No. 647,915. Patented Apr. 17, 1900.

J. DENEAL.

FLUID PRESSURE ENGINE.

(Application filed June 22, 1896.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

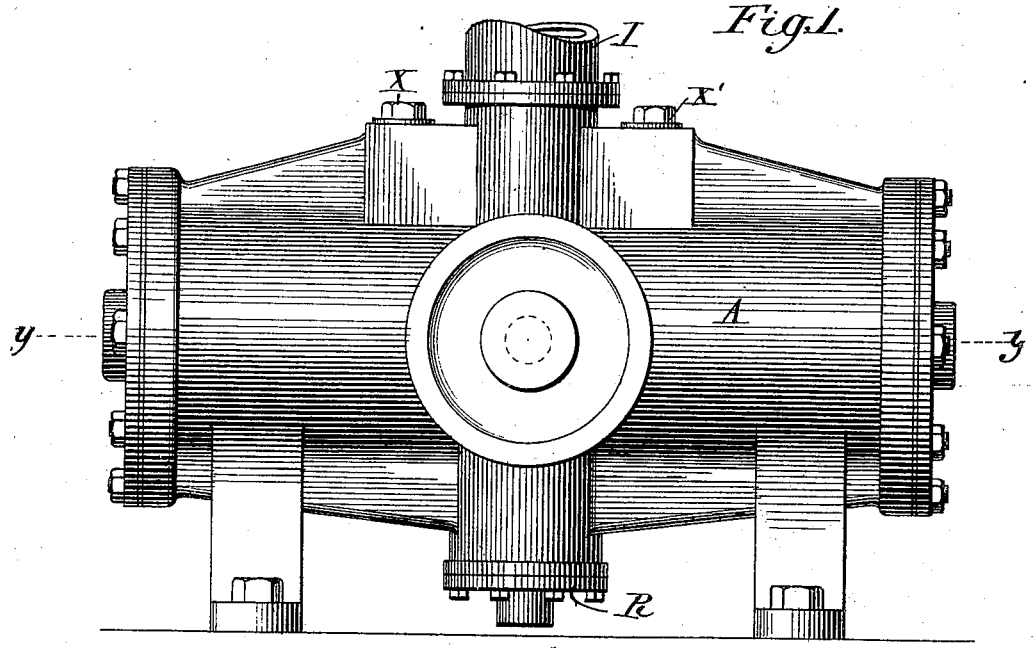

Fig. 2.

