F. E. DOMSCHEIT.

TURBINE ENGINE.

APPLICATION FILED SEPT. 8, 1914.

1,190,637.

Patented July 11, 1916.

4 SHEETS—SHEET 1.

Fig. 1

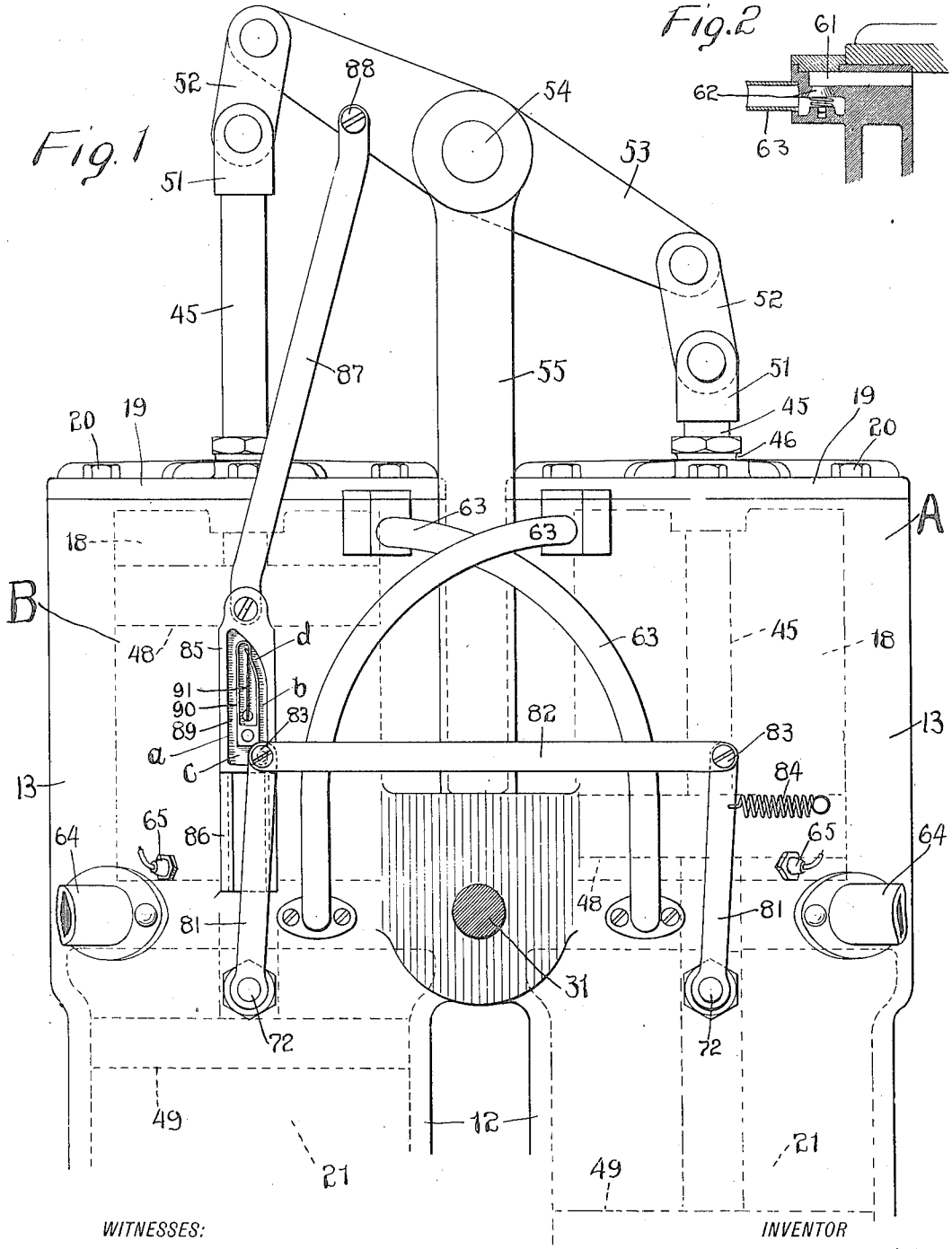

Fig. 2

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4 SHEETS—SHEET 2.

