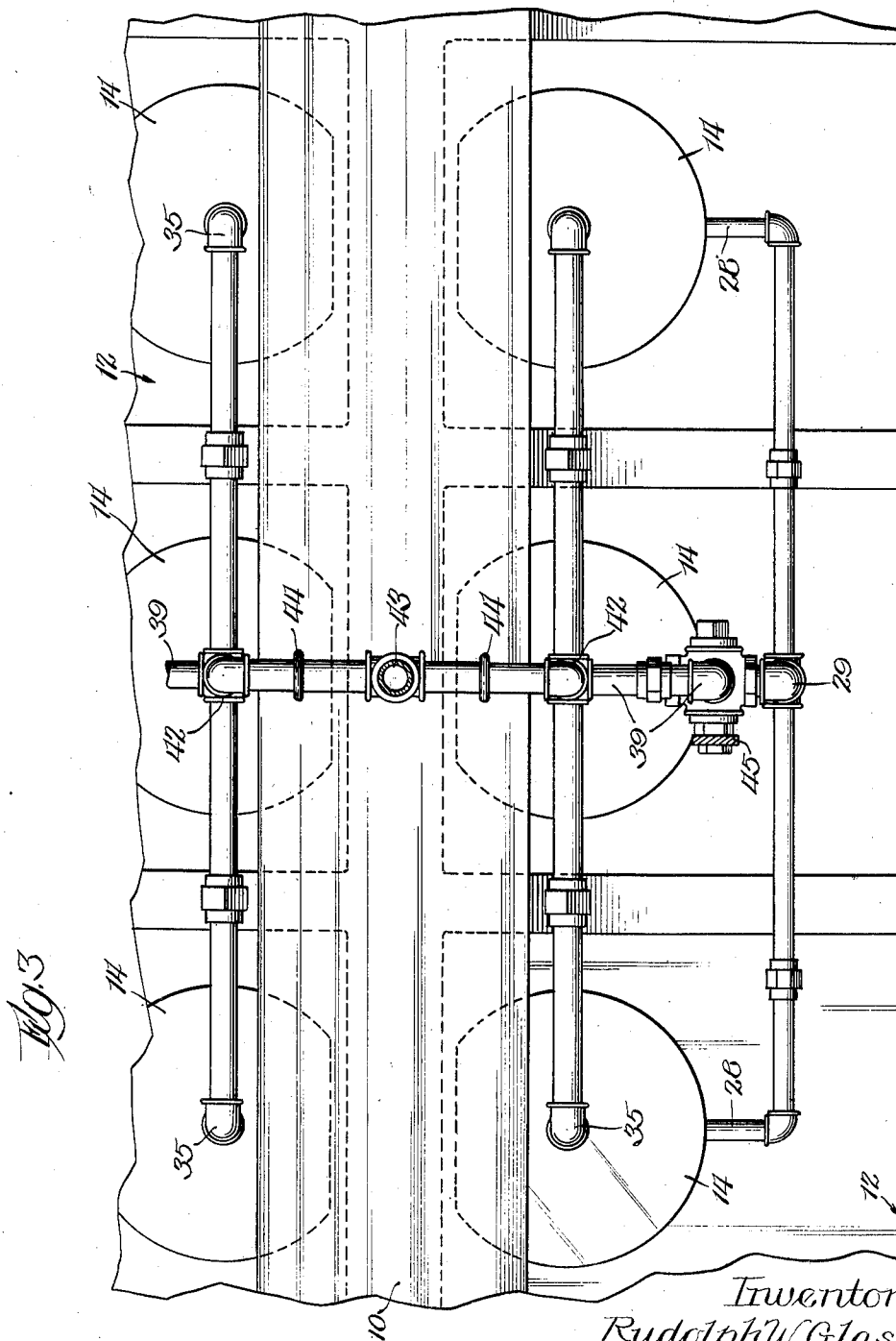
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BLANK HOLDER

