No. 840,990. PATENTED JAN. 8, 1907.

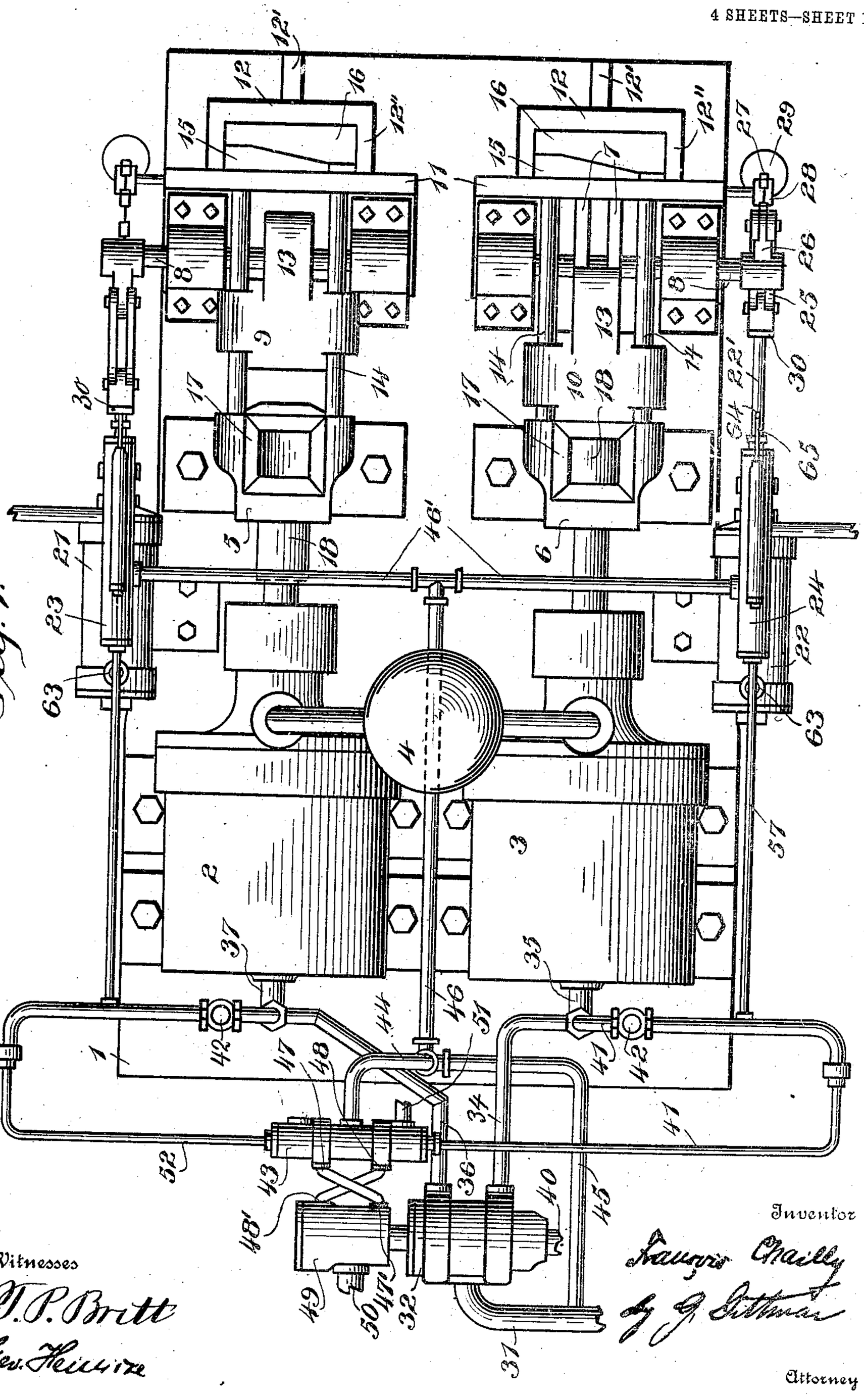
F. CHAILLY.

HYDRAULIC PRESS.

APPLICATION FILED OCT. 25, 1906.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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4 SHEETS—SHEET 2.

Fig. 3.

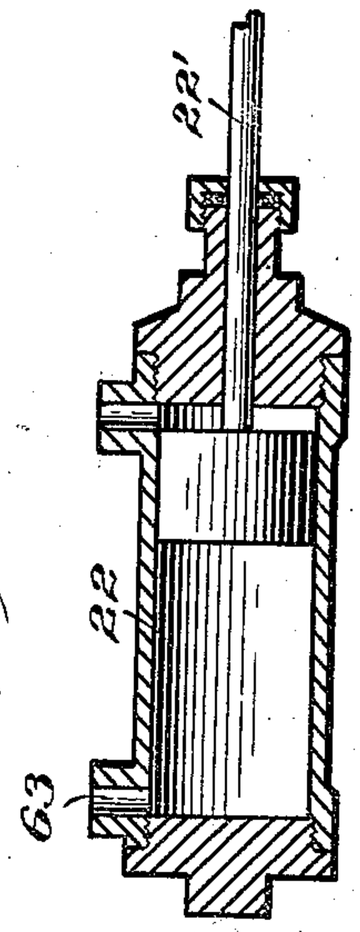

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 6.

