

No. 774,154.

PATENTED NOV. 8, 1904.

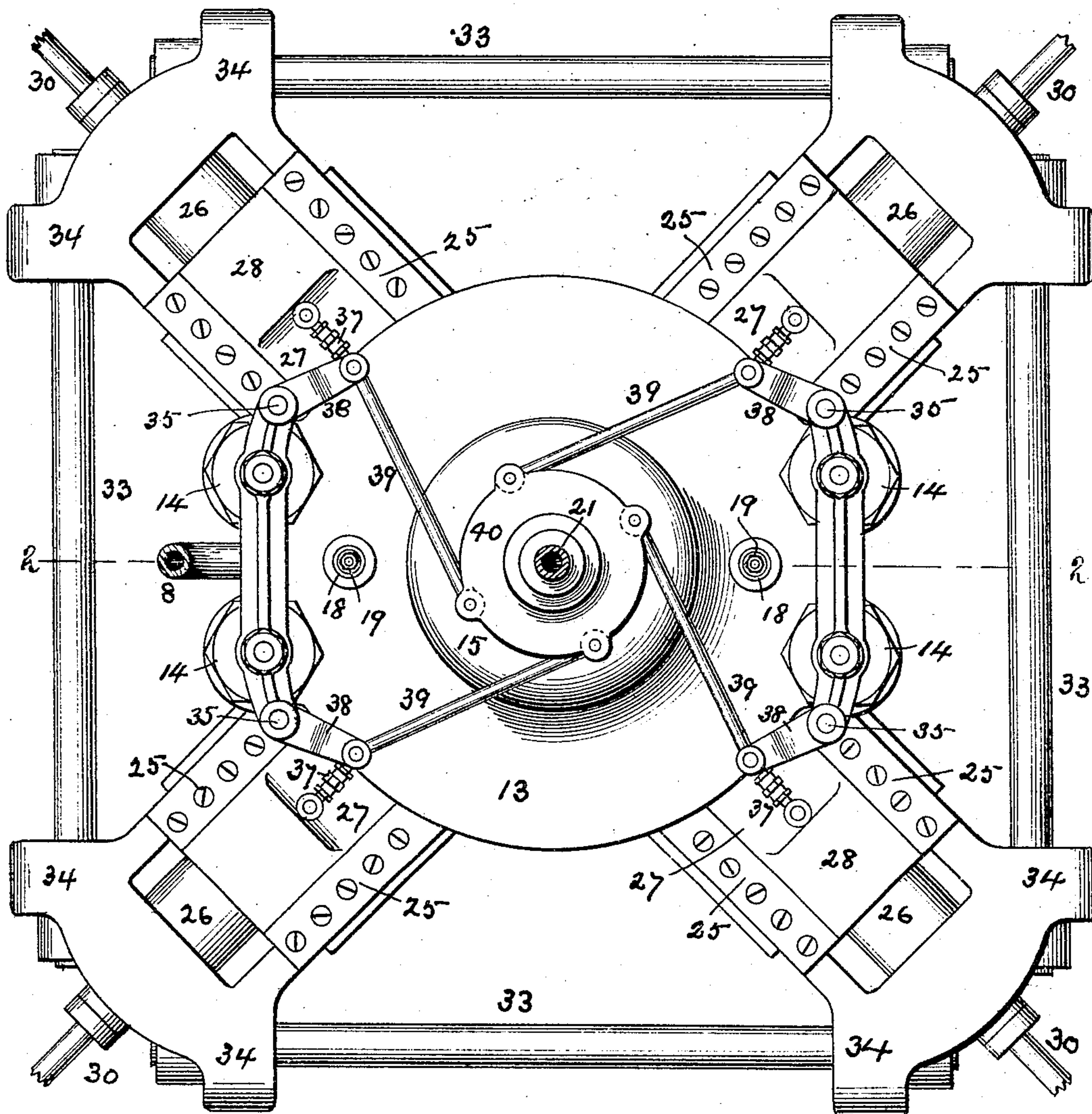
E. G. BUDD.  
HYDRAULIC PRESS.