Filed Feb. 18, 1922

6 Sheets-Sheet 3



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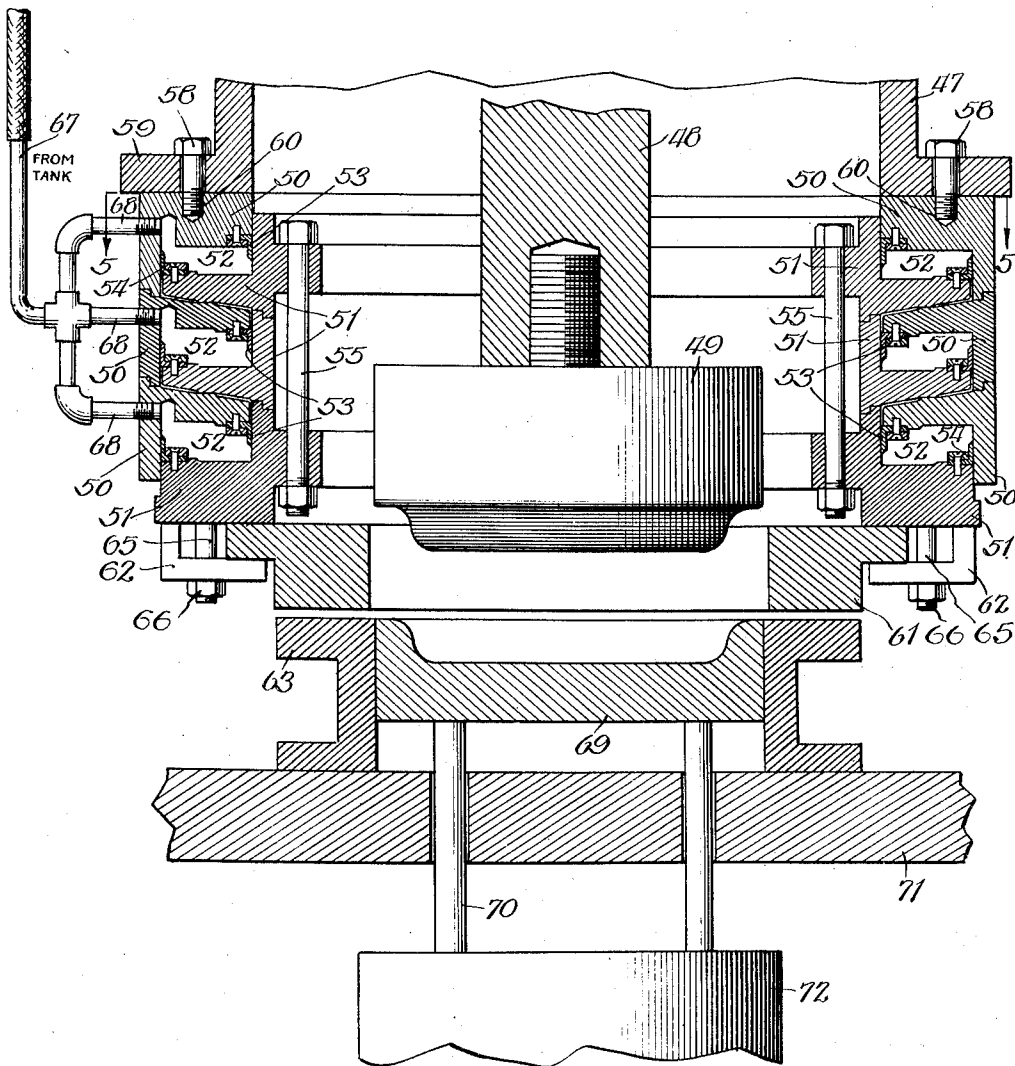
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BLANK HOLDER