Fig. 3

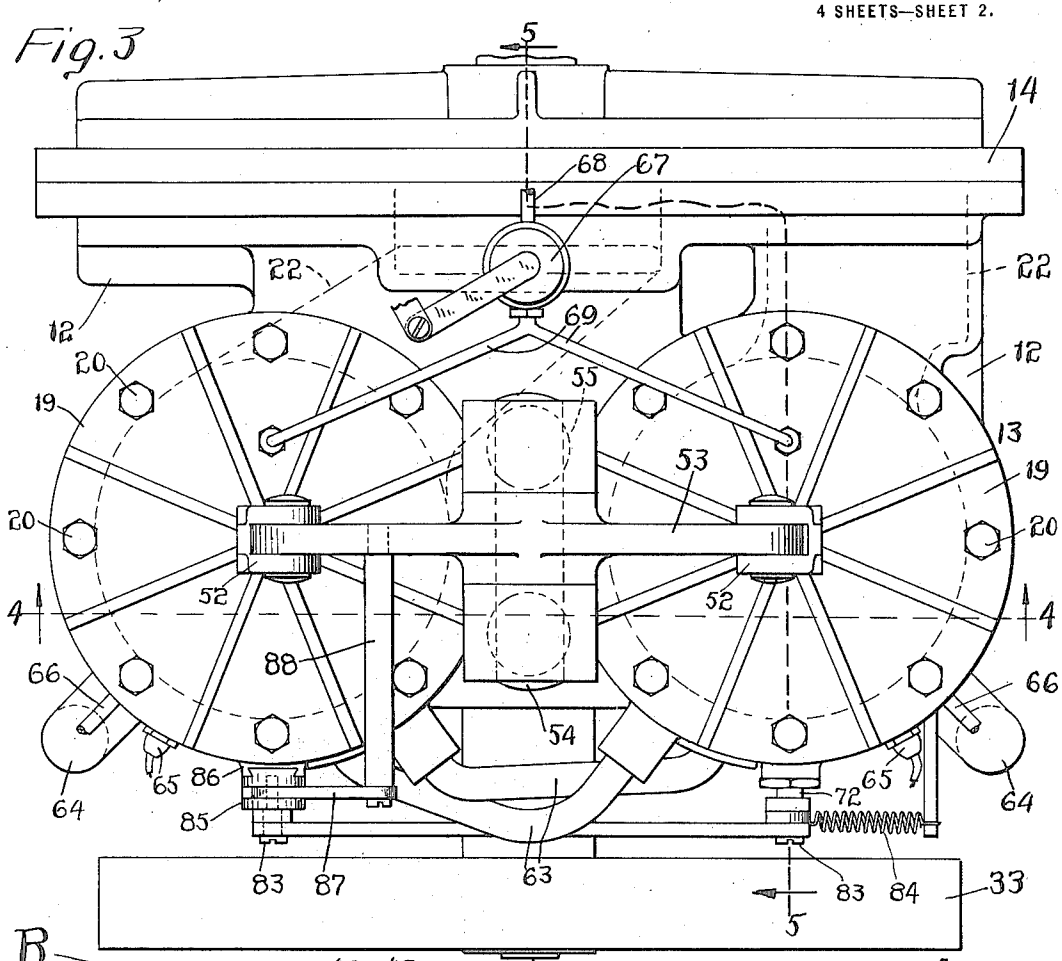

Fig. 4

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