APPLICATION FILED FEB. 26, 1902.

NO MODEL.

4 SHEETS—SHEET 1.

*Fig. 1.*



Witnesses:  
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A. M. Kelly.

Inventor,  
Edward G. Budd  
By Wm. A. H. H. H. Atty.



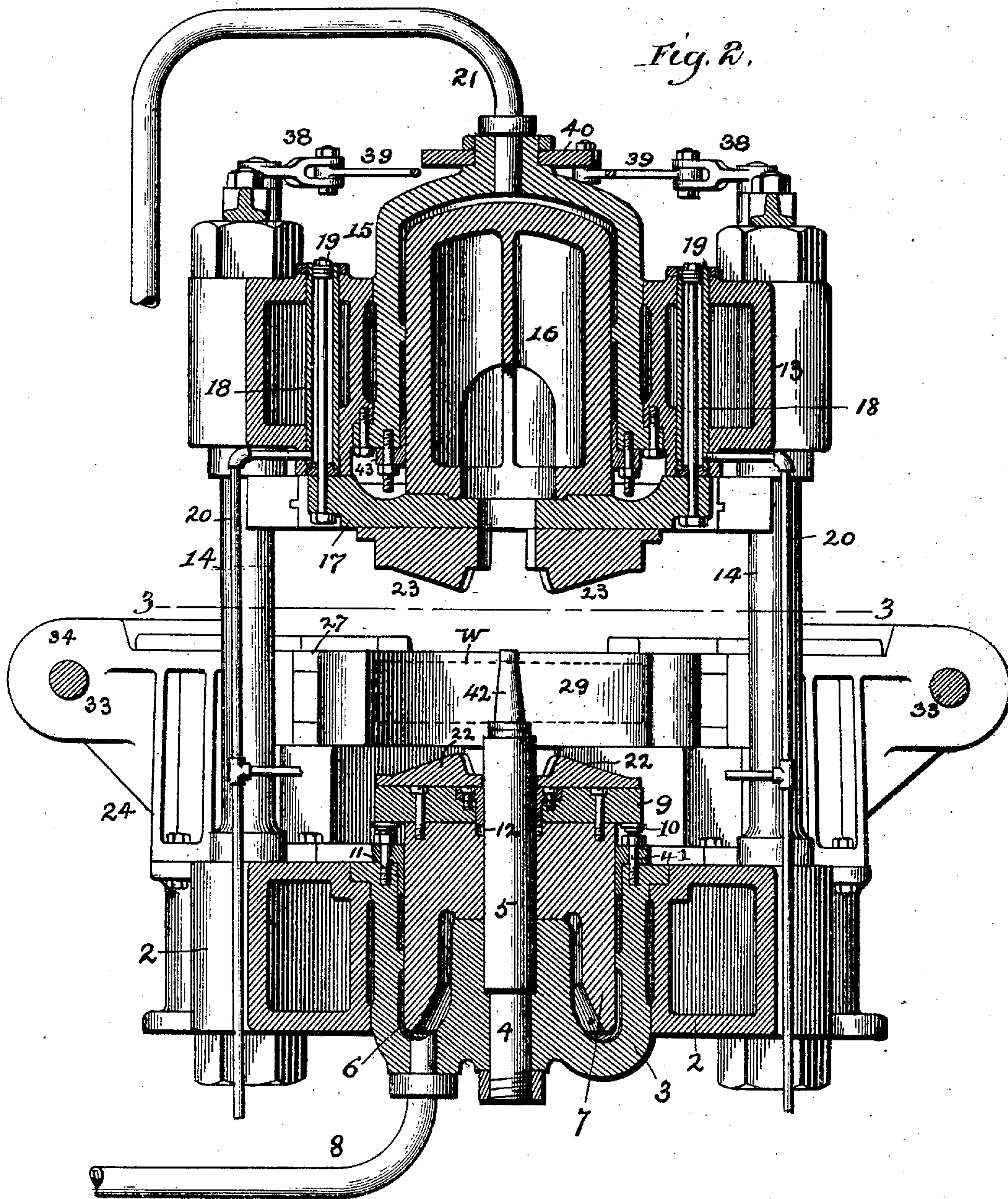
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4 SHEETS—SHEET 2.