Filed Feb. 18, 1922

6 Sheets-Sheet 4

Fig. 4



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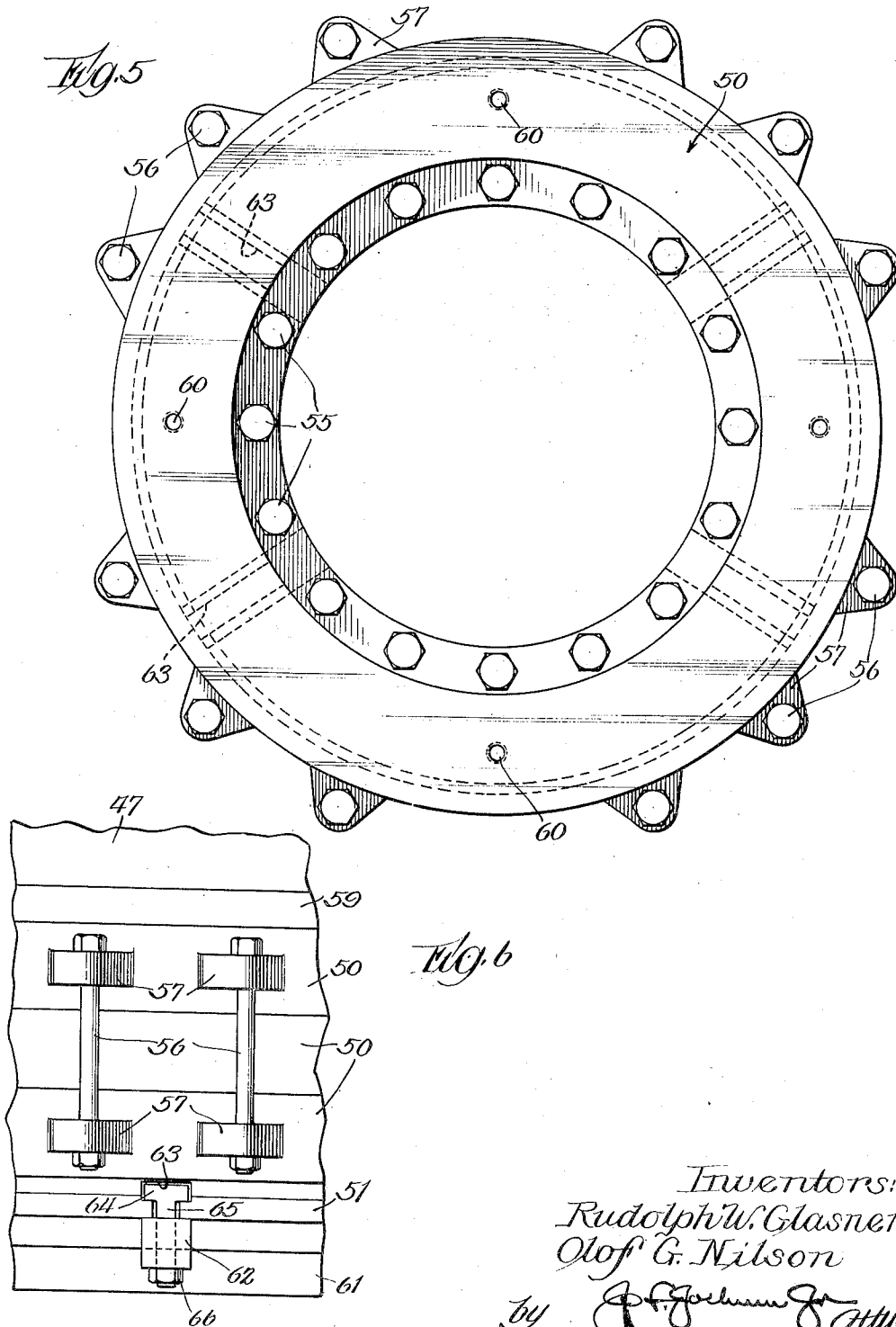
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BLANK HOLDER

Filed Feb. 18, 1922

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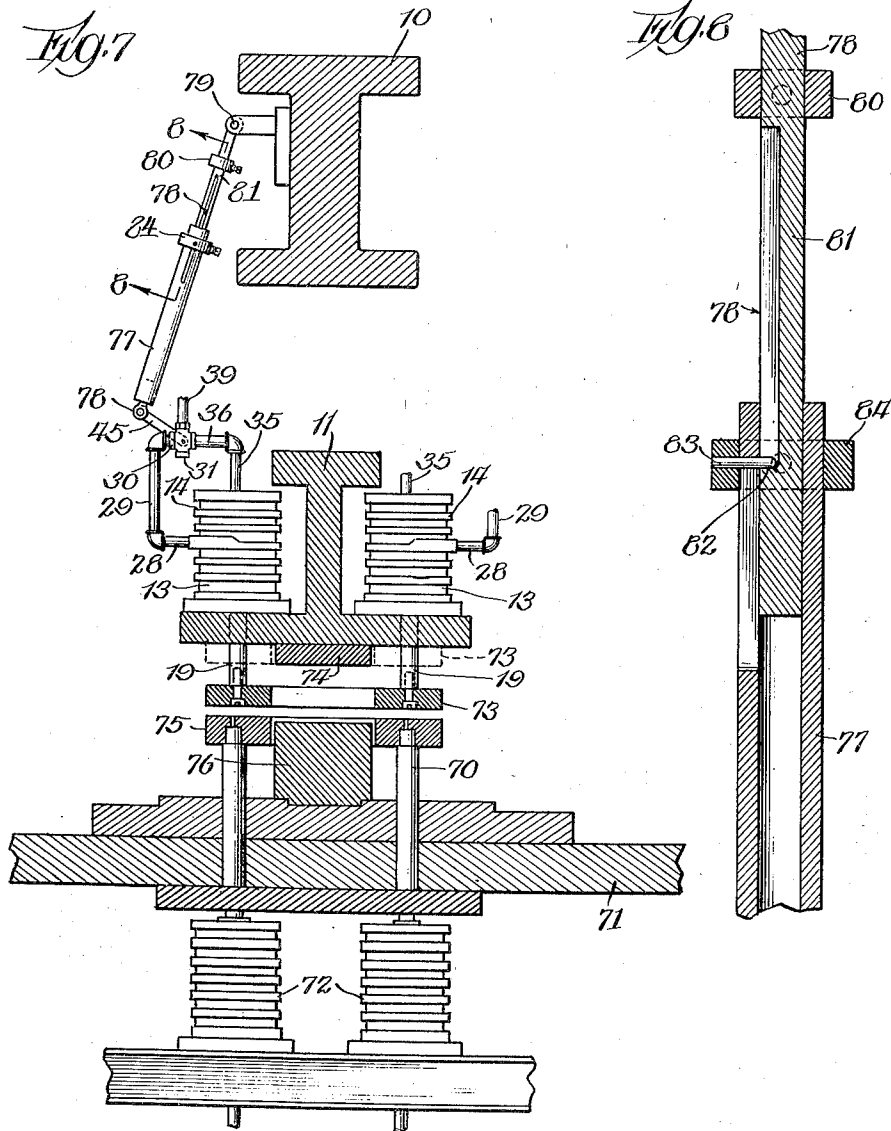
R. W. GLASNER ET AL