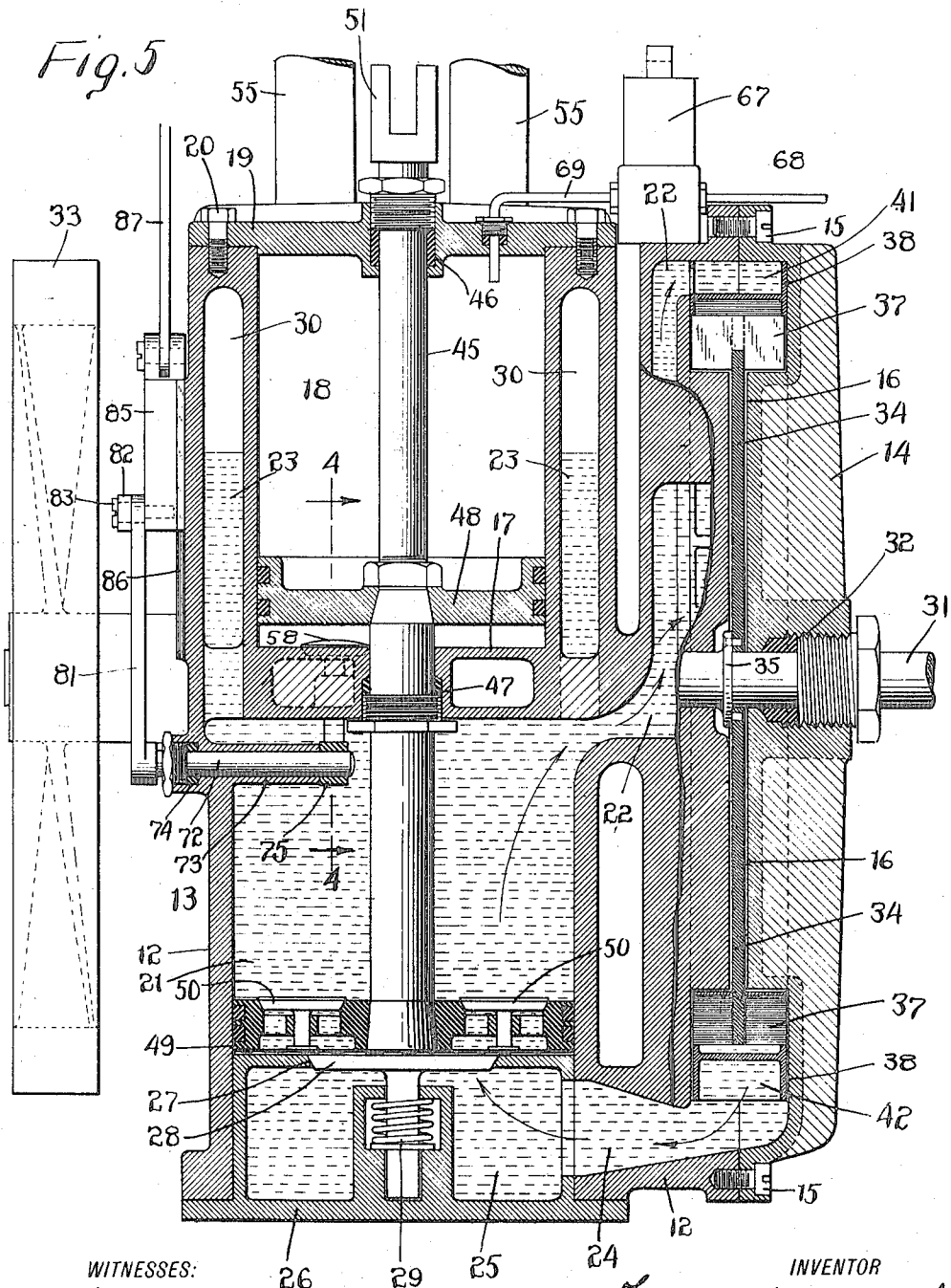
4 SHEETS—SHEET 3.