Witnesses:

H. B. Hallock,  
P. M. Kelly.

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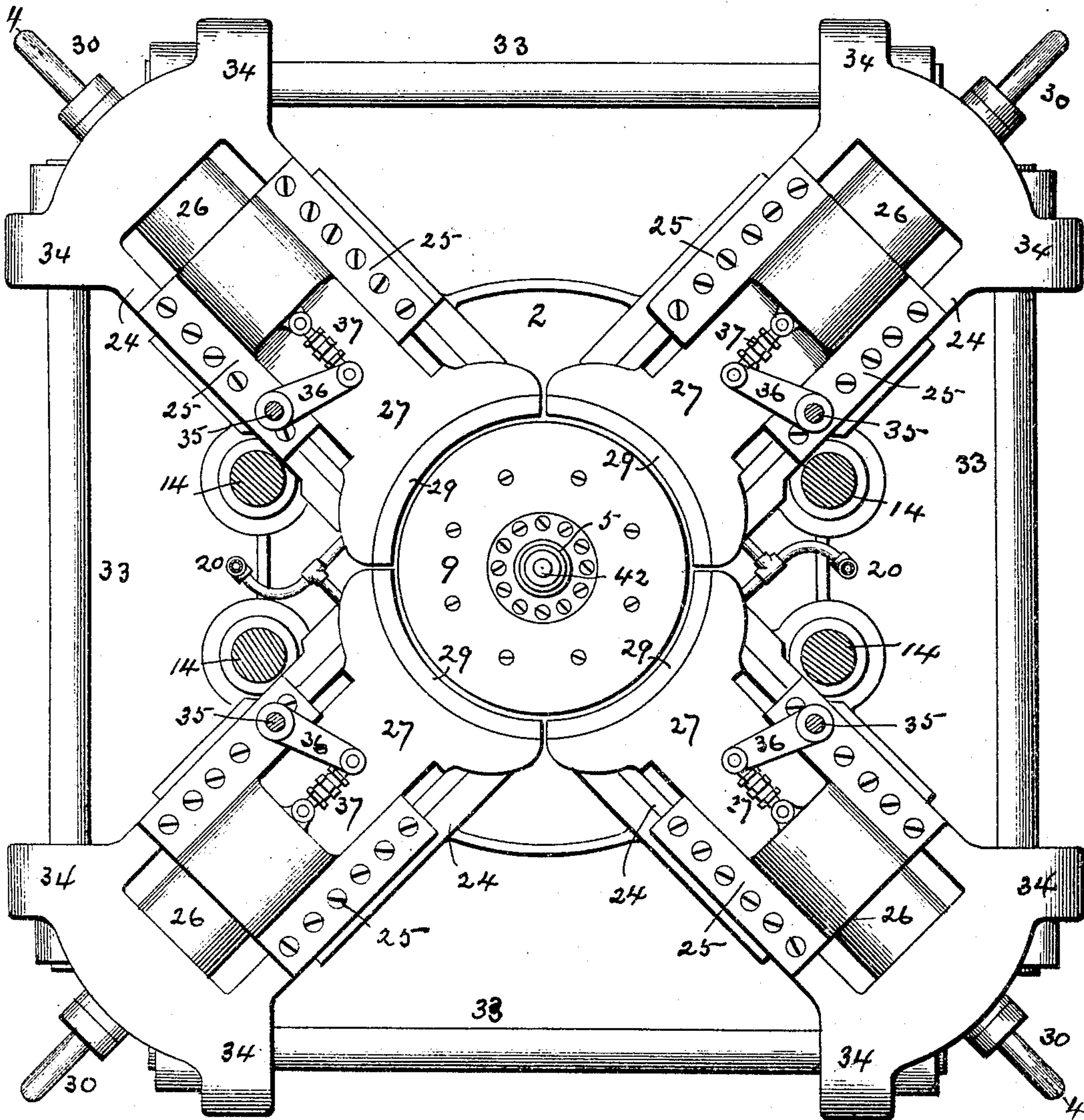
E. G. BUDD.  
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APPLICATION FILED FEB. 26, 1902.