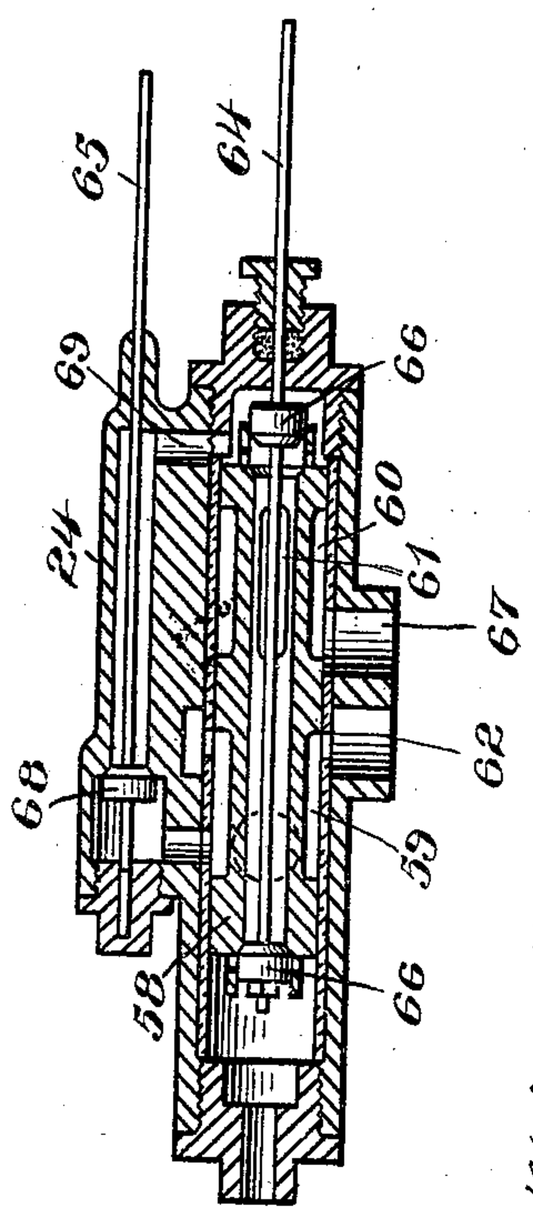


Fig. 4.