Fig. 5



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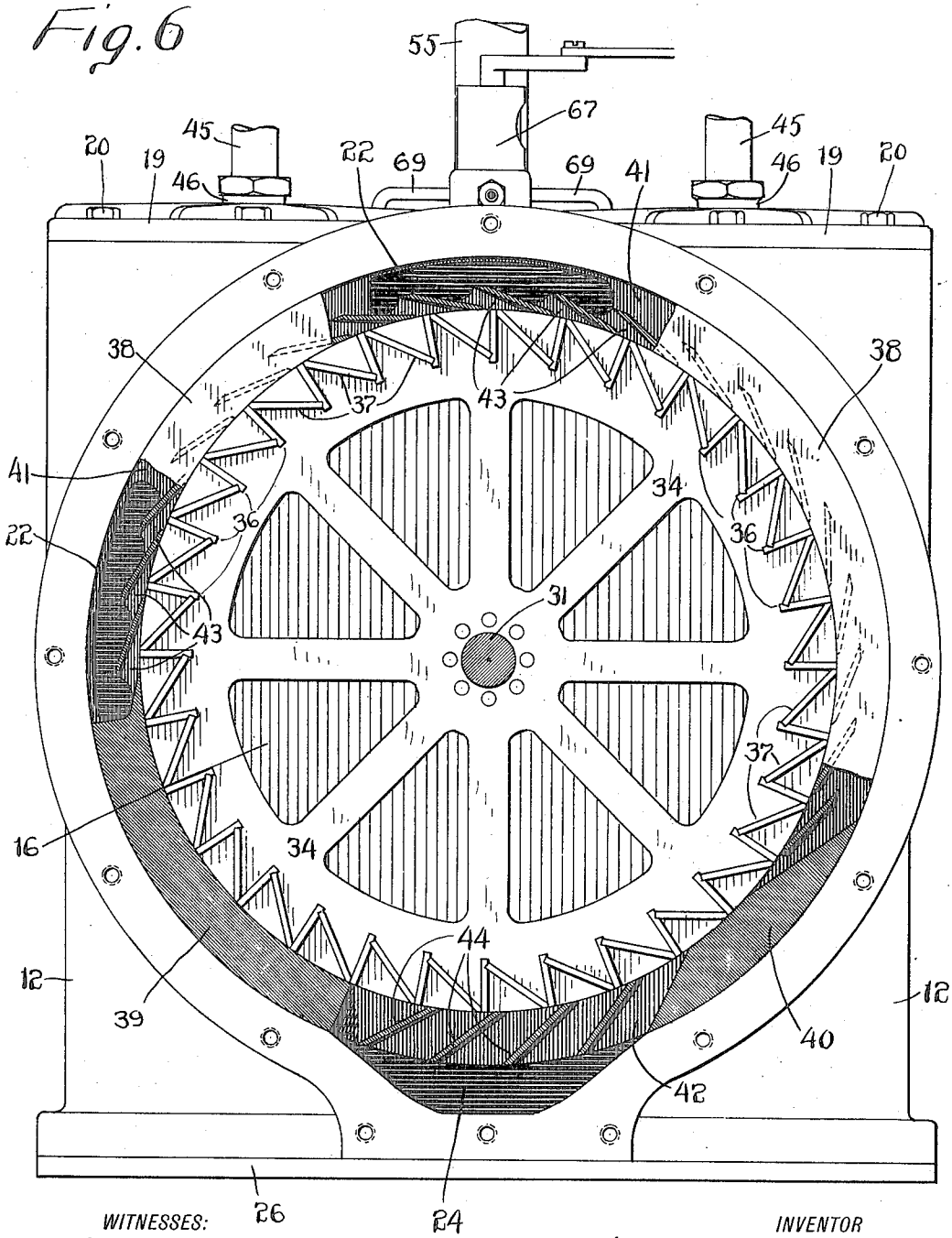
4 SHEETS—SHEET 4.

Fig. 6



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TURBINE-ENGINE.

1,190,637. Specification of Letters Patent. Patented July 11, 1916.

Application filed September 8, 1914. Serial No. 860,679.