NO MODEL.

4 SHEETS—SHEET 3.

*Fig. 3.*



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No. 774,154.

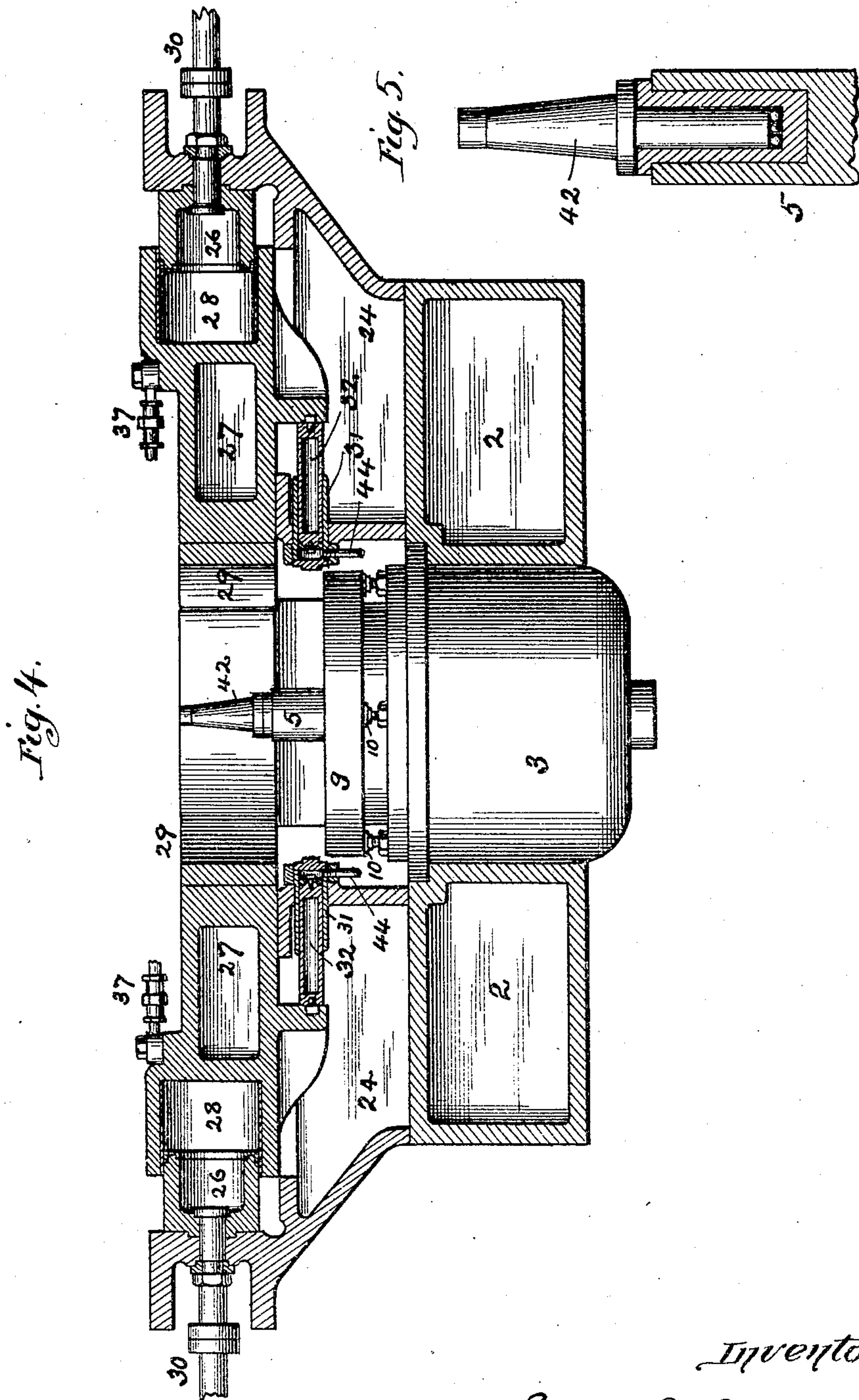
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E. G. BUDD.  
HYDRAULIC PRESS.