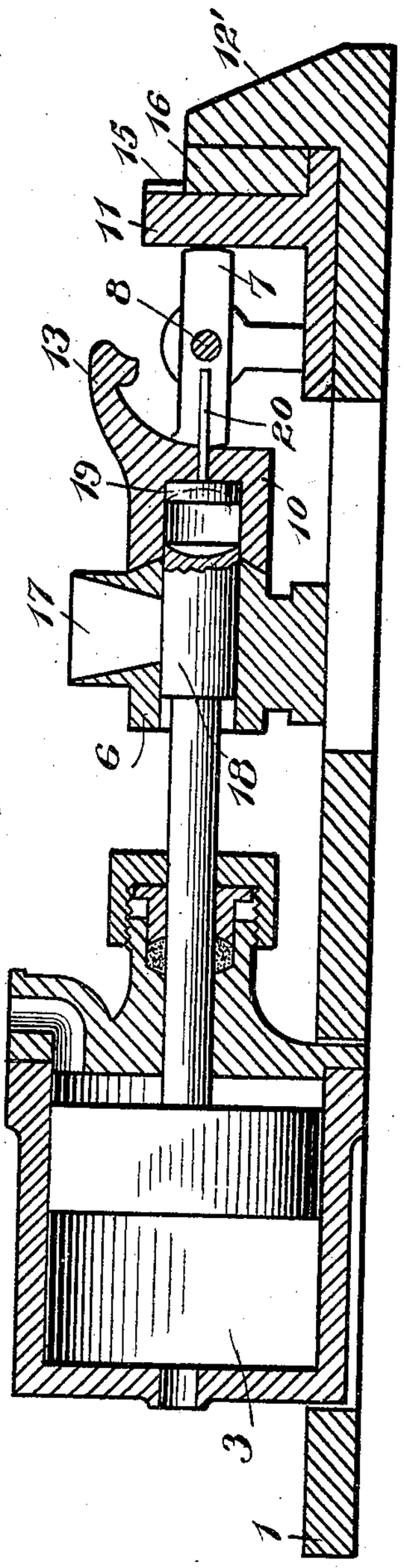
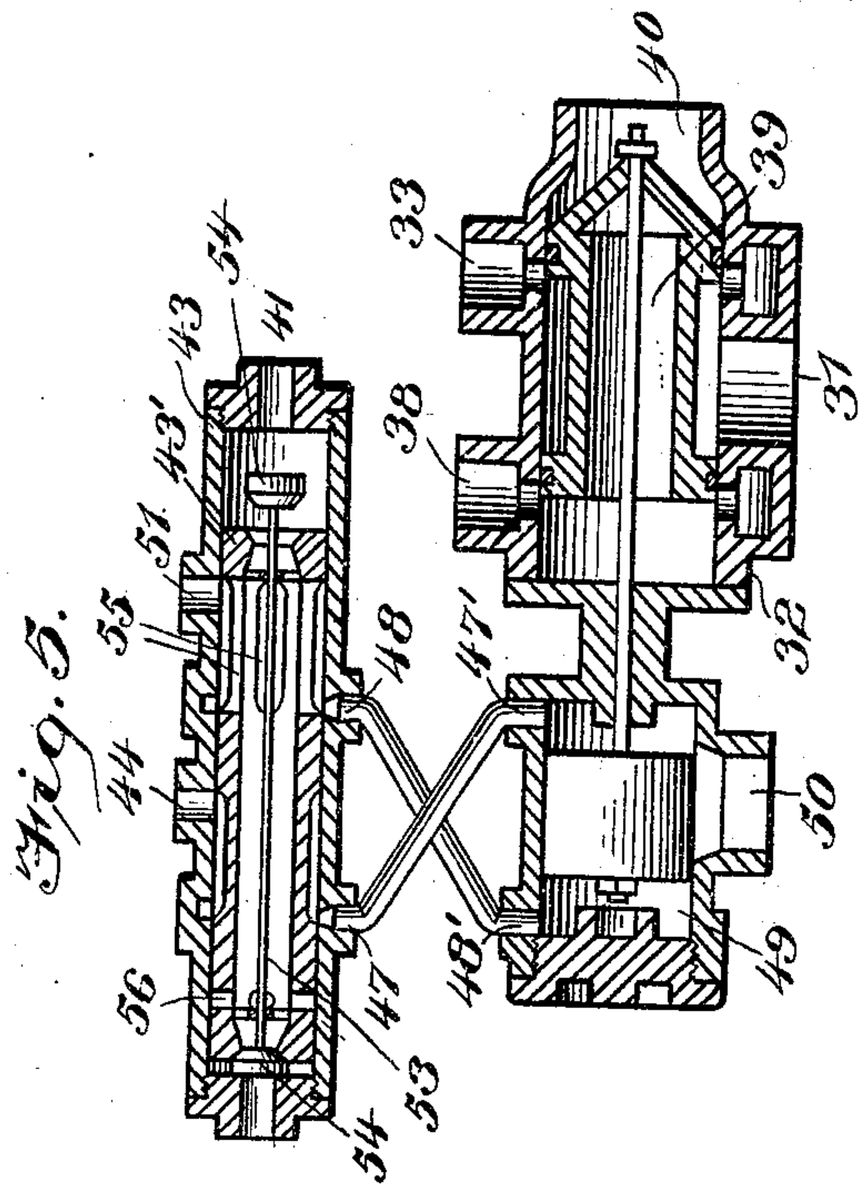


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 8.

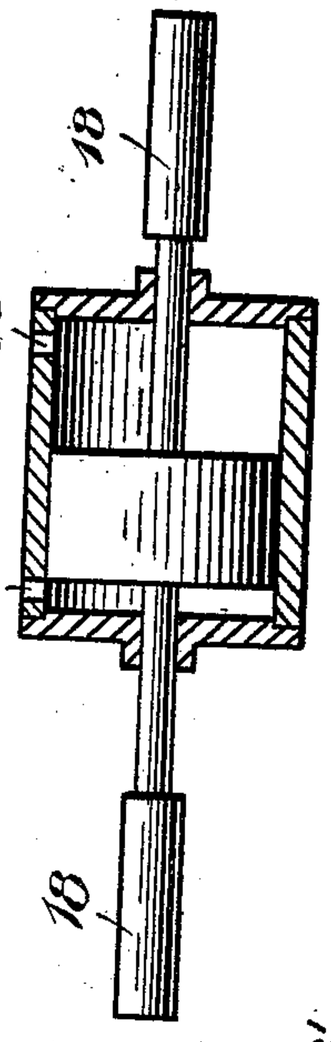


Fig. 9.