To all whom it may concern:

Be it known that I, FRIDERICH E. DOMSCHEIT, a subject of the Emperor of Germany, residing at Bridgeport, county of Fairfield, State of Connecticut, have invented an Improvement in Turbine-Engines, of which the following is a specification.

This invention relates to motors and has for its general objects to provide a new and improved type of internal combustion engine of simple construction and efficient and reliable operation, and also to provide a novel fluid transmission mechanism for converting the motion of the piston or pistons of such or any other reciprocating engine into rotary motion of the engine or motor shaft without the use of cranks or crank shafts, thereby securing a constant and continuous application of power and eliminating all shock or possibility of dead center, said last-named mechanism including a novel driven element or turbine, and having provision for cooling the working cylinders of the engine.

With these and other objects in view I have devised the novel mechanism which I will now describe, reference being had to the accompanying drawings, in which:

Figure 1 is a front elevation with the fly wheel removed. Fig. 2 is a detail section of one of the check valves and associated parts at the top of each of the engine or working cylinders. Fig. 3 is a plan view. Fig. 4 is a section substantially on the line 4—4, Figs. 3 and 5. Fig. 5 is a section substantially on the line 5—5, Fig. 3. Fig. 6 is a rear elevation with the cover plate removed and the turbine ring partly broken away.

12 denotes the machine frame or casing as a whole which is of a suitable form and size to provide the necessary supports, guides, and bearings for the various moving parts except as hereinafter pointed out. Said casing or frame comprises a body having two double chambered cylinders 13 and a cover plate 14 secured to said body by screws or bolts 15 and forming therewith a flat or shallow turbine chamber 16.

Each of the cylinders 13 (see particularly Fig. 5) is divided by a head or partition 17 into an upper engine or working cylinder or chamber 18, closed at its upper end by a head 19 secured in place by screws or bolts 20, and a co-axial lower pump cylinder or chamber 21 communicating through inlet passages or conduits 22 with the turbine chamber 16.

24 denotes exhaust passages or conduits leading from the turbine chamber 16 and communicating with suction chambers 25 in the lower ends of the pump cylinders 21, said suction chambers being preferably formed in separate casings 26 inserted within the lower ends of said cylinders and having ports 27 controlled by downwardly closing check valves 28 normally held in position to close said ports by springs 29. The pump cylinders 21, inlet and exhaust passages 22 and 24 and suction chambers 25 are completely filled with a suitable liquid, such as oil or water.

23 denotes annular chambers or jackets surrounding the engine cylinders 18 and communicating with the corresponding pump cylinders 21, whereby the propelling liquid may be caused to circulate about said engine cylinders and serve as a cooling medium therefor. Said chambers 23 are closed at their upper ends within which a suitable amount of air may be trapped above the liquid, as indicated at 30 in Fig. 5, said air being compressed and acting as a cushion upon the non-compressible liquid to equalize the power transmitted and to eliminate all shocks.

31 denotes the main or power shaft of the motor, which shaft is suitably journaled in the frame or casing 12 and passes through a suitably disposed stuffing box or boxes 32.

33 denotes a fly-wheel fixed upon the shaft 31 and preferably formed with an integral fan, as shown in Fig. 5, for directing a current of air against the cylinders 13 to assist in cooling said cylinders and the liquid in the casing.

34 denotes a disk-like turbine wheel which is riveted or otherwise rigidly secured to a collar or flange 35 on the shaft 31 and rotates within the chamber 16.

36 (see Fig. 6) denotes radially arranged paddle blades carried by the periphery of the turbine wheel 34. 37 denotes inclined blades also carried by the periphery of said turbine wheel and connecting the blades 36 to form substantially triangular pockets or buckets about said periphery.

38 denotes the turbine ring which sur-

rounds the turbine 34 and closely fits the periphery thereof. Said turbine ring is formed with a hollow interior separated by partitions 39 and 40 into an inlet or supply chamber 41 communicating with the inlet passages 22, and an exhaust chamber 42 communicating with the exhaust passages 24.