1,562,953

BLANK HOLDER

Filed Feb. 18, 1922

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE.

RUDOLPH W. GLASNER AND OLOF G. NILSON, OF CHICAGO, ILLINOIS, ASSIGNORS TO
MARQUETTE TOOL & MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A COR-
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BLANK HOLDER.

Application filed February 18, 1922. Serial No. 537,392.

To all whom it may concern:

Be it known that we, RUDOLPH W. GLASNER and OLOF G. NILSON, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Blank Holders, of which the following is a specification.

This invention relates to improvements in blank holders particularly adapted, though not necessarily limited in its use with sheet metal presses.

One of the objects of the invention is to provide improved means whereby a single acting press may be readily converted into a double acting press.

A further object is to provide improved means whereby a double acting press may be readily converted into a triple acting press.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, 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 illustrating this invention and in which

Figure 1 is a front elevation of a portion of a single acting press having this improved blank holder applied thereto the shaping member being omitted.

Figure 2 is a vertical sectional view as taken on line 2—2, Figure 1.

Figure 3 is a detail view as taken on line 3—3, Figure 1.

Figure 4 is a vertical sectional view of a portion of a double acting press having a blank holder constructed in accordance with the principles of this invention, applied thereto.

Figure 5 is a view taken on line 5—5, Figure 4.

Figure 6 is a view in elevation of a portion of Figure 5.

Figure 7 is a view partly in vertical section and partly in elevation showing another form of the invention.

Figure 8 is a detail sectional view on line 8—8, Figure 7.

Referring more particularly to the drawings and in the form of the invention shown in Figures 1 to 3, the numeral 10 designates

a stationary portion of a single acting press 55 and 11 designates a reciprocating ram or plunger of the ordinary and well known construction, and which plunger is adapted to be reciprocated in the usual manner.

The ram 11 is provided with the usual 60 flange 12 and upon this flange are mounted a plurality of pairs of superposed cylinders 13—14. Any number of these cylinders may be employed on both sides of the center of the ram, one set being thus disposed on each 65 side. As the construction and operation of each of the cylinders of each set is the same the description of one will apply equally as well to them all.

Arranged within the cylinder 13 is a piston 70 15 and within the cylinder 14 is a piston 16, each of the pistons being provided with any suitable packing arranged about their peripheries to form fluid tight joints between the pistons and the cylinder walls. 75 The pistons 15 and 16 are connected by a hollow piston rod 17, which passes through the head of the cylinder 13 and is open at its top to form communication with the interior of the cylinder 14. The piston rod 80 is also provided with any suitable number of openings 18 adjacent the upper face of the piston 15, so that the cylinders 13—14 will have communication with each other by means of the hollow piston rod. 85

The piston 17 is provided with a depending portion 19 which extends through the lower head of the lowermost cylinder 13 and also through a suitable opening in the flange 12. To the end of these depending 90 portions 19 a blank holder ring 20 is connected in any suitable manner such as by means of fastening devices 21. Any suitable means may be provided for limiting the movement of the blank holder ring 20 95 with respect to the ram 11 in one direction such as bolts 22, which are secured by one extremity to the blank holder ring, and which pass through suitable openings 23 100 in the flange 12, to project therebeyond and the projecting end 24 of the bolts are threaded and adapted to receive suitable fastening nuts 25.