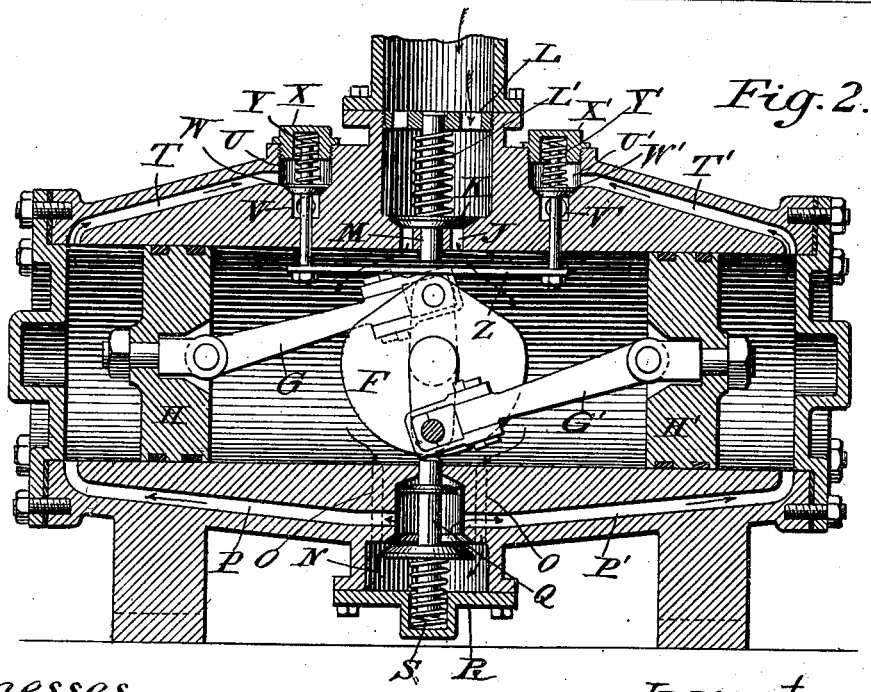

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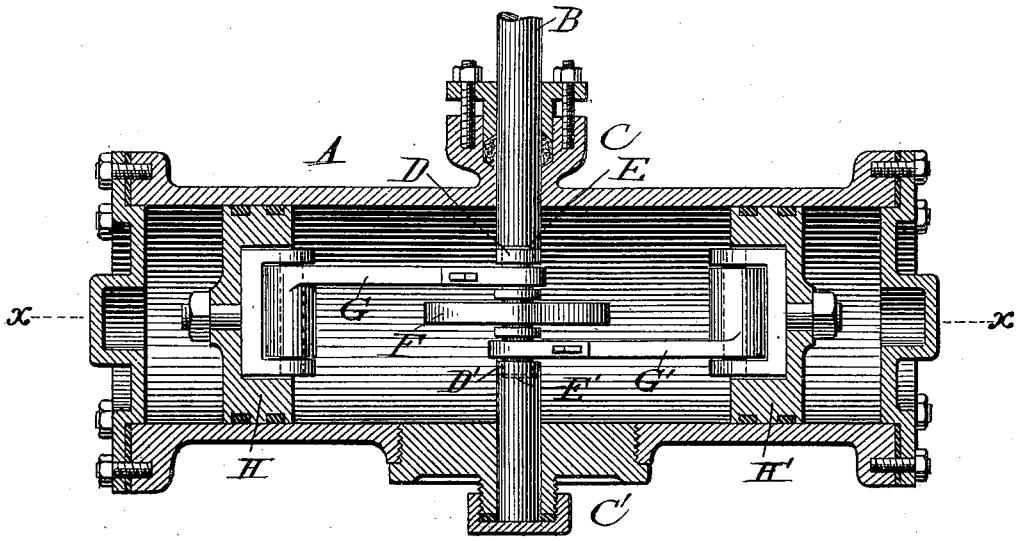
Fig. 3.



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UNITED STATES PATENT OFFICE.

JACKSON DENEAL, OF TOLEDO, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO C. E. SUTTON, ELI A. STARK, AND M. S. FRANZ, OF SAME PLACE, AND B. F. MARTINE, OF ASHLAND, OHIO.

FLUID-PRESSURE ENGINE.

SPECIFICATION forming part of Letters Patent No. 647,915, dated April 17, 1900.

Application filed June 22, 1896. Serial No. 596,419. (No model.)

To all whom it may concern:

Be it known that I, JACKSON DENEAL, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Fluid-Pressure Engine, of which the following is a specification sufficiently full, clear, and accurate as will enable persons skilled in the art to make and use the same.

The object of my invention is the production of a fluid-pressure engine which shall be economical in the use of the motive fluid; which shall admit of the effective use of the motive fluid a second time; which shall use steam quickly and exhaust it rapidly, so as to minimize the loss from condensation; which shall not leak motive fluid; which shall have the reciprocating parts accurately balanced, thus adapting the engine for high speeds without excessive wear and vibration; which shall eliminate as far as possible friction of all the movable parts and to that end dispense with the use of connecting-rods moving through stuffing-boxes; which shall be simple in construction, cheap in first cost, and, when necessary, easy to repair, and which, finally, shall be compact, suiting it for use within limited areas or spaces. To attain this object or end, I have devised an engine comprising, first, a cylinder, two pistons dividing the cylinder into three chambers, a rotary shaft projecting into the central part of the cylinder, two cranks, two pitmen, means for periodically admitting motive fluid into the central chamber, means for periodically exhausting or educting motive fluid from the central chamber into the end chambers back of the pistons, and means whereby the motive fluid can finally pass to the atmosphere; second, a single cylinder capable of withstanding great outward pressure, two pistons located within the cylinder and dividing it into three chambers, a rotary shaft having one end projecting into the cylinder at right angles thereto and provided with two cranks placed approximately one hundred and eighty degrees each from the other, two pitmen uniting the pistons and cranks, means for periodically admitting motive fluid to the central chamber for the purpose of forcing the pistons apart, means for periodically exhausting the motive fluid from the central chamber into the end chambers and back of the pistons, and means for periodically exhausting the motive fluid from the end chambers to the atmosphere immediately or mediately; third, a cylinder, two movable pistons located within the cylinder and dividing it into three chambers, a shaft passing into or through or journaled in the central chamber, means uniting the shafts and pistons, which when the pistons are moved will impart a rotary motion to the shaft, means for periodically admitting motive fluid to corresponding sides of the pistons, means for periodically exhausting the motive fluid to the other corresponding sides of the pistons, and means for finally exhausting the motive fluid to the atmosphere immediately or mediately; fourth, a cylinder, two pistons, a rotary shaft projecting into the cylinder, two cranks, two pitmen, means within the central chamber operated by the shaft and controlling the admission of motive fluid to the central chamber and its eduction therefrom to the end chambers back of the pistons, and means for exhausting the motive fluid to the atmosphere; fifth, a cylinder, two pistons, a rotary shaft projecting into the cylinder, two cranks, two pitmen, a rotary element, as a cam-shaped disk, operated by the shaft and controlling the admission of motive fluid to the central chamber and its eduction therefrom to the end chambers, and means for allowing the motive fluid to pass to the atmosphere, and, finally, an engine comprising and embracing certain novelties of construction and combinations and arrangements of parts hereinafter specified, and pointed out in the claims.