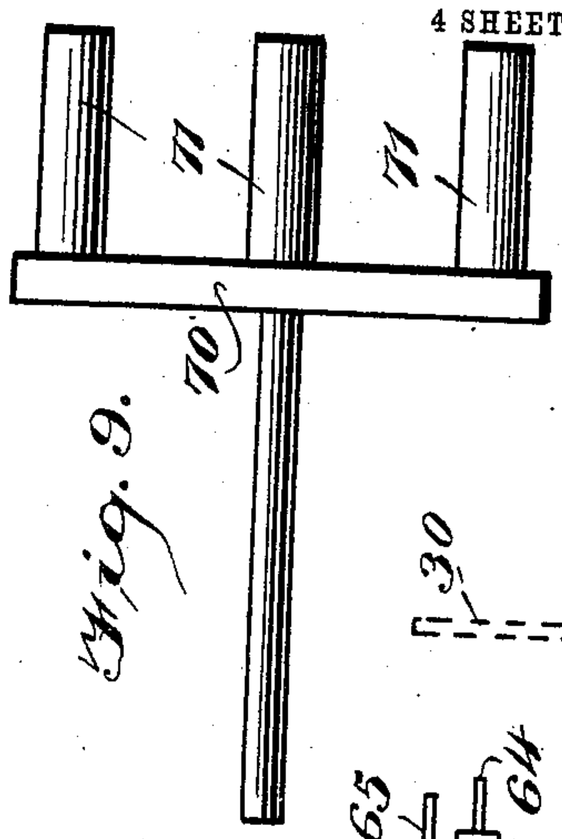
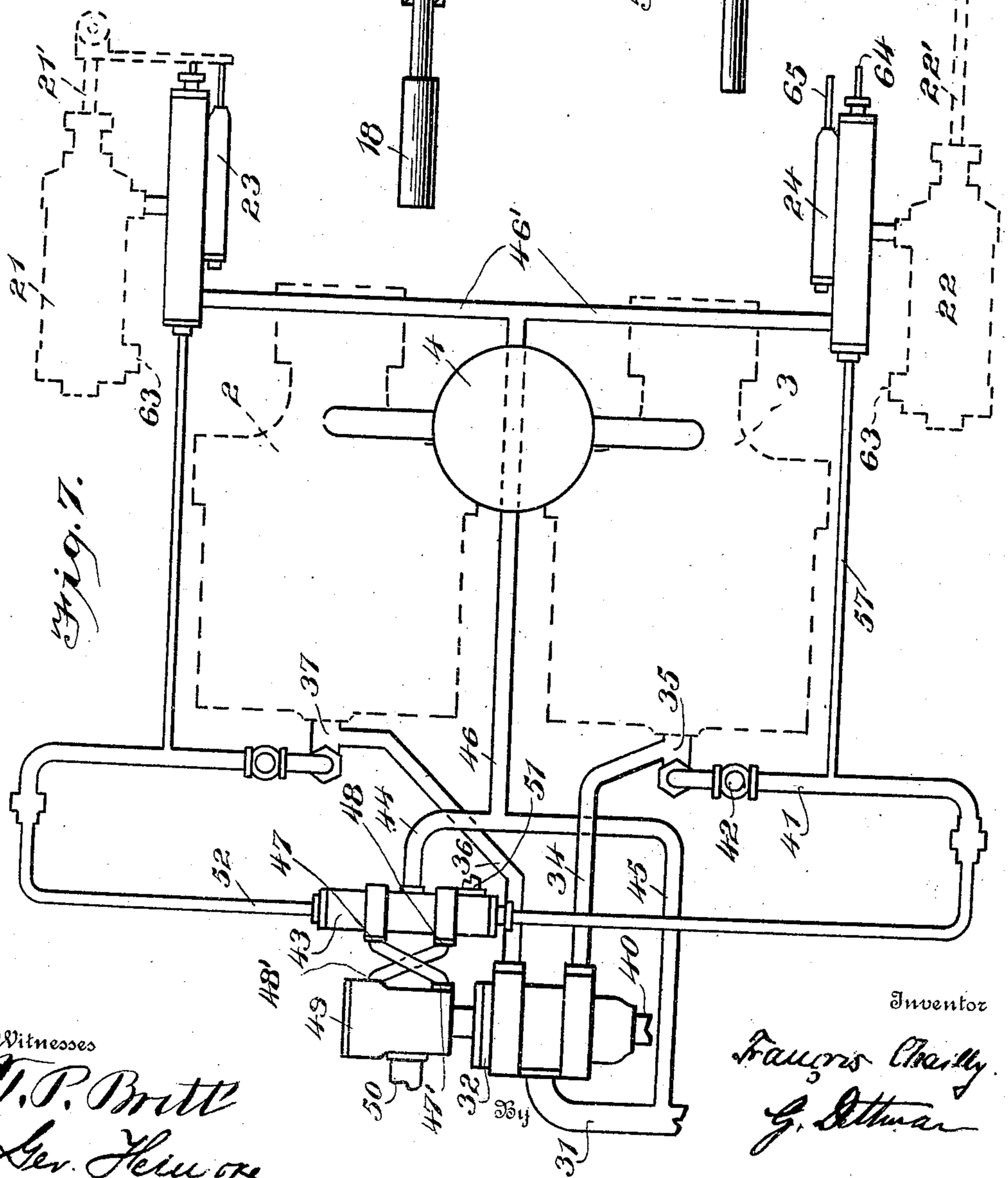