Leading from the cylinder 13, beneath the piston 15, is an outlet 26 which has communication with the atmosphere and through 105 which opening any fluid which may be present beneath the piston 15 will be discharged!

when the piston is moving towards the lower head of the cylinder 13.

Leading from the cylinder 14, beneath the piston 16 is an outlet 27, with which
5 outlet is connected a pipe 28, which in turn is connected with a pipe 29 having connection with a valve casing 30, the valve casing being provided with an outlet 31 having communication with the atmosphere. With-
10 in the valve casing 30 is a valve 32 having passages 33 and 34 therein.

Leading into the top of the cylinder 14, preferably through the upper head thereof is a pipe 35, which has communication by
15 means of a connection 36 with an outlet 37 of the valve casing 30. The valve casing 30 is provided with another opening 38, with which a pipe 39 has communication and this pipe 39 has communication with a pipe 40,
20 which passes through a suitable stuffing box 41 and telescopes with a pipe 42, which latter has communication with a supply pipe 43. The pipe 42 is anchored upon the portion 10 of the machine by means of a suitable anchoring device or yoke 44, so that the
25 pipe will remain stationary while the ram 11 is being reciprocated, and during such reciprocation the pipe 40, which telescopes with the pipe 42 will be reciprocated with
30 respect thereto and will always maintain a communication between the pipe 39 and the supply pipe 43.

The valve 32 is adapted to be positioned so that the pipes 36 and 39 will be brought
35 into communication while the pipe 29 will be brought into communication with the outlet 31, leading to the atmosphere. In this position of the valve the fluid enters the pipe 43 and flows through the telescoping
40 pipes 42-40 into the pipe 39 through the valve casing 30 and passages 34 of the valve to the pipe 36, from where it will be delivered through the pipe 35 into the cylinder
45 14 above the piston 16. A portion of the fluid will flow through the hollow piston rod 17 to be discharged through the outlets 18 into the cylinder 13 above the piston 15. This will cause the piston 16 to descend
50 with respect to the cylinders and thereby lower the blank holder ring. Any fluid in the cylinder 13 below the piston 15 will be discharged to the atmosphere through the opening 26, while any fluid in the cylinder
55 14 beneath the piston 16 will be discharged through the opening 27, pipes 28-29, passage 33 in the valve 32, to the atmosphere through the outlet 31 of the casing 30.

The fluid is admitted into the cylinders above the pistons before the ram 11 starts to
60 descend so that the full pressure will be exerted upon the tops of the pistons 15 and 16. As soon as the blank holder, which is carried by the blank holder ring 20 contacts with the work the motion of the blank holder
65 and blank holder ring will be arrested while

the ram continues in its further downward movement. This arresting of the movement of the blank holder and blank holder ring will cause the pistons 15 and 16 to be forced
70 upwardly in the cylinders 13 and 14, as the ram 11 descends further, thereby creating a pressure upon the tops of the pistons and which pressure is exerted upon the blank holder, which is in engagement with the
75 work.

After the operation of forming of the article has been completed the blank holder may be allowed to remain in contact with the work until the ram has reached a pre-
80 determined point in its cycle of operation. At this time, the blank holder ring then starts to recede and this receding operation of the blank holder may be accomplished at any desired time.

If desired, however, the valve 32 may be
85 operated at any point in the cycle of operation of the ram 11 so as to cause pressure to be exerted upon the bottom of the piston 16 in the cylinder 14 to raise the blank holder ring and the blank holder away from the
90 work so as to permit of the ready removal of the shaped article. By thus adjusting or causing the blank holder ring or blank holder to move away from the work in this manner it will be manifest that it is possible
95 to draw a shell of a depth to substantially the full stroke of a single action press, by reason of the fact that the blank holder or blank holder ring will be withdrawn sufficiently
100 to permit the removal of the finished article.

