(No Model.)

2 Sheets—Sheet 1.

J. KELLER.

ENGINE.

No. 603,788. Patented May 10, 1898.

Fig. 1.

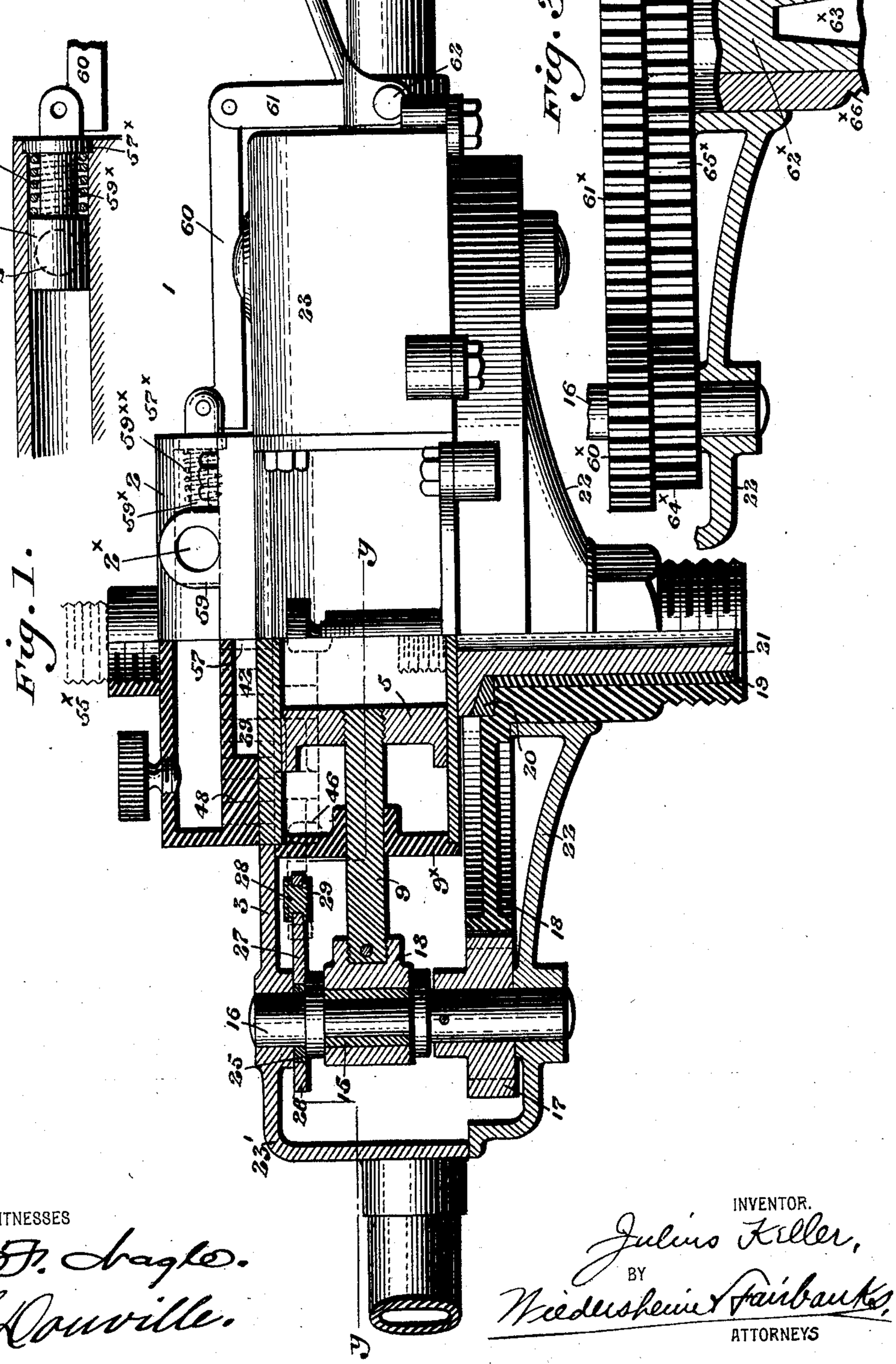

Fig. 2.

Fig. 4.