Fig. 7.



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UNITED STATES PATENT OFFICE.

FRANÇOIS CHAILLY, OF NEW YORK, N. Y.

HYDRAULIC PRESS.

No. 840,990. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed October 25, 1906. Serial No. 340,578.

To all whom it may concern:

Be it known that I, FRANÇOIS CHAILLY, a citizen of the Republic of France, residing at New York, State of New York, have invented certain new and useful Improvements in Hydraulic Presses, of which the following is a full, clear, and exact specification.

The object of the present invention is a hydraulic press which can be used in many industries—for instance, for compressing powdered substances into briquets or for punching or stamping metal in machine-shops, &c.

By a system of suitable valves forming part of this invention the press is made self-acting and the attendant has nothing else to do but to supply the hoppers of the press-molds with the material to be agglomerated.

In the example described below two molds and hydraulic cylinders are employed which work alternately and while the material is compressed in one mold the second is opened automatically and the briquet is ejected. Thereupon this second mold closes and is filled with a measured quantity of material, which now receives the pressure, while the first mold opens and allows the compressed block to drop out, and so on.

The valves are of such construction that the pressure can be regulated at will and the compressed blocks receive invariably the same degree of compression for which the valves have been adjusted.

Means are provided to drive the pistons always home on their back stroke independent of the length of stroke of the neighbor piston, and thus I am enabled to feed measured quantities of material into the molds and to obtain blocks or briquets of absolutely the same size and density.

The press may also be worked by steam or by compressed air.

In the accompanying drawings, forming part of this specification, Figure 1 shows my press in a plan view, and Fig. 2 in side elevation. Fig. 3 is a longitudinal section through one of the mold-controlling press-cylinders. Fig. 4 is a longitudinal section through one of the hydraulic cylinders and the press-mold. Fig. 5 is a longitudinal section through the main valves. Fig. 6 is a longitudinal section through the valves controlling the cylinder operating the molds. Fig. 7 is a diagrammatic plan view of the valves and pipe connections, illustrating the system of the water distribution. Figs. 8 and 9 illustrate how the ends of the piston-rods may be shaped to operate in a number of molds instead of one only.

On a base-plate 1 two hydraulic cylinders 2 and 3 are secured to give alternately a compressive action upon a substance to be compressed. To this end the piston-rod is extended through the cylinder-head to be reciprocated in a mold. The piston-rod passes preferably through the front head only, but may be made to pass also through the rear head in order to coöperate with two molds, one at each end of the hydraulic cylinders. The arrangement as shown and described below, working at one end only, offers certain advantages. When two pistons in two hydraulic cylinders act alternately under the pressure from the rear, the water in front of the pistons can be shifted from one cylinder to the other and back under a slight pressure sufficient to force the pistons always home at the end of their stroke independent of the length of stroke of the companion piston. To this end the front ends of the hydraulic cylinders are connected with a water-reservoir 4, preferably closed and provided with an air-cushion, which may be elevated, but is readily yielding under the slight variations of pressure in front of the pistons.

The pressure acting on the rear of the pistons may be derived from any suitable source of power—from an elevated water-reservoir, from a steam-boiler, a pump, or a compressed-air tank, &c. This pressure being very high—say one hundred and twenty pounds per square inch—easily overcomes the pressure on the front side of the pistons, and the piston-rods extending into molds 5 and 6, secured in front of the hydraulic cylinders, compress therein any material, such as coal-dust, clay, or sand to be agglomerated, wood-pulp, sawdust, &c. The piston-rod may also be used for shearing, punching, or stamping metal, as will be readily understood, and thus my press can be used with great advantage in machine-shops.

The molds should necessarily be very resisting and yet must open easily in order to remove the compressed blocks. With this object in view I employ cams 7 on shafts 8,

which lean with one end against movable heads 9 and 10 of the mold and with the other end against a well-supported plate 11, integral with the bearings of the shaft. The cams have an elongated approximately rectangular shape (best shown in Fig. 4) and transfer when in horizontal position all the pressure on a solid support 12 on the base-plate, and when turned into vertical position they catch a dog 13, projecting from the movable mold-head 9 or 10, sliding the same along suitable guide-bars 14, so as to open the mold.