Any suitable means may be provided for actuating the valve 32. This may be accomplished either by hand or automatically.
105 If it is desired to accomplish the same automatically there may be provided a lever 45, which is connected with the valve 32 and connected with the lever 45 is a link or rod 46, which may in turn be connected with any
110 suitable part of the machine. As the valve 32 is adjusted so as to permit the pistons 15 and 16 to be raised in the cylinders by fluid pressure, the valve will be positioned so that the port or passage 33 will form communication between the pipes 39 and 29, thereby
115 directing the fluid pressure through the pipe 39 to the bottom of the piston 16. At the same time the passage 34 will be positioned to establish communication between the pipe 36 and the outlet 31, so that the fluid
120 in the cylinders 13-14, above the pistons 15-16, will be discharged through the pipe 35, pipe 36, passage 34 and through the discharge outlet 31 in the valve casing 30 to the
125 atmosphere.

In the form of the invention illustrated in Figures 4 to 6, the principles of this invention are shown as being applied to a double
130 acting press, in which 47 designates the blank holder and 48 the punch which car-

ries the upper die 49. The blank holder and die are reciprocated in the ordinary manner well-known in this art.

The pad or cushion in this form of the invention embodies a cylinder and a piston or a plurality of superposed annular cylinders, any number of which may be employed. Each of the cylinders embodies a fixed annular member 50 and a reciprocable member 51. The fixed member embodies preferably a top and side portion while the reciprocable member preferably embodies a bottom and side portion. The top of the fixed member and the bottom of the reciprocable member overlap each other and their edges respectively abut the inner faces of the sides of the other member so as to form a space or chamber 52 therebetween, suitable packing 53—54 being provided to form fluid tight joints. The reciprocating members 51 are adapted to be superposed and are secured together in any suitable manner such as by means of fastening bolts 55, arranged adjacent the inner periphery of the members. The fixed members 50 are also superposed and are adapted to be secured together in any desired or suitable manner preferably by means of fastening devices or bolts 56, extending through suitable ears 57, and the cushion thus formed is adapted to be secured to the blank holder 47 in any suitable manner preferably by means of fastening bolts 58, passing through suitable openings in a flange 59 and entering suitable threaded openings 60 in the uppermost member 50.

The draw ring 61 is secured to the lowermost reciprocable member 51 in any desired or suitable manner but preferably by means of clamps 62, preferably of an L shaped formation, one edge of which abuts the lower face of the member 51 and the other edge overlaps a flange on the draw ring 61. The lowermost member 51 is provided with a groove 63, extending through its lower face into which groove the head 64 of a bolt 65 is adapted to be seated. This bolt passes through the clamp 62 and receives on its free end a nut 66.

It will therefore be seen that when the blank holder cage 47 is reciprocated the draw ring 61 will also be reciprocated and when the draw ring forces the blank against a die 33 the movement of the draw ring 61 will be arrested but the blank holder cage 47 will continue to descend for the full length of the stroke. The draw ring 61 is controlled by the fluid pressure so that the draw ring will be caused to exert a substantially uniform pressure upon the blank during the forming operation. To that end fluid is supplied to the chambers 52 in any suitable manner preferably through the medium of a pipe 67, provided with branches 68, one leading to each of the chambers

52. The pipe 67 receives its supply from any suitable source and if desired the pipe 67 or a portion thereof may be flexible so as not to interfere with the reciprocating movement of the blank holder cage 47.

The die, in the form of the invention illustrated in Figure 4, embodies a movable portion 69, which latter is preferably supported by means of pins 70 passing through the bolster plate 71 of the press and the pins 70 may be supported by means of a suitable cushion 72, common in machines of this character.

In operation, the blank to be formed is placed upon the die 63 and as the blank holder cage 47 and punch 48 descend, the draw ring 61 will contact with the blank and co-operate with the portion 63 of the die for holding the blank in position. At the time the blank holder descends the pressure of the fluid in the chambers 52 will be exerted upon the movable portions 51 of the cushion but when the draw ring 61 is arrested by its engagement with the work, the reciprocable members 51 will be caused to move with relation to the fixed members 50, so as to grip the blank between the draw ring and the die 63. As the blank holder cage 47 reaches the limit of its downward movement the punch 48 continues in its descending movement so that the die 49 will engage and shape the work. After the work has been performed the punch recedes in advance of the draw ring 61.

When this form of the invention is applied to the ram of a single action press, it is obvious that the extent of relative movement of the parts of the cushion must be increased and this is accomplished by constructing the parts of the cushion to allow of a greater latitude of movement of the parts one with respect to the other.