APPLICATION FILED FEB. 26, 1902.

NO MODEL.

4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

EDWARD GOWEN BUDD, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR  
TO THE AMERICAN PULLEY COMPANY, A CORPORATION OF PENN-  
SYLVANIA.

## HYDRAULIC PRESS.

SPECIFICATION forming part of Letters Patent No. 774,154, dated November 8, 1904.

Application filed February 26, 1902. Serial No. 95,686. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD GOWEN BUDD, of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented an Improve-  
5 ment in Hydraulic Presses, of which the following is a specification.

My invention has reference to hydraulic presses; and it consists of certain improve-  
10 ments, all of which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my invention is to provide a construction of hydraulic press suitable for  
15 heavy work—such, for example, as the manufacture of forged or pressed car-wheels—and capable of having capacity for performing the work in a speedy and accurate manner.

My object is, further, to so form the press  
20 that the upper and lower dies are moved by separate hydraulic plungers arranged, respectively, above and below the work and also to simplify the structure by supporting the blank or work upon a standard centrally located  
25 with respect to the lower hydraulic cylinder and plunger, whereby there is no obstructing-support between the upper and lower hydraulic cylinders, thus simplifying the construction of the machine and greatly reduc-  
30 ing the height thereof, especially between the base and the work.

My object is also to provide such a press as  
35 abovedescribed with cheek-dies and hydraulic devices for radially operating them in the plane of the work and, further, in so connecting the several operative portions for moving said cheek-dies that they are required to move simultaneously to the same degree.

My object is, further, to provide in such a  
40 hydraulic press as above specified a rotatable support or mandrel for the work carried upon the central standard which extends upward through the lower hydraulic plunger, so that the work or blank may be rotated upon a ver-  
45 tical axis and be brought into successive positions between specific dies, respectively, upon the two plungers of the upper and lower hy-

draulic cylinders and also with respect to the cheek-dies.

My invention consists of certain improve- 50  
ments constructed in such manner as to secure the above objects and which are fully set forth hereinafter and will be better understood by reference to the drawings, in which—

Figure 1 is a plan view of the entire ma- 55  
chine. Fig. 2 is a vertical section on line 2 2 of Fig. 1. Fig. 3 is a horizontal section taken on the line 3 3 of Fig. 2 looking downward; and Fig. 4 is a vertical section of the lower part  
60 of the machine, taken on line 4 4 of Fig. 3.

2 is the base-frame or bed-plate and may  
be formed in sections, if so desired. The  
lower hydraulic cylinder 3 is bolted to this  
bed-plate and is provided with a central hub  
4, into which is secured an upwardly-extend- 65  
ing standard 5 for carrying the work W. The  
plunger 7 fits the cylinder 3 and is formed  
annular in shape, so as to surround the stand-  
ard 5, while at the same time fitting down  
into annular space 6 within the cylinder. The 70  
plunger 7 is packed at 11, where it fits the  
cylinder, and also at 12, where it fits the stand-  
ard. A pipe 8 supplies water under pressure  
to the cylinder or permits the water to escape  
from the said cylinder, as required. To the 75  
top of the plunger 7 is secured the platen 9,  
which carries the dies 22, of suitable construction, required for the work to be performed.  
The downward movement of the platen and  
plunger is limited by the adjustable nuts 10 80  
on the screw-threaded studs 41.