Each support 12 is strengthened by a rib 12′ and by cheeks 12″, cast with it and with the base-plate, so that it has a box-like shape in which wedges 15 and 16 may be housed. The wedges bear against the side plate 11 of the shaft-bearings, which thus can be adjusted to a tight close of the mold and transfer all pressure through the cams upon the support or anvil 12.

The guide-bars 14 are firmly secured with one end in the stationary parts 5 and 6 of the molds, and the other ends enter into holes in the side plates 11, snugly fitting therein.

The stationary molds have each a hopper 17 and a horizontal perforation for a piston 18, being the reinforced end of the hydraulic piston-rod. The mold-heads 9 and 10 slide on the bars 14 and are bored out in line with piston 18. A small piston 19 forms the bottom of the mold-heads 9 and 10 and extends, with a rod 20, outward, almost abutting with its end against the shaft 8. Therefore when the cams 7 turn from the horizontal into the vertical position and catch the dog 13 of the movable mold-head, sliding the latter along the rods 14 to open the mold, the piston 19, abutting with its rods 20 against a shaft 8, cannot follow, and therefore the compressed block will be ejected and will fall down through the base-plate, which is provided with a suitable opening under the mold.

The shafts, with the cams, are turned by supplementary hydraulic cylinders 21 22, suitably governed by valves 23 and 24. The piston-rods 21′ and 22′ of these cylinders are connected by a link 25 to a crank 26, keyed upon the outer end of each shaft 8, and by a chain 27, passing over a roller 28 on the base-plate to a heavy weight 29. Thus when the pressure fluid enters in one of the small cylinders 21 or 22 this weight is raised, while the shaft, with the cams, turns to throw the mold open.

An arm 30, extending vertically from the end of each piston-rod 21′ and 22′, is adapted to strike the ends of rods projecting from the valves 23 and 24, and thus produces the shifting of the same, thereby relieving the pressure in the cylinders, whereupon the weight pulls the piston back in its place and the cams are turned back again into the horizontal position, whereby the mold is closed again, as will be readily understood.

I will now describe how the valves 23 and 24 are working and also how the whole system operates automatically by means of valves. (Shown in detail in Figs. 5 and 6.)

The pressure fluid (water, steam, or air) enters through the main 31 into the valve 32, Fig. 5, and through port 33 it passes into suitable pipe connections 34 and 35 into the cylinder 3. Driving its piston forward by pressing against its rear face will easily overcome the pressure on the front side of the piston and drive the water under the air-cushion in the reservoir 4 backward, thereby returning the piston in the companion cylinder 2. The water in the rear of said piston goes back to the valve 32 through pipe connections 36 and 37, entering by the port 38 and through the hollow body of the slide 39 to the exhaust 40. At the same time while the piston in cylinder 3 goes forward, as described, the material in the mold 6, which is now closed, will be compressed. At first when the material which has fallen through the hopper 17 in front of the piston 18, filling out the available empty space in the mold, is still soft and offers little resistance the pressure in the cylinder 3 will be less than the available pressure-supply, assumed to be one hundred and twenty pounds per square inch; but when the piston arrives near the end of its stroke and the mass in the mold is highly compressed the pressure in the cylinder will gradually increase and come up to the mark of one hundred and twenty pounds per square inch. Then the high pressure in the pipe connections 34 35 will be transferred also into a branch pipe 41, which is provided with a relief-valve 42. This valve can be of ordinary construction to be pressed down on its seat, only a spring (not shown) is interposed between the valve-plate and the screw-stem so that the valve can be regulated to lift under any desired pressure. As soon as the valve-plate is lifted from its seat the water flows through the branch 41 into the valve 43, shifting therein a slide 43′ into the position shown in the detail section, Fig. 5. The valve-body is connected by a branch 44 with a connection 45 in communication with the main 31 and with the feed-pipe 46 for the valves of the supplementary cylinders, to be described below.

Ports 47 and 48 are connected crosswise to ports 47′ and 48′ of a small cylinder 49, forming a continuation of the main valve 32. This cylinder is provided with an exhaust 50, and 51 is an exhaust of the casing of valve 43. Now that the slide 43′ has come into the position shown in detail in Fig. 5 the pressure-water entering through port 44 can pass through ports 47 and 47′ behind the piston of cylinder 49 and shift it, with the slide 39, into the opposite position—that is to say, the

port 33, leading into the cylinder 3, will be closed and the port 38, connected with the cylinder 2, will be open. Thus the system is changed and the pressure fluid from the main 31 will act in cylinder 2 in the same manner as described with respect to cylinder 3. When on this side of the press the pressure has reached the maximum in the cylinder and the relief-valve 42 in the branch pipe on this side will be lifted, the water will be allowed to pass into the valve 43 through the branch pipe 52, and slide 43′ will go back into the original position. Before that, while still in the position shown, the piston in cylinder 49 ejects the water before it through ports 48′ and 48 to the exhaust 51, and also the pressure in the branch 41 is relieved immediately, and the water can escape toward the exhaust or outlet 51. To this end a rod 53, with valve-heads 54 at each end, is sildably arranged in the slide 43′, closing off both ends of the same alternately by means of suitable valve-seats.