WITNESSES

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INVENTOR.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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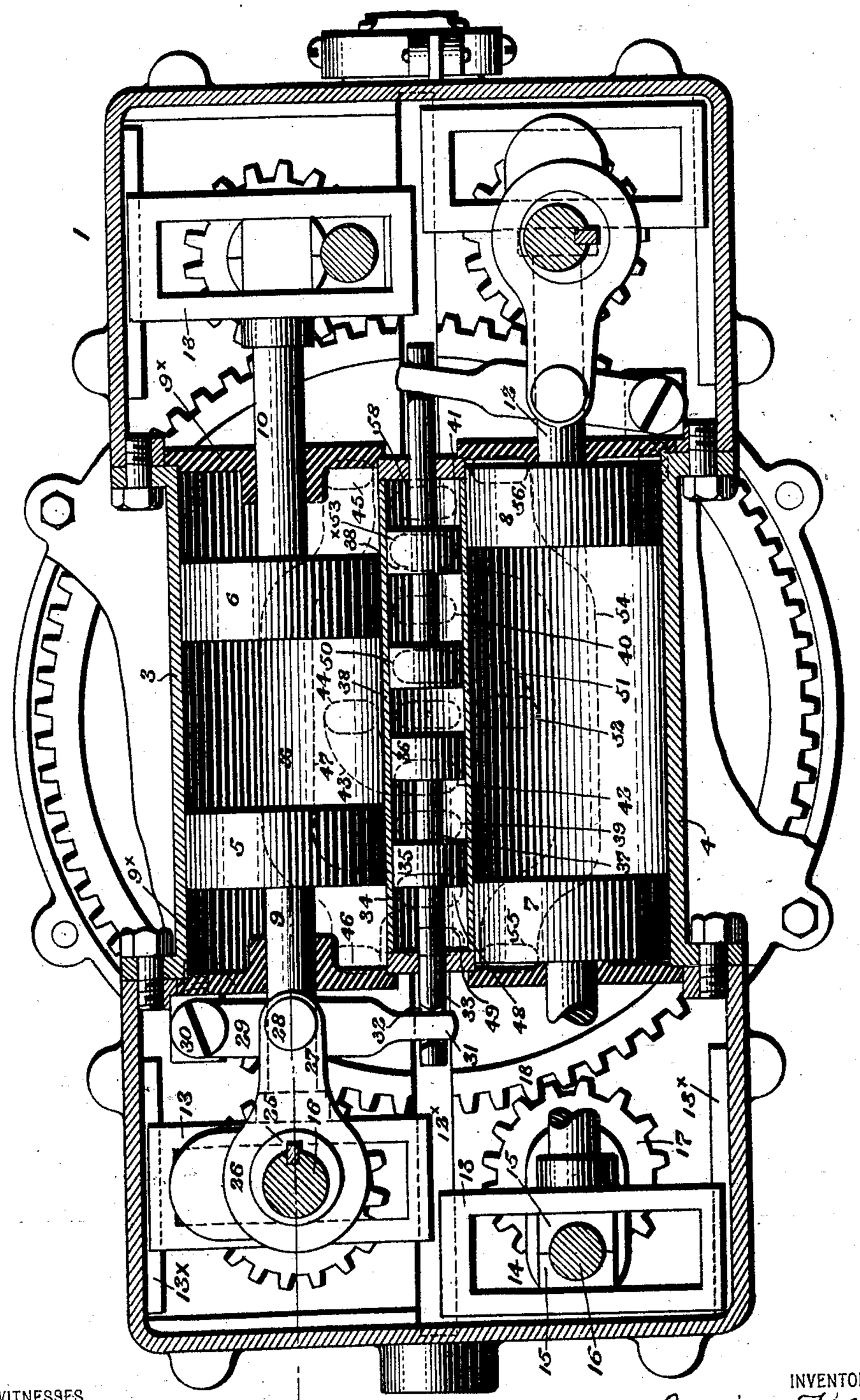

Fig. 2.

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UNITED STATES PATENT OFFICE.

JULIUS KELLER, OF PHILADELPHIA, PENNSYLVANIA.

ENGINE.

SPECIFICATION forming part of Letters Patent No. 603,788, dated May 10, 1898.

Application filed September 29, 1897. Serial No. 653,482. (No model.)

To all whom it may concern:

Be it known that I, JULIUS KELLER, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Engines, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of an improved construction of engine in which a plurality of cylinders having an intermediate valve-chamber provided with alining valves are employed, the reciprocal motion of the pistons contained in said cylinders being transformed to a rotary motion by suitable intervening mechanism, the tool being balanced under all conditions and readily transported.