43 denotes inlet passages communicating with the inlet chamber 41 and inclined toward the radial paddle blades 36. 44 denotes partitions in the exhaust chamber 42 forming exhaust passages which are inclined away from said radial blades 36, or toward the inclined blades 37.

45 denotes piston rods extending longitudinally of the cylinders 13 and through the coaxial engine and pump chambers thereof, said piston rods extending through suitable stuffing boxes 46 and 47 in the cylinder heads 19 and walls 17 respectively.

48 denotes solid engine pistons secured to the piston rods 45 and operating within the engine cylinders 18.

49 denotes pump pistons secured to the piston rods 45, operating within the pump cylinders 21, and provided with suitable ports controlled by downwardly closing check valves 50.

51 (see Fig. 1) denotes forks at the upper ends of the piston rods 45 connected by short links 52 to the opposite ends of an equalizing bridge or walking beam 53 pivoted at 54 to uprights 55 supported by the machine frame 12.

Referring to Fig. 4, each of the cylinder heads or partitions 17 is formed with a fuel inlet chamber 56 and an exhaust chamber 57, said chambers communicating through suitably arranged ports with the cylinders 18 below the pistons 48, which portions of said cylinders constitute the explosion spaces of the engine. Said ports are respectively controlled by inlet valves 58 and exhaust valves 59 provided with downwardly extending stems 70 and 71, respectively, which pass through stuffing boxes 60 in said heads or partitions 17.

61 (see Fig. 2) denotes passages leading from the upper ends of the engine cylinders 18 and controlled by inwardly closing spring-pressed check valves 62.

63 denotes pipes leading from the passages 61 beyond the valves 62 and communicating with the fuel inlet chambers 56. The pipes 63 (see Figs. 1 and 3) cross one another, the pipe 63 leading from the passage 61 of one engine cylinder communicating with the inlet chamber 56 corresponding to the other engine cylinder, and vice versa.

64 denotes exhaust pipes leading from the exhaust chambers 57.

65 denotes spark plugs arranged at the lower ends of the engine cylinders 18 and extending into the explosion spaces thereof beneath the pistons 48. 66 (see Fig. 3) denotes pipes also communicating with said explosion spaces, and through which initially compressed charges may be forced into said explosion spaces by any suitable means (not shown) for the purpose of starting the engine.

67 (see Figs. 3 and 6) denotes a carbureter of any suitable type having a fuel inlet 68 and communicating with an intake manifold 69 the branches of which communicate with the upper ends of the cylinders 18 through the heads 19 (see Fig. 5).

72 (see Figs. 1, 4 and 5) denotes rock shafts journaled in inwardly extending sleeve-like projections 73 (Fig. 5) of the casing 12 beneath the cylinder heads or partitions 17, said rock shafts extending through stuffing boxes 74 to the exterior of the casing.

75 denotes oppositely extending arms fixed to the inner ends of the shafts 72 and having bifurcated ends embracing the valve stems 70 and 71 respectively.

76 denotes fixed collars or flanges on the valve stems 71 and arranged at opposite sides of the bifurcated ends of the corresponding arms 75, whereby, as the shafts 72 are rocked in one direction or the other, the exhaust valves 59 will be opened or closed.

77 denotes fixed collars or flanges on the lower ends of the valve stems 70.

78 denotes sleeves slidably mounted on the valve stems 70 and having at their upper ends flanges 79 against which the bifurcated ends of the corresponding arms 75 bear, and between which and the fixed collars 77 are interposed springs 80. The arrangement of the last-named parts is such that with a rock shaft 72 in the position shown at the right in Fig. 4 the corresponding inlet valve 58 may open upwardly against the tension of the spring 80, but with the rock-shaft 72 in the position shown at the left in Fig. 4 the sleeve 78 is forced into engagement with the collar or flange 77, thereby positively locking the corresponding valve 58 against upward opening movement.