The accompanying drawings illustrate one example of the physical embodiment of my invention constructed according to one of the many modes or ways of applying the principle.

Figure 1 is a side view in elevation of the said example, showing at the top the pipe for admitting motive fluid. Fig. 2 is a view of a section of Fig. 1, taken in a longitudinal and perpendicular plane, as on line *x x* of Fig. 3. Fig. 3 is a view of a section of Fig. 1, taken in a longitudinal and horizontal plane on line *y y*.

Referring to the views, the letter A designates the cylinder, made in any desirable way; B, a rotary shaft; C C′, bearings for the shaft; D D′, cranks; E E′, crank-pins; F, a cam-shaped disk; G G′, pitmen united to the pistons by wrist-pins; H H′, pistons; I, a motive-fluid-supply pipe; J, an inlet-port; K, an induction-valve having two stems; L, a perforated plug having a bearing for the longer stem of the valve; L′, a spring surrounding the stem; M, a bearing for the shorter stem of the valve; N, a chamber; O, ports and passages; P P′, eduction-passages; Q, a valve having two stems; R, a cap; S, a spring; T T′, exhaust-passages; U U′, chambers; V V′, secondary chambers; W W′, valves, each having two stems; X X′, removable caps or plugs; Y Y′, springs; Z, a bar uniting the stems of the valves and located directly beneath the induction-valve, and the dotted circles indicate the exhaust ports or passages which lead from the secondary chambers to the atmosphere.

To allow the introduction of the shaft having the cranks, a plug threaded or perforated to receive bolts and which carries the bearing C′ may be provided, as illustrated in section, Fig. 3.

It will be seen that the two pistons divide the interior of the cylinder into a central chamber and two end chambers and that the pitmen, cranks, and cam-shaped disk are located entirely within the central chamber, and, further, that the friction of the movable parts is by the peculiar construction and arrangement reduced to a minimum.

The *modus operandi* is as follows: Motive fluid, being admitted to the central chamber through the ports J, follows the paths indicated by the arrows. It first forces the pistons apart to the full length of the pitmen and cranks, and in such positions the revolving cam-shaped disk raises the valve Q from its seat and allows the motive fluid to pass from the central chamber to the end chambers back of the pistons. Then as the pistons move inwardly and reach approximately the extreme positions of their instrokes the cam-shaped disk engages the bar Z, raises it, and opening the exhaust-ports permits the motive fluid to pass from the end chambers to the atmosphere. The cam-shaped disk elevating the bar Z simultaneously brings it in contact with the stem of the valve K, which is forced upwardly against the spring and opens communication between the supply-pipe and the central chamber of the cylinder. Thus in a single revolution the disk periodically opens eduction passage-ways for the motive fluid from the central chamber to the end chambers, exhaust passage-ways from the end chambers to the atmosphere, and an induction passage-way from the supply-pipe to the central chamber. The periods of induction, eduction, and exhaustion of the motive fluid can of course be regulated as occasion may demand. Figs. 2 and 3 show the several movable parts approximately in the positions they occupy when the pistons are moving toward each other during their instrokes.

In practice the spring L′ may be omitted, inasmuch as gravity and the pressure of the steam above will cause the valve K to remain closed except when raised by the disk F during a part of its revolution.