In the position Fig. 5 the pressure-water from branch 41, which has pushed the slide 43′ into the position shown, finds the head 45 open and can go into the hollow interior of the slide and escape through slots 55, as shown. When by the pressure through the pipe 52 the slide 43′ is thrown back again, the head 54 at the right end strikes against the end plug of the valve and the head at the left side is thrown open. The pressure-water from pipe 52 is now relieved by passing into the hollow interior of the slide 43′ and escapes through the slots 55 and the exhaust 51, while the water before the piston in cylinder 49 commingles with the escaping pressure-water in passing through ports 47′ 47 and holes 56 through the wall of the slide into its interior. The full pressure through port 44 and ports 48 and 48′ brings the slide 39 back again into its original position and changes the system, so that the piston in cylinder 3 is pressed forward again. The weight 29 has closed the mold automatically and has brought the mold-controlling parts into the position shown in Figs. 2 and 4. The parts of the valve 24 take the position shown in Fig. 6 immediately when the relief-valve 42 opens and admits pressure-water into the branch 41, which is connected with the end of valve-casing 24 by a pipe 57, admitting the pressure-water against the end of a sliding valve-body 58. This valve-body is provided with two broad annular grooves 59 and 60, the first being imperforate and the second having longitudinal slots 61 in its bottom to produce communication with the hollow interior. The groove 59 is always under high-water pressure admitted from the main 31 through branches 45, 46, and 46′. Therefore at the completion of the compression, when the valve has taken the position Fig. 6, high-pressure water will be admitted through port 62 into the supplementary cylinder 22, and its piston will travel back, lifting the weight 29 and opening the mold, as above described, at the same time ejecting the ready compressed block.

A small port 63 may be provided at the rear end of cylinder 22 for the escape of the air in the cylinder. This port 63 may be connected by a suitable pipe with the reservoir 4 or with a similar separate air-cushioned reservoir. (Not shown.) In this instance the weight 29 for closing the mold may be dispensed with, since pressure from said air-cushioned reservoir would serve to drive the piston in cylinders 21 or 22 back to turn the cams into the horizontal mold-closing position. When the piston reaches the end of its stroke, the arm 30 strikes the valve-rods 64 and 65, as already stated above, first the rod 64, which extends a little farther than 65, thereby shifting the valve-body 58 into a position to shut off the pressure from cylinder 22 and closing by valve-head 66 the inner space of the valve-body 58, while the valve-head 66 at the left end of the rod 64 leaves a passage open to this inner space, so that the pressure from pipe 57 may be relieved. This pressure-water finds now an outlet through the interior of the valve-body 58 and passes through the slots 61 to the exhaust 67. The arm 30 in reaching the end of its stroke has just touched the end of rod 65, thereby throwing open a plug 68 and admitting the high-pressure water in front of valve-plate 66 and valve-body 58 by passing through the port 69. This will assist the shifting of the valve-body 58 and compel it to return into its original position, while the pressure on the plate 66 at the right end will insure an open channel at the left end, so that the pressure in the connecting-pipe 57 will be relieved. The water in the cylinder 22, which has driven the piston home and produced the shifting of the valve, is now free to pass into the exhaust 67 as the groove 60 overbridges the ports 62 and 67. The weight 29 can therefore close the mold again. The plug 68 is immediately thrown into the closed position, preventing the pressure to pass through port 69 in front of the valve-body 58; but this valve-body remains in the position of rest till again by lifting of the relief-valve 42 pressure is admitted through the connecting-pipe 57, whereupon also the valve-body 58 takes the position shown in Fig. 6, and the pressure through branches 46 46′ acts again in the supplementary cylinder to throw the mold open. The action in the supplementary cylinder 21 is absolutely the same as in 22, and therefore the description need not be repeated.

Fig. 8 shows a disposition of a piston-rod extending through both ends of the cylinders 2 and 3, so that molds at both ends may co-

operate with the hydraulic cylinder. In such case the reservoir 4 may be omitted, and the system of water distribution and valves may be duplicated, having the ports 35 and 37 at the sides of the cylinder, as will easily be understood. I can also multiply the molds by using the system just as described and shown and by securing at the end of each piston-rod projecting from the hydraulic cylinders a strong bar 70, as shown in Fig. 9, carrying three or more pistons 71, having a diameter equal to the piston 18, so as to correspond with the bore of the molds which would be arranged on the base-plate side by side.