81 (see Figs. 1 and 5) denotes operating arms fixed to the outer ends of the shafts 72.

82 denotes a link connected at its ends by pivots 83 to the ends of the arms 81.

84 denotes a spring secured at one end to one of the arms 81 and at its opposite end to the casing 12, said spring tending normally to hold the arms 81 and link 82 in the position shown in Fig. 1.

85 denotes a slide guided for vertical movement in a preferably undercut or dovetailed guideway 86 on the front of the casing 12, said slide being connected by a link 87 with an arm 88 projecting from one arm of the walking beam 53. The slide 85 is formed with a groove 89 into which

extends the inner end of one of the pivots 83. Said groove 89 comprises two vertical portions *a*, *b*, a lower horizontal portion *c* connecting said vertical portions, and an upper inclined or cam portion *d*, also connecting said vertical portions, and controlled by a pivoted finger or latch 90 normally held in the position shown in Fig. 1 by a leaf spring 91.

The operation of the motor is as follows: For convenience the two engine cylinders 18 are designated A and B respectively in Fig. 4, wherein the piston 48 in the cylinder A is shown as in its lowermost position and the piston in cylinder B shown in its uppermost position, these positions corresponding to the positions of the parts shown in Fig. 1. In order to start the engine a suitable initially compressed charge may be injected into the explosion space of cylinder A through the corresponding pipe 66 and fired therein by suitable manipulation of the ignition system to produce a spark at the corresponding plug 65. As the piston in cylinder A rises the piston in cylinder B is caused, through the walking beam 53, to descend, thereby drawing into the upper end of the cylinder B an explosive charge through the intake 69 and carbureter 67. As the piston in cylinder A reaches the end of its upward stroke and commences to descend the piston in cylinder B begins to rise on its explosion stroke, compressing the explosive charge above the same and forcing said charge through the corresponding pipe 63 into the inlet chamber 57 of cylinder A. During this movement the inlet valve 58 of cylinder A is held locked in closed position, as will presently be more fully explained, and the exhaust valve 59 of said cylinder held open, so that the products of combustion in the lower end of cylinder A are forced out by the descending piston through the exhaust chamber 57 and exhaust pipe 64. As the piston in cylinder A approaches the limit of its downward movement the corresponding shaft 72 is rocked, as will presently be explained, into the position shown at the right in Fig. 4, thereby closing the exhaust valve 59, unlocking the inlet valve 58 and permitting the compressed charge in the inlet chamber 56 to open said valve 58 against the tension of the spring 80 and enter the explosion space of cylinder A until the pressure in said space and in the inlet chamber 56 is equalized, when the inlet valve is closed by its spring 80. Thereupon said charge is fired and the cycle of operations is repeated. From the foregoing it will be seen that as each piston rises on the explosion stroke the opposite piston operates to draw in a fresh charge, and as each piston descends to force out the products of combustion the opposite piston rises on its explosion stroke to compress said charge, which is admitted beneath the descending piston at or near the completion of its exhausting or scavenging stroke.

As the piston of cylinder A rises the slide 85 moves downwardly, thereby causing the pivot 83 to move upwardly in the vertical portion *b* of the groove 89 and locking the rock shafts 72 in the positions shown in Figs. 1 and 4, in which position the exhaust valve 59 of cylinder B is held open and inlet valve 58 of said cylinder locked in closed position, as shown at the left in Fig. 4, this being the exhaust stroke of the piston of cylinder B. As the piston in cylinder A approaches the limit of its upward movement and that in cylinder B together with the slide 85 approach the limit of their downward movement, the pivot 83 is forced to the left by the cam portion *d* of the groove 89, forcing aside the finger 90, which, however, is returned to the position shown by the spring 91 as soon as the pivot 83 passes the same. This movement to the left of the pivot 83 causes both shafts 72 to be rocked, thereby closing the exhaust valve 59 of cylinder B and unlocking the inlet valve 58 thereof, as above stated, and also opening the exhaust valve 59 of cylinder A and locking the inlet valve 58 of said cylinder in closed position. As the piston in cylinder A descends and that of cylinder B together with the slide 85 ascend, the pivot 83 travels in the portion *a* of the groove 89, holding the valves of cylinder A in the position last described. As the limit of upward movement of the slide 85 is approached the pivot 83 is brought opposite the portion *c* of the groove 89, whereupon the spring 84 returns the parts to the position shown, closing the exhaust valve 59 and unlocking the inlet valve 58 of cylinder A.