It also consists of a plurality of spindles adapted to revolve simultaneously but at different rates of speed, either of said spindles being adapted for the reception of the tool, whereby the latter may be expeditiously changed from one spindle to the other, so as to be run fast or slow, as may be desired.

It further consists of novel details of construction, all as will be hereinafter fully set forth, and particularly pointed out in the claims.

Figure 1 represents a side elevation of an engine embodying my invention, a portion thereof being shown in section, the latter being taken on line *x x*, Fig. 2. Fig. 2 represents a horizontal section of the engine, the section being taken on line *y y*, Fig. 1, and showing the relative position of the pistons, valve, and their adjuncts. Fig. 3 represents a detached sectional view showing means for rotating a drill at different speeds. Fig. 4 represents a sectional view showing the valve and its adjuncts.

Similar figures of reference indicate corresponding parts in the drawings.

Referring to the drawings, 1 designates an engine, the same consisting of the air-chamber 2, into which the air or other motive fluid is conducted through the air-inlet $2^{\times}$, said air-chamber being located above the cylinders 3 and 4, which are located in the present instance side by side and substantially parallel to each other. The cylinder 3 contains the pistons 5 and 6, which are adapted to move toward and away from each other, while the cylinder 4 contains a pair of similar pistons 7 and 8, which also move toward and from each other.

The pistons 5, 6, 7, and 8 are each provided with the piston-rods 9, 10, 11, and 12, respectively, said rods passing through the cylinder-heads $9^{\times}$.

Each of the above-mentioned piston-rods is connected to a yoke 13, and since the construction and manner of connection of each thereto is substantially the same a description of one will suffice for all. The yoke 13 is in the present instance in the shape of a parallelogram or other figure, which reciprocates on the slides $13^{\times}$ and the guides $12^{\times}$. The interior walls of the yoke are in contact with the sliding box 14, which is made in sections 15, the latter engaging the crank 16, which is mounted in suitable bearings in the top bearing-plate 23 and the bottom bearing-plate 22. The crank-shaft 16 has secured thereto in any suitable manner the pinion 17, which rotates in unison therewith and is in mesh with the main gear 18, which is located below the cylinders 3 and 4.

19 designates the main-gear bushing, and 20 the thrust-washer, which contacts with a suitable portion of the stud 21, the relative position of the parts when assembled being understood from Fig. 1.

25 designates an eccentric which is mounted on the shaft 16 and engaged by the eccentric-strap 26, which has an arm 27, the latter carrying the pin 28, by means of which connection is made to the lever 29, the latter being fulcrumed at the point 30. The end 31 of the lever 29 passes through an opening 32 in the piston-rod 33, the latter carrying the piston-valve 34, which consists of the two cylindrical portions 35 and 36, which are connected by a neck 37, it being noted that there are two of these piston-valves 34 and $38^{\times}$, each of which is in alinement with each other and located in the valve chest or chamber 38 and operated from the crank-shafts 16, which are located diagonally to each other, it being noted that each of said valves is located in the same valve-chamber, whose bore in the

present instance forms an unbroken continuity.

39 and 40 designate ports which are located in the valve-chamber 38, each side of the center thereof, said ports being always open with respect to the valves. The left-hand valve 34 regulates or controls the flow of the air for the pistons 5 and 6, while the right-hand valve 38× controls the air operating the pistons 7 and 8. The pistons 5 and 6 are shown on half-stroke and the air passing through ports 42, 43, and 44 enters the cylinder 3 near the center thereof and forces the pistons 5 and 6 apart, the ports 45, 46, 47, and 48 being open for exhaust and in connection with the exhaust-port 49. The pistons 7 and 8 are shown in Fig. 2 as being at the end of their outward stroke, the valve 38× being now at half-stroke and the inlet-ports 50 and 53 being closed, a further movement of the valve 38× will open the ports 50, 51, and 52 for exhaust and the ports 53, 54, 55, and 56 for the inlet of air at the end of the cylinder 4 and upon the pistons 7 and 8 contained in said cylinder 4, thereby forcing both pistons toward each other, said cylinder 4 exhausting through ports 52, 51, 50, and 57, the above-described operations taking place alternately and successively. The reciprocation of the pistons will cause a corresponding movement to be imparted to the piston-rods attached thereto, thereby reciprocating the yokes 13, and consequently the crank-shafts 16, the rotation of said crank-shafts being imparted to the pinions 17, and thence to the main gear 18, from which latter rotation is imparted to the drill.