In the form of the invention shown in Figures 7 and 8, the blank holder ring 73 is connected with the piston rods 19, and the ram 11 is preferably provided with a projection 74 extending below the lower face thereof, the projection 74 being of a height substantially equal or slightly greater than the thickness of the ring 73, so that when the ring 73 is raised by means of the fluid being directed beneath the piston 16 into the cylinder 14, through the opening 27, the ring 73 will be moved in close proximity to the face of the bottom of the ram and the portion 74 of the ram will project into the opening in the ring as shown in dotted lines in Figure 7.

In this form of the invention the bottom draw ring 75 is supported by means of the pins 70 and the upper face of the ring 75 is preferably adapted so that it will normally stand slightly above the die block 76, which latter is secured upon the bolster

plate 71 in the usual manner.

In operation and during the downward movement of the ram 11 the ring 73 will be in the position shown in Figure 7, as it approaches the ring 75 to engage and clamp the work, the work being supported by the ring 75 and extending across the die block 76. A further movement of the ram in a downward direction will cause the ring 73 to co-operate with the ring 75 to grip the blank. The ring 73 is held in the position shown in Figure 7, by reason of the pressure in the cylinders 14 above the piston 16, and this pressure is sufficiently strong to cause the ring 73 to shape the blank over the die 76. During this shaping operation and as the ram 11 descends, the ring 75 will also descend against the pressure of the cushions 72 until the completion of the forming operation.

When the ram 11 begins to recede, the ring 75 will follow the ring 73 and the shell which has been shaped over the die block 76 will be stripped or removed from the die block as the ring 75 ascends. When the ring 75 reaches the limit of its upward movement the shaped article will be supported by the ring 75 until the valve 30 has been operated to permit the fluid in the cylinders 14 to be discharged from the cylinders 14, through the pipes 35—36, 29—28, to the bottom side of the plunger 16. This will cause the plunger 16 to rise with respect to the ram 11, and with it the draw ring 73 until the draw ring 73 has assumed the position shown in dotted lines in Figure 7. In this position of the parts, when the ram is elevated, the shaped article may be removed.

With this invention it will be manifest that a press of this character may be readily adapted to and effectively and efficiently draw or shape articles of a depth to substantially the full stroke of the ram.

Any suitable means may be provided for shifting the valve 30, but a simple and efficient means embodies a tubular member 77, which is pivotally connected at one end as at 78 with the lever 45, connected with the valve. Telescoping with this member 77 is a rod 78, which is pivotally connected as at 79, with a fixed portion of the press such as the portion 10.

Adjustably mounted upon the rod 78 is a collar 80 which is adapted, when the ram 11 rises to engage, at a predetermined point in the operation of the press, the end of the member 77 and thereby shift the valve 30 in one direction.

The rod 78 is provided with a slot or groove 81 having a shoulder 82 and a pin or member 83 projects into the groove or slot 81 and is in turn connected with a collar 84, adjustably mounted upon the member 77. This collar 84 with the pin 83 is adapted to be so positioned upon the member 77 that when the ram 11 reaches a predetermined point in

its cycle of operation, the pin 83 is engaged by the shoulder 82, to shift the lever 45 and position the valve in the casing 30 so as to establish communication between the pipe 36 and the atmosphere through the opening 31, and also establish communication between the pipe 39 and the pipe 29 so as to permit the fluid above the piston in the cylinder 14 to be discharged to the atmosphere and to direct the incoming fluid to the bottom of the piston 16 to move the ring 13 into the position shown in dotted lines in Figure 7.

With this improved invention it will also be manifest that the mechanism will automatically adjust itself to compensate for the varying thicknesses of the sheets or blanks to be drawn or shaped and at the same time a substantially unvarying pressure will be exerted upon the blank throughout the forming operation.

Furthermore it will be manifest that with this invention it is not necessary to set the upper blank holder accurately as the upper blank holder may be set at approximately the proper position, after which the blank holder will automatically adjust itself according to the thickness of the blank being operated upon.

It will also be manifest that by the provision of a fluid pressure means operating upon the blank holder of a double acting press, the press will be converted into a triple acting press.

It is sometimes desired or necessary in constructing or shaping certain forms, such as irregular forms to exert a different gripping pressure upon different parts of the blank being shaped and in order to accomplish this result it is necessary to maintain different pressures in different cylinders 14 or groups of cylinders, and this may be accomplished in any suitable manner such as by means of a controlling valve designated generally by the reference numeral 85 in Figure 1, and this valve is arranged in the pipe connection 35 between the cylinder and the valve casing 30.