During the upward movement of each of the engine pistons 48 the corresponding pump piston 49 is moved upwardly, thereby forcing the liquid in the upper part of the pump cylinder 21 through the corresponding inlet passage 22, turbine ring 38 and inlet passages 43 upon the turbine wheel, and at the same time drawing liquid from the exhaust chamber 42 of said turbine ring through the corresponding exhaust passage 24 and suction chamber 25 into the lower end of the pump cylinder 21, the valve 28 opening at this time against the tension of the spring 29. As the engine piston 48 descends the corresponding pump piston 49 also descends causing the valve 28 to close and the valves 50 to open, thereby permitting the liquid previously drawn into the lower end of the pump cylinder 21 to pass to the upper end thereof into a position to be forced through the turbine at the next upstroke of the engine piston.

Inasmuch as the fluid or hydraulic pressure upon the turbine is occasioned by the

upward or power stroke of each engine piston, and inasmuch as substantially upon the completion of the working stroke of one piston that of the other commences, it will be seen that a substantially continuous pressure is exerted upon said turbine, this pressure being equalized and rendered constant by the action of the air cushions 30, so that a constant and continuous application of power is secured and all possibility of shock or dead center avoided.

Having thus described my invention I claim and desire to secure by Letters Patent:

1. A motor comprising, in combination, a reciprocating engine, a rotary motor shaft, a rotary fluid driven element connected with said shaft, a pump cylinder communicating with said rotary element and having a discharge chamber, a reciprocating piston in said cylinder operated by said engine, a separate casing constituting a suction chamber within said pump cylinder, said discharge and suction chambers communicating with said rotary element and said suction chamber having a port communicating with said pump cylinder, and a spring-pressed check valve for controlling said port.

2. A motor comprising, in combination, an engine, a rotary fluid driven element, and a pump operated by said engine and comprising a cylinder having discharge and suction chambers and a valved reciprocating piston in said cylinder, said supply and suction chambers both communicating with said fluid driven element.

3. A motor comprising, in combination, an engine having a pair of reciprocating oppositely acting fluid impelling elements, rotary fluid driven means, and inlet and exhaust conduits for said fluid driven means each communicating directly with both said fluid impelling elements.

4. A motor comprising, in combination, an engine, a rotary fluid driven element, a pump operated by said engine and comprising a cylinder and a valved reciprocating piston in said cylinder, and inlet and exhaust conduits for said fluid driven element communicating with said cylinder at opposite sides of said piston respectively.

5. A motor comprising, in combination, an engine having a plurality of cylinders and a plurality of reciprocating pistons in said cylinders respectively, a plurality of reciprocating fluid impelling elements operated by said pistons respectively, a single rotary fluid driven element, and inlet and exhaust conduits for said fluid driven element each communicating directly with all of said fluid impelling elements.

6. A motor comprising, in combination, an engine having a plurality of cylinders and a plurality of reciprocating pistons in said cylinders respectively, a plurality of reciprocating pumps operated by said pistons respectively and each having a discharge chamber and a suction chamber, a single rotary fluid driven element, an inlet conduit for said fluid driven element communicating directly with all of said discharge chambers, and an exhaust conduit for said fluid driven element communicating directly with all of said suction chambers.

In testimony whereof I affix my signature in presence of two witnesses.

FRIDERICH E. DOMSCHEIT

Witnesses:

H. W. MEADE,

E. M. CULVER.