The standard 5 at the top is provided with  
a mandrel 42, journaled in it so as to rotate  
upon a vertical axis and upon which the work  
or blank W is placed. When the work is to 85  
be a disk of metal for forging, it is provided  
with a tapered hole, into which the tapered  
mandrel fits. The mandrel may be removed  
with the work and driven out afterward in  
case it becomes tightly held to the forging. 90  
In case the press is to be used for pressing or  
forming sheet metal then the mandrel will be  
substituted by any suitable supporting-die for  
holding the sheet-metal blanks, so that they



may be acted upon not only by the upper and lower dies, but also by the cheek-dies 29 in such manner, for example, as is shown in Letters Patent No. 630,449 to Corscaden, dated 5 August 8, 1899.

14 represents four heavy upright bolts secured to the bed-plate 2 and supporting an upper frame 13, on which is secured the upper hydraulic cylinder 15, which opens downward. 10 These upright bolts are very heavy and strong, since they are required to sustain the entire tensile strain produced by the action of the upper and lower dies. These bolts are, moreover, grouped in pairs, the bolts of each pair 15 being nearer together than are the bolts of the two pairs, so as to leave a wide space in front and back of the press for inserting and removing the work and for manipulating it.

The upper hydraulic cylinder 15 is provided 20 with a plunger 16, working through a packed joint 43 of suitable construction. Fitted to the plunger 16 is a platen 17, to which the upper dies 23 are secured. The cylinder 15 is provided with a pipe 21, through which 25 water under pressure may be admitted to or removed from it to operate the plunger. To cause this plunger and its platen to rise when the pressure is removed from the cylinder 15, I provide a pair of small cylinders 18, in which 30 pistons 19 work, said pistons being connected by rods with the platen 17. Water under pressure is supplied to these cylinders 18 to raise the platen 17, the plunger 16, and the dies 23, carried by the platen. This water- 35 pressure may be supplied by pipe 20 and may be on continually or only when the pressure is removed from the cylinder 15, as desired. Any other convenient mode of raising the plunger, platen, and dies may be used in 40 place of the small hydraulic cylinders and pistons.

The dies 22 23, as shown, are in sections and segmental and adapted to operate at one 45 time upon a portion of the upper and lower surfaces of the blank W only, the blank being turned from time to time to bring new portions of its surface into position for operation. While I have shown these dies in segmental shape, it is to be understood that I do 50 not confine myself to any particular shape or form of dies. If the press is used for other purposes than the making of wheels from a blank, it is evident that the dies would be changed accordingly. The preferred method 55 of forging wheels from solid blanks with the use of segmental dies is set out in my application, Serial No. 87,077, filed December 24, 1901, and the press of this application is excellently adapted for the said method of manu- 60 facture.

Bolted to the bed-frame 2 are frames 24, which carry plungers 26 for operating the four cheek-dies 29. These cheek-dies are arranged circumferentially about and on a level 65 with the mandrel 42 and work W and are each

curved in plan and of a length approximately equal to one-quarter of a circle. The operating-faces are shaped to suit the required outer circumference or periphery of the blank or article. Each of these cheek-dies is se- 70 cured to a reciprocating frame 27, moving in guides 25 on the frame 24, and are provided with a cylinder 28, which fits over the plunger 26 of said frame 24. This plunger is stationary or fixed, while the cylinder is mov- 75 able; but it is evident that this relation may be reversed, if so desired. Water is admitted to the cylinder through the plunger 26 by pipe 30 from any suitable source of supply. The frames 24 in addition to being 80 bolted to the base-frame are bolted together by bolts 33. There are four of said frames and cheek-dies operating devices shown, and these frames are braced by the four bolts 33, connected to the lugs 34 on the frames, so that 85 when the cheek-dies are forced in upon the work the outward strains are counterbalanced, and excessive strain upon the connection of the frames 24 with the base-frame 2 is obvi- 90 ated. In this manner the great forging strains by the cheek-dies are taken up by the tension-bolts 33 and the frames 24, to which they are secured. In some character of work the four 95 cheek-dies are necessary and used; but in other cases, such as in the use of the segmental dies 22 23, only two of the cheek-dies would be required, and these would be upon sides in alinement with the dies 22 radially considered.