The throttle valve or plug 59, located in the seat 59×, controls the inlet to the valve-chest at the point 2× and is operated by the link 60, which latter has the member 61 attached thereto, said member being pivoted at 62 to the handle 64 and said throttle-valve being operated by the arm 63, the latter and said member being arranged in the form of an elbow-lever, it being apparent that when said arm is pressed against the handle 64 the throttle is opened and the machine starts, but as soon as the arm 63 is released it closes the throttle-valve and the machine stops.

I desire to call especial attention to the fact that by locating the inlet for the motive fluid so that said inlet is controlled by the longitudinal movement of the throttle-valve proper I am enabled to throttle or control the admission of the motive fluid with great exactness, so that the engine can be run fast or slow at will, a result which cannot be attained where an ordinary stop-valve having a bevel-seat is employed.

The throttle-valve is closed by means of the spring 59××, which surrounds the valve-stem 59×, one end of said spring abutting against a shoulder of said valve and its other end contacting with the plate or washer 57×, through which said valve-stem passes.

It will be especially noted that the space between the feed-screw 55× and the drill or tool is as short as possible and that by having the cylinders 3 and 4 located in the center of the machine and parallel to each other the machine is perfectly balanced under all conditions.

In Fig. 3 is shown means for rotating a drill at different speeds, the parts appearing in substantially the same relative position as seen at the lower portion of Fig. 1, 22 designating the bottom bearing-plate, in which the crank 16 has its lower bearing, said crank having the pinion 60× secured thereto, said pinion meshing with the main gear 61×, having the hub or spindle 62× depending therefrom and the socket 63× therein for the reception of the drill.

64× designates a pinion mounted on the crank 16 adjacent to the pinion 60×, but of less diameter than the latter, said pinion 64× meshing with the main gear 65×, which is of greater diameter than the gear 61×, said gear 65× having a depending sleeve or spindle 66×, which is provided with exterior screw-threads upon which the drill or holder therefor is adapted to be secured.

It will be evident from the foregoing that the main gear 61× will revolve faster than the gear 65×, and when it is desired to change the speed of rotation of a drill it is only necessary to remove the drill from the socket 63× and to make the necessary connections to enable the drill to be rotated by means of the threaded portion of the sleeve 66×, it being understood that the pinions 60× and 64× revolve in unison, as do their intermeshing gears, whereupon the spindles 62× and 66× are also caused to revolve simultaneously, whereby the tool employed can be expeditiously interchanged, so as to run fast or slow, as may be desired.

It will of course be evident that the engine above described can be operated by steam as well as by air or any other motive fluid.

It will of course further be evident that changes may be made by those skilled in the art that will come within the scope of my invention, and I do not, therefore, desire to be limited in every instance to the exact construction I have herein shown and described.

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

1. In an engine, a plurality of cylinders, a valve-chamber provided with alining valves intermediate of and in communication with said cylinders, a plurality of pistons in each cylinder, a main gear rotatably supported in proximity to said cylinders, a plurality of crank-shafts, means for rotating the same by the reciprocation of said pistons, and mechanism operated by said shafts for rotating said main gear.

2. In an engine, a plurality of cylinders, each having a pair of pistons therein, a valve-chest intermediate of and in communication with said cylinders, a plurality of alining pis-

ton-valves in said chest, shafts rotated by the reciprocation of said pistons, pinions mounted on said shafts, a main gear in mesh with said pinions and connections from said shafts for operating said valves.

3. In an engine, a plurality of cylinders, each having a pair of pistons therein, an alining valve-chest located in proximity with said cylinders, a plurality of valves in said chest, yokes suitably supported and connected to the piston-rods attached to said pistons, crank-shafts on which said yokes are mounted, pinions carried by said crank-shafts, a main gear in mesh with said pinions, and mechanism intermediate said shafts and valves for reciprocating the latter.

4. In an engine, a pair of cylinders arranged side by side, a valve-chest intermediate said cylinders, valves in said chest and pistons in said cylinders working oppositely to each other, a plurality of crank-shafts, a plurality of yokes, a piston-rod for each piston being secured to one of said yokes, boxes common to said yokes and shafts, slides and guides for supporting said yokes, an eccentric mounted on a pair of said shafts arranged diagonally to each other, connections from said eccentrics for operating said valves, pinions mounted on said shafts and a main gear rotatably supported and in mesh with said pinions.