Having thus described my invention, what I claim is—

1. In a hydraulic press, a power-cylinder, a separable mold, one member of which is movable, a fixed member adjacent to said movable member to receive the pressure of the power-cylinder exerted on the mold, means for operating the movable member of the mold, an automatically-operated valve for supplying motor fluid to the power-cylinder, and an automatically-operated valve for controlling the means for operating the movable member of the mold.

2. In a hydraulic press, a pair of alternately-operating power-cylinders, and a pair of separable and alternately-operating molds, one member of which molds is movable, fixed members to receive the pressure of the power-cylinder exerted on the molds, means for operating the movable member of the molds, an automatically-operated valve for supplying motor fluid to both power-cylinders, and an automatically-operated valve for controlling the means for operating the movable member of each mold.

3. In a hydraulic press, a power-cylinder, a separable mold, one member of which is movable, a fixed abutment, cams between said movable member and said fixed abutment engaging the movable member to secure it in closed position, and also to remove said member from the fixed member of the mold, an automatically-operated valve for supplying motor fluid to the power-cylinder, and an automatically-operated valve for controlling said cams.

4. In a hydraulic press, a power-cylinder, a separable mold, one member of which is movable, a fixed abutment, cams between said movable member and said abutment, a supplemental power-cylinder for operating said cams, an extension on the movable member of the mold engaged by said cams to open the mold, an automatically-operated valve for supplying motor fluid to the power-cylinder, and an automatically-operated valve for supplying motor fluid to the supplemental power-cylinder.

5. In a hydraulic press, a power-cylinder, a separable mold, one member of which is movable, a fixed abutment on the base-plate, an adjustable plate provided with shaft-bearings, a shaft supported in said bearings, cams on said shaft engaging the movable member of the mold, a supplemental power-cylinder and connection with said shaft, an automatically-operated valve for controlling the power-cylinder, and an automatically-operated valve for controlling the supplemental power-cylinder.

6. In a hydraulic press, a power-cylinder, a separable mold, one member of which is movable, a fixed abutment on the base-plate, an adjustable plate provided with shaft-bearings, a shaft supported in said bearings, cams on said shaft engaging the movable member of the mold and a vertical member of said adjustable plate, an adjusting device between the fixed abutment and the adjustable plate a supplemental power-cylinder connected to said shaft, means for controlling the power-cylinder, and means for controlling the supplemental power-cylinder.

7. In a hydraulic press, a power-cylinder, a press-mold operated thereby, means for supplying motor fluid under a predetermined pressure to the cylinder on the power-stroke, a reservoir for supplying motor fluid under a reduced pressure to the cylinder on the return stroke of the piston and means for automatically cutting off the high-pressure fluid at the end of the power-stroke of the piston in the power-cylinder.

8. In a hydraulic press, a pair of alternately-operating power-cylinders, and a pair of molds connected to said cylinders, means for supplying motor fluid under a predetermined pressure to the cylinders on the power-stroke, a reservoir connected to both cylinders for supplying motor fluid under a reduced pressure to the cylinders on the return stroke of the piston, and means for cutting off the high-pressure fluid at the end of the power-stroke of one piston, and directing said fluid to the other cylinder.

9. In a hydraulic press, a pair of alternately-operating cylinders, and a pair of molds connected to said cylinders, a fluid motor-supply valve common to both cylinders, and comprising a hollow cylindrical slide open at both ends, a cylinder having a piston attached to said slide, a hollow cylindrical slide in a supplemental valve-casing, open at both ends and provided with a rod extending through the slide and having disks on the ends thereof to close the ends of the slide alternately, an imperforate annular groove, and a perforate annular groove in the exterior of the slide, the valve-casing having openings in its ends connected to the power-cylinders, supply and exhaust ports and ports communicating with the cylinder inclosing the piston attached to the main slide.

10. In a hydraulic press, a pair of alternately-operating power-cylinders, and a pair of separable molds connected thereto a supplemental power-cylinder for opening and closing the mold, and provided with a valve-case having a supply-pipe at one end communicating with the main power-cylinder, a hollow cylindrical slide open at both ends a rod extending through the slide and having disks to close the ends of the slide alternately, an imperforate annular groove and a perforated annular groove in the exterior of the slide, the valve-casing being provided with supply and exhaust ports, and a supplemental valve for controlling the supply of motor fluid to the main valve.

In testimony whereof I affix my signature.

FRANÇOIS CHAILLY.

In presence of—
HENRI DONZÉ,
ANGELO BIOLY.