It is important to have all of the four frames 27 of the cheek-dies 29 move in and out at the 100 same speeds, so that the said cheek-dies shall simultaneously act upon the metal, so as to press or forge it equally. This action I secure in the following manner:

Shafts 35 are journaled on the main or sta- 105 tionary portions of the press and have crank-arms 38 at top and 36 at the bottom. The lower crank-arms 36 are respectively linked at 37 with one of the cheek-die frames 27. The top crank-arms 38 are each connected by a link 110 39 with a ring-frame 40, journaled on the top of the cylinder 15 and free to revolve. By this connection between the four cheek-dies and their reciprocating frames they must move at the same rates of speed under the ac- 115 tion of the water-pressure furnished from a common source of supply.

The cheek-dies and their frames are with- drawn when the pressure is removed from the cylinders 28 by means of the small cylinders 120 31, having the pistons 32, said pistons being actuated by hydraulic pressure similarly to the action on the piston 18 in lifting the plunger 16 of the upper hydraulic cylinder 15. The water is supplied to these cylinders 31 by 125 pipes 44, leading from a suitable accumulator.

In cases where only two of the cheek-dies are required the other two may be omitted and the reciprocating frames 27 allowed to move without performing work, or said dies 130



and their operating devices may be wholly omitted, if desired.

By the construction herein set out the height of the press is not excessive. It is light in weight, is quick in operation, and it enables the introduction and removal of the work in an easy manner.

While I prefer the construction shown, I do not confine myself to the details of construction, as they may be modified in various ways without departing from the spirit of my invention.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a hydraulic press, the combination of upper and lower platens for supporting dies and hydraulic cylinders and plungers for operating them to and from each other, with radially-acting cheek-dies, devices hydraulically operated for moving the cheek-dies, and connecting mechanism between the several cheek-dies and frame of the hydraulic cylinders of the upper and lower platens for insuring their movement to be toward each other and at the same speed, whereby they are caused to act upon the work at the same time in the same manner, and accurately center it between the dies of the upper and lower platens.

2. In a hydraulic press, the combination of upper and lower platens for supporting dies and hydraulic cylinders and plungers for operating them to and from each other, with radially-acting cheek-dies, devices hydraulically operated for moving the cheek-dies, connecting mechanism between the several cheek-dies for insuring their movement to be at the same speed, whereby they are caused to act upon the work in the same manner, said mechanism consisting of a frame pivoted above the hydraulic cylinder for the upper platen and linked to the several cheek-dies by cranked arms and in which the connections with the pivoted frame are to one side of its pivot substantially as set out.

3. In a hydraulic press, the combination of upper and lower platens for supporting dies and hydraulic cylinders and plungers for operating them to and from each other, with radially-acting cheek-dies, devices hydraulically operated for moving the cheek-dies, rock-shaft and lever connections between the several cheek-dies supported by the frame carrying the hydraulic cylinders of the upper and lower platens whereby the movement of any cheek-die insures a similar movement to the other cheek-dies and causes a simultaneous action upon the blank operated on.

4. In a hydraulic press, the combination of upper and lower platens for supporting dies and hydraulic cylinders and plungers for operating them to and from each other, with radially-acting cheek-dies, devices hydraulically operated for moving the cheek-dies, lever connections between the several cheek-dies where-

by the movement of any cheek-die insures a similar movement to the other cheek-dies said connections consisting of rock-shafts having crank-arms at each end, connections between one of said arms of each rock-shaft and one of the respective cheek-dies, a pivoted rock-frame arranged above the hydraulic cylinders, and link connections between the other crank-arms of the rock-shafts and the pivoted rock-frame, whereby the rock-frame is so disposed as not to occupy the space between the several hydraulic cylinders, and devices for operating the dies.