5. In an engine, a main gear rotatably supported, a plurality of cylinders located adjacent to said gears, each cylinder having a pair of pistons therein moving in opposite directions, a valve-chest containing a pair of valves, means for moving the latter in opposite directions, ports leading from said valve-chest to substantially the middle of each cylinder and also to the ends of the latter, said ports serving alternately as inlet and exhaust ports, and a series of pinions rotated by the reciprocation of said pistons, said pinions meshing with said main gear.

6. In an engine, a pair of cylinders arranged side by side, a pair of pistons in each cylinder, a valve-chest connected with said cylinders, valves in said chest controlling the reciprocation of said pistons, a plurality of crank-shafts, a plurality of yokes, a rod for each piston secured to each of said yokes, boxes common to said yokes and shafts, an eccentric mounted on a pair of said shafts arranged diagonally to each other, connections from said eccentrics for operating said valves, pinions mounted on said shafts and a main gear rotatably supported and in mesh with said pinions.

7. In an engine, main gears of different diameters rotatably supported, a plurality of cylinders located above said gears, each of said cylinders having a pair of pistons therein moving in opposite directions, a valve-chest containing a pair of valves, means for moving the latter in opposite directions, ports leading from said valve-chest to substantially the middle of each cylinder, and also to the ends of the latter, said ports serving alternately as inlet and exhaust ports, a plurality of crank-shafts, rods connecting said pistons with said shafts, a plurality of gears, and a plurality of pinions of different diameters mounted on said shafts and adapted to mesh with said gears.

8. In an engine, an inclosing casing, a plurality of cylinders, a valve-chest intermediate of said cylinders and in communication therewith, alining valves in said chest, crank-shafts rotatably mounted and having their bearings in said casing, connections common to said crank-shafts, pistons and valves, a plurality of pinions mounted on each of said crank-shafts, and revolving in unison therewith, a plurality of gears meshing with said pinions, and a plurality of spindles rotatably mounted in said casing.

9. In an engine, an inclosing casing, a chamber supported thereon in which the motive fluid is initially received, an inlet for said fluid, a seat or passage extending transversely to said inlet, a throttle-valve longitudinally movable in said passage past said opening, a spring for retaining said throttle-valve in position, means for actuating said valve from the exterior, a plurality of cylinders located in said casing, a plurality of pistons in each of said cylinders, a valve-chest adjacent the latter and communicating therewith, a plurality of valves in said chest, means for operating said valves, crank-shafts rotatably mounted in said casing, and means for transmitting power from said shafts to a drill or tool.

10. In an engine, a plurality of cylinders, a plurality of pistons in each cylinder, valves for controlling said pistons, a plurality of main gears of varying diameters, rotatably supported in proximity to said cylinders, a plurality of crank-shafts, means for effecting the rotation of said shafts by the reciprocation of said pistons, a plurality of pinions of different diameters mounted upon each of said shafts and rotating in unison therewith, said pinions meshing with said gears and spindles actuated by the latter, said spindles rotating simultaneously and at different speeds.

11. In an engine, the combination of a plurality of cylinders, a plurality of pistons in each cylinder, a valve-chest intermediate of said cylinders, and in communication therewith, a plurality of valves in said chest, said valves being located in each end thereof, a chamber located above said chest, an inlet for the motive fluid leading into said chamber, a passage extending transversely to said inlet, a throttle-valve consisting of a plug movable in said passage and adapted to be moved past said inlet so as to wholly or partially close the latter, a spring for holding said throttle-valve in position, means for operating said valve from the exterior, a main gear rotatably supported in proximity to said

cylinders, a plurality of crank-shafts, means for rotating the same by the reciprocation of said pistons and mechanism operated by said shafts for rotating said main gear.

12. In an engine, the combination of an inclosing casing, crank-shafts rotatably mounted in said casing, a plurality of cylinders in the latter, pistons in said cylinders actuated by fluid-pressure, valves for controlling the movement of said pistons, a valve-chest for said valves, a chamber located adjacent said valve-chest in which the motive fluid is initially received, a throttle-valve of the piston type, adapted to reciprocate in said chamber, for enabling the operator to gradually admit the motive fluid to said cylinders, pinions on said shafts, a main gear rotatably supported in said casing and meshing with said pinions, a main-gear bushing, a thrust-washer, a stud against which said bushing and washer are adapted to contact, and means for operating said valves.

JULIUS KELLER.

Witnesses:
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JOHN A. WIEDERSHEIM.