

F. G. FREESE.
ENGINE.

APPLICATION FILED MAY 6, 1908.

Patented July 27, 1909.

2 SHEETS—SHEET 1.

929,575.

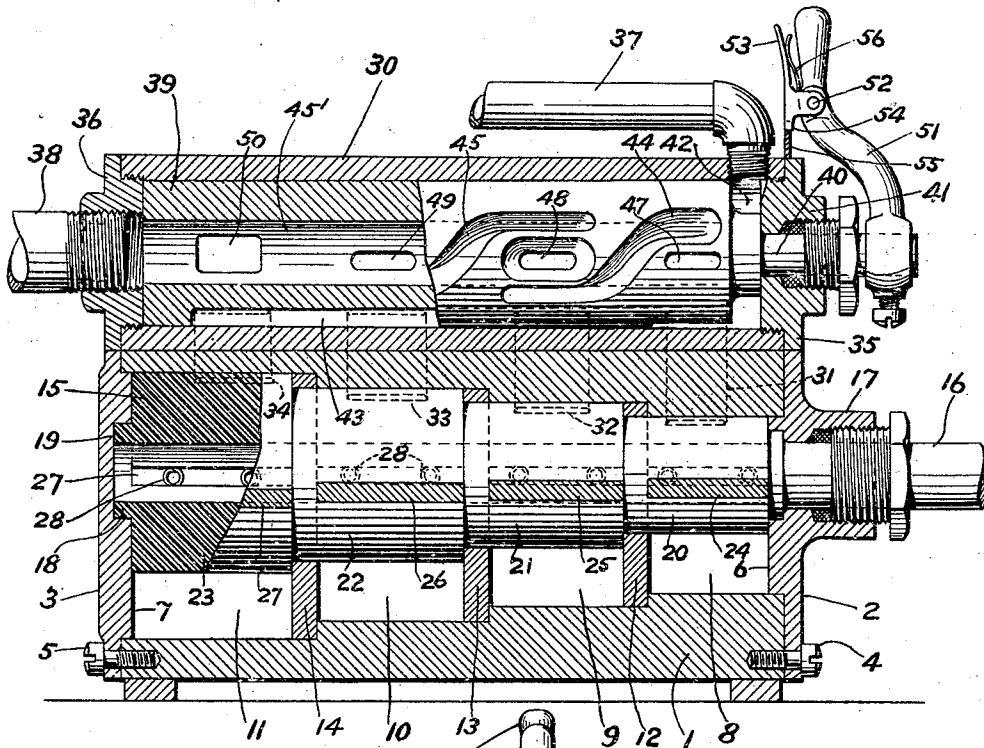


FIG. 1.

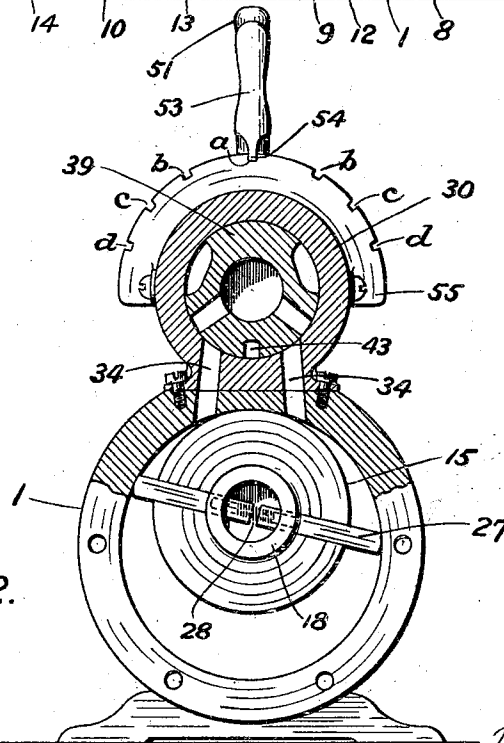


FIG. 2.