From the description of the pictured example it will be seen that I have produced an engine adapted to be operated by a motive fluid which fulfils all the conditions hereinbefore set forth as the object or end of my improvements.

As regards my method of using motive fluid, and especially steam, a second time, it has been proven by actual tests that the eduction or exhaustion of the motive fluid after it has acted upon corresponding ends of the pistons to the other corresponding ends is very effective and attended with characteristic and desirable results.

In one trial of an engine constructed and operating according to the principle set forth steam at a certain boiler-pressure was admitted to the central chamber so as to act upon corresponding ends of the pistons and then exhausted to the atmosphere. Sufficient energy of the motive fluid was utilized to drive a dynamo and generate in a circuit twenty volts of electricity. When the steam admitted at the same pressure was educted or exhausted from the central chamber to the end chambers back of the pistons and finally discharged to the atmosphere, the voltmeter indicated seventy-five volts. In another trial steam at five-pounds pressure was admitted to the central chamber and exhausted directly to the atmosphere. The shaft made eighty revolutions per minute. When the steam was educted or exhausted from the central chamber into the end chambers back of the pistons and finally to the atmosphere, the speed of the shaft increased to one hundred and seventy-six revolutions per minute.

While I have illustrated and described only one example of the physical embodiment of my invention, I do not thereby intend to limit the scope thereof to this particular example or mode of embodiment, inasmuch as the principle can be applied in other ways and by other modes not involving a substantial departure.

It should be observed that the general way of constructing the engine and the provision of means or valve mechanism which allows the transmission of the motive fluid after its energy has been partially utilized on opposite sides of the pistons to corresponding opposite sides of the same pistons, and, finally, to the atmosphere, are among the essential features of my improvements, and these features of construction and operation can be incorporated in a variety of structures and under different shapes, which will present a different appearance to the eye. Many substitutions of elements may also be made. For

example, the cylinder, pistons, shaft, and means for uniting the pistons and shaft, so that the reciprocating motions of the former may impart a rotary motion to the latter, (shown on the drawings,) may be replaced by others, and in lieu of the particular valve mechanisms may be used other mechanisms of different construction and differently located, if desired, which will perform the functions of the control and transmission and exhaustion of the motive fluid. All such incorporations and substitutions, as well as all colorable modifications and changes, I intend to embrace within the scope of my claims.

What I claim is—

1. An engine having a shaft, pistons, shaft-cranks, and means for uniting the pistons and cranks located within the cylinder; and means for periodically admitting motive fluid to corresponding sides of the pistons and educting or exhausting the same to the other corresponding sides of the pistons and to the atmosphere; in substance as set forth.

2. An engine having a cylinder provided with ports; two pistons dividing the interior of the cylinder into three chambers; a rotary shaft in the cylinder; two cranks; two pitmen; means for periodically admitting motive fluid into the central chamber; and means for periodically educting or exhausting the motive fluid from the central chamber into the end chambers back of the pistons and thence to the atmosphere; in substance as set forth.

3. An engine having a cylinder; two pistons dividing the cylinder into three chambers; a rotary shaft in the cylinder; means for transmitting the motion of the pistons to the shaft; means for periodically admitting motive fluid into a central chamber; means for periodically educting the motive fluid from the central chamber to the end chambers back of the pistons; and means for discharging the motive fluid to the atmosphere; in substance as set forth.

4. An engine having a cylinder provided with ports; two pistons; a shaft passing into or through the cylinder; means joining the pistons and shaft for transforming reciprocating into rotary motion; means for periodically admitting motive fluid to corresponding sides of the pistons; means for periodically educting or exhausting the motive fluid to the other corresponding sides of the pistons; and means for finally exhausting the motive fluid to the atmosphere; in substance as set forth.

5. An engine having two pistons dividing the cylinder into three chambers; a rotary shaft journaled in the central chamber; means for transmitting the motions of the pistons to the shaft; means controlling the admission of motive fluid to the central chamber operated by the shaft; and means for educting or exhausting motive fluid to the end chambers and to the atmosphere; in substance as set forth.

6. An engine having two pistons dividing the cylinder into three chambers; a rotary shaft journaled in the central chamber; means for transmitting the motions of the pistons to the shaft; means controlling the admission of motive fluid to the central chamber; means controlling the eduction of the motive fluid from the central chamber to the end chambers and operated by the shaft; and means for exhausting the motive fluid; in substance as set forth.