5. In a hydraulic press, the combination of upper and lower platens for supporting dies and hydraulic cylinders and plungers for operating them to and from each other, with radially-acting cheek-dies, devices hydraulically operated for moving the cheek-dies, secured to the lower hydraulic cylinder, tension-bolts for holding the cheek-die hydraulic-power device against being spread or forced away from the work.

6. In a hydraulic press, the combination of upper and lower platens for supporting dies and hydraulic cylinders and plungers for operating them to and from each other, with radially-acting cheek-dies, devices hydraulically operated for moving the cheek-dies, a central support for the blank to be operated on arranged centrally of the cheek-dies and extending upward through the lower hydraulic plunger and cylinder.

7. In a hydraulic press, the combination of upper and lower platens for supporting dies and hydraulic cylinders and plungers for operating them to and from each other, with radially-acting cheek-dies, devices hydraulically operated for moving the cheek-dies, a central support for the blank to be operated on arranged centrally of the cheek-dies and extending upward through the lower hydraulic plunger and cylinder and provided with a rotatable mandrel carried on its upper end to permit the blank or work to be rotated between the several dies.

8. In a hydraulic press, the combination of upper and lower platens for supporting dies and hydraulic cylinders and plungers for operating them to and from each other, with radially-acting cheek-dies, devices hydraulically operated for moving the cheek-dies, a central support for the blank to be operated on arranged centrally of the cheek-dies and extending upward through the lower hydraulic plunger and cylinder and provided with a rotatable mandrel carried on its upper end to permit the blank to be rotated between the several dies, and segmental dies carried by the upper and lower platens in alinement and between which different portions of the blank may be successively brought in the act of forging.

9. In a hydraulic press, the combination of a base-frame, an upwardly-directed hydraulic



cylinder having an upwardly-extending standard for carrying the work, a plunger fitting into said cylinder and surrounding the standard and upper hydraulic-power devices above the standard whereby the work may be operated from above and below by suitable hydraulic-actuated dies while supported on its standard.

10. In a hydraulic press, the combination of a base-frame, an upwardly-directed hydraulic cylinder having an upwardly-extending standard for carrying the work, a plunger fitting into said cylinder and surrounding the standard, a rotatable mandrel on the top of the standard for directly carrying the work and permitting it to be rotated, and upper hydraulic-power devices above the standard whereby the work may be operated from above and below by suitable hydraulic-actuated dies while supported on the mandrel of the standard.

11. In a hydraulic press, the combination of a base-frame, a cylinder and die-actuating plunger carried by the frame and working upwardly, a standard extending upward centrally through the plunger and carried by the cylinder, an upper frame, supported from the lower frame by tie-bolts, a downwardly-di-

rected hydraulic cylinder carried by the upper frame, a reciprocating die-actuating plunger for said downwardly-directed hydraulic cylinder, and radially-acting hydraulic cheek-die mechanism arranged about the standard and supported by the base-frame.

12. In a hydraulic press, the combination of a base-frame, a cylinder and die-actuating plunger carried by the frame and working upwardly, a standard extending upward centrally through the plunger and carried by the cylinder, an upper frame supported from the lower frame by tie-bolts, a downwardly-directed hydraulic cylinder carried by the upper frame, a reciprocating die-actuating plunger for said downwardly-directed hydraulic cylinder, radially-acting hydraulic cheek-die mechanism arranged about the standard and supported by the base-frame, and tension-bolts for holding the cheek-die mechanism in position and preventing excessive strain on its connections with the base-frame.

In testimony of which invention I have hereunto set my hand.

EDWARD GOWEN BUDD.

Witnesses:

CHARLES E. BIMLEY,  
ALEX. R. CHESTON.