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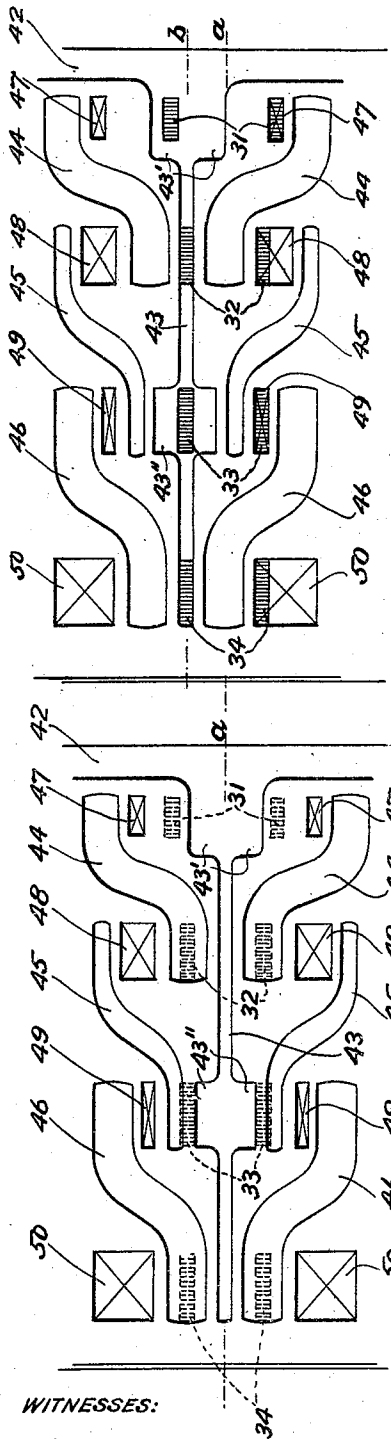


FIG. 4.

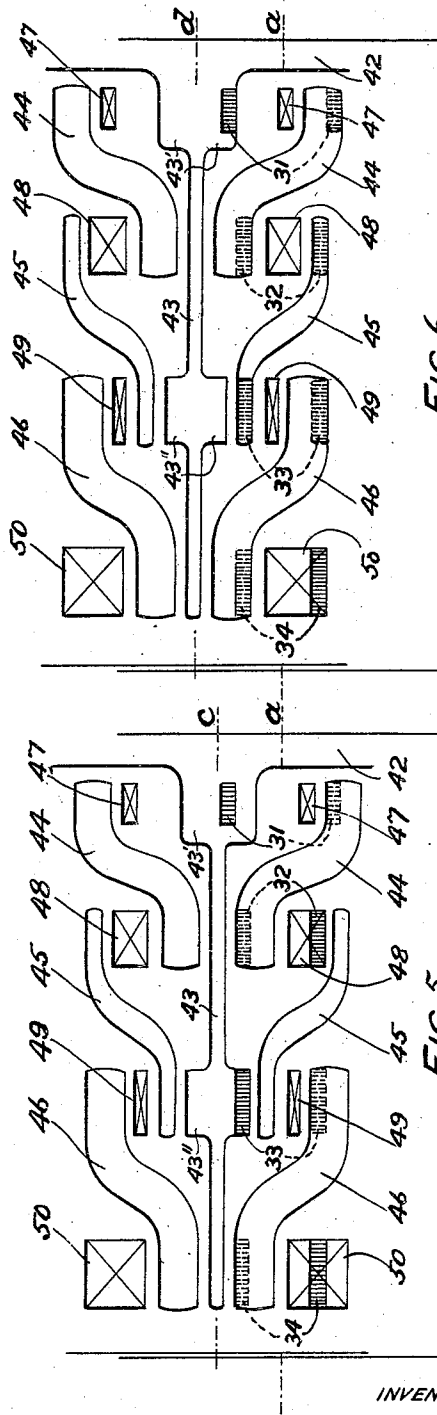


FIG. 6.

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UNITED STATES PATENT OFFICE.

FRANK G. FREESE, OF PHILADELPHIA, PENNSYLVANIA.

ENGINE.

No. 929,575.

Specification of Letters Patent.

Patented July 27, 1909.

Application filed May 6, 1908. Serial No. 431,110.

To all whom it may concern:

Be it known that I, FRANK G. FREESE, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain Improvements in Engines, of which the following is a specification.

This invention is an engine having a cylinder and piston each provided with several sections, preferably of progressively increasing size, in combination with valve mechanism, whereby the engine may be run as a single expansion, plural expansion, or compound engine, with ready change from one to the other or to reverse without stopping.

The construction is simple and compact; having very few parts, the working parts inclosed, low friction, little wear, low cost of operation and uniform action, there being no dead center position.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of an engine embodying my improvements; Fig. 2 is a transverse sectional view of the same; Fig. 3 is a diagrammatic representation of the valve mechanism with the ports closed; Fig. 4 represents diagrammatically the position of the valve mechanism for single expansion; Fig. 5 represents diagrammatically the position of the valve mechanism for a double compound action; and Fig. 6 represents diagrammatically the position of the valve mechanism for quadruple expansion.