7. An engine having two pistons dividing the cylinder into three chambers; a rotary shaft in the central chamber; means for transmitting the motions of the pistons to the shaft; means controlling the admission of motive fluid to the central chamber and its exhaustion from the end chambers operated by the shaft; and means controlling the eduction of the motive fluid from the central chamber to the end chambers.

8. An engine having two pistons dividing the cylinder into three chambers; a rotary shaft in the central chamber; means for transmitting the motions of the pistons to the shaft; means for controlling the admission of motive fluid to the central chamber; and means operated by the shaft controlling the eduction of motive fluid from the central chamber to the end chambers and its exhaustion from the end chambers to the atmosphere.

9. An engine having two pistons dividing the cylinder into three chambers; a rotary shaft in the central chamber; means for transmitting the motions of the pistons to the shaft; means for periodically admitting motive fluid to the central chamber; means for periodically educting motive fluid from the central chamber to the end chambers back of the pistons; and means operated by the shaft for exhausting motive fluid from the end chambers to the atmosphere.

10. An engine having a cylinder; two movable pistons dividing the cylinder into three chambers; a rotary shaft projecting into the cylinder; two cranks; two pitmen; means within the central chamber controlling the admission of motive fluid to the central chamber and its eduction or exhaustion therefrom to the end chambers back of the pistons; and means for exhausting the motive fluid to the atmosphere; in substance as set forth.

11. An engine having a cylinder; two pistons; a rotary shaft; two cranks; two pitmen; a rotary element operated by the shaft and controlling the admission of motive fluid to the central chamber of the cylinder and its exhaustion or eduction therefrom to the end chambers of the cylinder back of the pistons; and means for exhausting motive fluid from the end chambers to the atmosphere; in substance as set forth.

12. The combination in an engine, constructed and operating substantially as set forth, of a rotary shaft in the central chamber; a cam-shaped disk operated by the shaft for controlling the admission of motive fluid

to the central chamber; and means for educting the motive fluid to the end chambers and to the atmosphere.

13. The combination in an engine and with its constituent parts constructed substantially as set forth, of a shaft having two cranks, and a cam-shaped disk for controllling the eduction or exhaustion of the motive fluid from the central chamber to the end chambers; in substance as and for the purpose set forth.

14. The combination in an engine, constructed and operating substantially as set forth, of a rotary shaft in the central chamber; a cam-shaped disk controlling the admission of motive fluid to the central chamber and the eduction of motive fluid to the end chambers; and means for exhausting motive fluid.

15. The combination in an engine, constructed and operating substantially as set forth, of a rotary shaft in the central chamber; and means located within the central chamber and operated by the rotary shaft for controlling the admission of motive fluid.

16. The combination in an engine, constructed and operating substantially as set forth, of a rotary shaft in the central chamber; and means located within the central chamber and operated by the rotary shaft for controlling the eduction of motive fluid from the central chamber to the end chambers.

17. An engine having two pistons only located in a cylinder; two pitmen; two cranks; a rotary shaft in the cylinder; means for periodically admitting motive fluid to corresponding faces or sides of the two pistons; means for periodically educting motive fluid to the other corresponding faces or sides of the two pistons; and means for periodically exhausting motive fluid to the atmosphere.

18. The combination in an engine, constructed and operating substantially as set forth, of a shaft located in the central chamber; three valves controlling the admission, eduction, and exhaustion of the motive fluid; and means operated by the shaft for actuating all the valves.

19. The combination in an engine, constructed and operating substantially as set forth, of a shaft located in the central chamber; valves controlling the admission, eduction, and exhaustion of the motive fluid; and means operated by the shaft for actuating the valves which control the admission and eduction of the motive fluid.

20. An engine having two pistons; a rotary shaft a part of which is located within the cylinder of the engine; means for transforming the reciprocating motions of the pistons to the shaft and rotating the same; means for periodically admitting motive fluid to corresponding sides of the pistons; means for educting motive fluid to the other corresponding sides of the pistons; and means controlling the exhaust to the atmosphere; the cylinder of the engine being provided with eduction-passages uniting the central chamber and end chambers.

In testimony that I claim the foregoing as my own I hereby affix my signature in presence of two witnesses.

JACKSON DENEAL.

Witnesses:
WILLIAM WEBSTER,
CARROLL J. WEBSTER.