While in Figure 1, a controlling valve 85 is shown as being applied to only one of the cylinders 14, it is to be understood that a similar valve may be employed in connection with each of the cylinders 14 or any desired number or groups of said cylinders.

This valve 85 preferably embodies a casing provided with a wall 86, having an opening 87 which is controlled by a valve 88, the latter being influenced by diaphragm 89. Acting upon the diaphragm 89 is a spring 90, the tension of which may be varied by means of an adjusting screw 91.

A pressure gauge 92 may be provided and the valve casing is provided with an outlet 93, which is connected with the pipe 35 leading to the cylinder 14. Connected also with the pipe 35 is a branch pipe 94, which

has communication with a valve casing 95, the latter having an outlet opening 96, discharging into the atmosphere. Within the casing 95 is a valve 97, controlled by a spring 98 and the tension of the spring may be adjusted by means of a suitable adjusting screw 99.

The tension of the spring 98 tends normally to hold the valve 97 seated so as to cut off communication between the pipe 35 and the outlet 96 while the spring 90 is so arranged that it tends normally to hold the valve 88 unseated.

In use the fluid under pressure entering the pipe 35 will flow through the opening 87 to be discharged through the opening 93 and into the cylinder 14.

Fluid will continue to flow in this direction and the pressure will be exerted in the cylinder 14 until a predetermined pressure is obtained in the cylinder and this initial predetermined pressure is controlled by the adjustment of the screw 91 to vary the tension of the spring 90, and which spring 90 operates upon the diaphragm 89 in opposition to the fluid thereupon. When the pressure has reached a predetermined degree the diaphragm 89 will be deflected, overcoming the tension of the spring 90 and will close the valve 88 to shut off any further supply of fluid to the cylinder 14, at the same time maintaining the pressure in the cylinder 14.

When the piston 16 (see Figure 2) descends the fluid pressure in the cylinder 14 may be controlled at will by the control of the valves 88 and 97, the tension of the spring 98 being maintained at the pressure which it is desired to open the valve 97. This construction permits of the obtaining of any desired pressure in any one or more of the cylinders 14 or groups of cylinders and the pressure in these cylinders may be controlled at will.

While the preferred forms of the invention have 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 this invention.

What is claimed as new is:—

1. A mechanically operated sheet metal drawing press embodying a reciprocating member, and means whereby the member will operate to draw a shell of a depth substantially equal to the full operation stroke of the press, the said means embodying a fluid pressure blank holding means joined with the reciprocating member for unitary

reciprocation and operable upon the top side of the work, and means for controlling the fluid pressure upon the blank holding means.

2. A mechanically operated sheet metal drawing press embodying a reciprocating member, means whereby the member will operate to draw a shell of a depth substantially equal to the full operating stroke of the press, the said means embodying a fluid pressure blank holding means connected with the reciprocating member and operable upon the top side of the work, and means embodying valve mechanism for controlling the fluid pressure upon the blank holding means by controlling the direction of flow of the fluid.

3. A mechanically operated sheet metal drawing press embodying a reciprocating member, fluid pressure blank holding means mounted upon the said member and operable upon the top of the work, the said means embodying a plurality of cushions, and means whereby the pressure of the cushions may be varied with respect to each other.

4. In a mechanically operated sheet metal drawing press a reciprocating member, fluid pressure blank holding means mounted upon the said member and operable upon the top of the work, the said means embodying a plurality of cushions, and means whereby the relative pressures of the cushions may be varied at will.

5. In a mechanically operated sheet metal drawing press a reciprocating member, fluid pressure blank holding means mounted upon the said member and operable upon the top of the work, the said means embodying a plurality of cushions and means whereby different pressure may be maintained in different cushions.

6. In a sheet metal drawing press a forming die, a reciprocating die co-operating therewith, a plurality of blank holding means, means adapting said blank holding means for operation in opposition to each other, and cushioning means individual to the said blank holding means.

7. In a sheet metal drawing press, a forming die, a reciprocating die co-operating therewith, a plurality of fluid pressure blank holding means, means adapting said blank holding means for operation in opposition to each other, and means whereby the pressure of said blank holding means may be varied at will with respect to each other.

In testimony whereof we have signed our names to this specification on this 15th day of February, A. D. 1922.

RUDOLPH W. GLASNER.
OLOF G. NILSON.