In the form of the invention illustrated, the engine comprises the cylinder 1 having the detachable heads 2 and 3 held in position by screws 4 and 5, the heads having the respective cylindrical hubs 6 and 7 which fit within the corresponding ends of the cylinder. The cylinder is divided into sections 8, 9, 10 and 11 of successively increasing diameters and sizes. These sections are separated by the diaphragms 12, 13 and 14 which telescope within the respective sections 9, 10 and 11 and fit against the adjacent ends of the respective sections 8, 9, and 10.

A piston 15, having the spindle 16 journaled in the packed bearing 17 of the head 2 and the hub 18 journaled in the socket or step bearing 19 of the head 3, is provided with the cylindrical sections 20, 21, 22 and

23 of successively increasing diameters. The piston sections revolve in the respective cylinder sections or chambers 8, 9, 10 and 11; the sections 20, 21 and 22 revolving in corresponding bearings in the partitions 12, 13 and 14 and the sections 21, 22 and 23 abutting against the diaphragms 12, 13 and 14 to hold them in place. The piston sections are provided respectively with the diametrically arranged reciprocating blades 24, 25, 26, and 27 which project so as to divide the respective cylinder sections, against the walls of which they bear, the blades being thrown outwardly by springs as 28 and by centrifugal force on revolving the piston.

A cylindrical valve chamber 30 extends parallel and is fixed to the cylinder 1, the chamber 30 being connected with each of the chambers 8, 9, 10 and 11 by two ports 31, 32, 33 and 34. The valve chamber has heads 35 and 36 screwed therein. A pipe 37 set in the chamber adjacent to the head 35 admits fluid and a pipe 38 set in the head 36 carries off the exhaust. A cylindrical valve 39 fits within the chamber 30 and has a spindle 40 journaled within the packed bearing 41 in the head 35. A circular channel 42, with which the pipe 37 directly communicates, is formed at the inlet end of the valve and communicates with the longitudinal exterior channel 43 formed in the valve; this channel having a length permitting it to simultaneously communicate with a full set of the two sets of ports 31, 32, 33 and 34 and off sets 43' and 43'' which permit it to be brought into direct communication with ports 31 and 33 when it is out of communication with ports 32 and 34. The valve is provided, on opposite sides of the central channel 43, with the similarly formed exterior channels 44, each of which can be brought into registration with the adjacent port 31 and the oppositely placed port 32; also with the similarly formed exterior channels 45, each of which can be brought into registration with the adjacent port 32 and the oppositely placed port 33, and also with the similarly formed exterior channels 46, each of which can be brought into registration with the adjacent port 33 and the oppositely disposed port 34. Similarly

placed ports 47, each between an offset 43' and a channel 44, connect the exterior of the valve with its interior passage 45' which communicates with the exhaust pipe 38, each port being adapted for registration with the adjacent port 31. Similarly placed ports 48, each between corresponding channels 44 and 45, connect the exterior of the valve with its interior passage and each is adapted to be brought into registration with the adjacent port 32. Similarly located ports 49, each disposed between corresponding channels 45 and 46, connect the exterior of the valve with its interior passage and each is placed so that it can be brought into communication with the adjacent port 33. Similarly placed ports 50, lying on opposite sides of the channels 46, connect the exterior of the valve with its interior passage and each may be brought, by revolving the valve, into communication with the adjacent port 34.

A handle 51 is fixed on the end of the valve spindle 40 and has connected therewith by the fulcrum 52 a lever or pawl 53 having a toe 54 adapted for engaging notches *a*, *b*, *c* and *d* in a rack and dial 55 which is fixed to the end of the cylinder 30, the pawl being thrown into engagement by a spring 56 and disengaged by pressing its top toward the handle. When the handle is in the vertical position, the pawl engages the notch *a* and all of the ports 31, 32, 33 and 34 are closed, as illustrated in Fig. 3. When the handle is turned to the right and set at *b* the channel 43 registers with all of a set of the ports 31, 32, 33 and 34 and the other set of these ports registers with the respective ports 47, 48, 49 and 50, as illustrated in Fig. 4, so that fluid is admitted directly to all of the chambers 8, 9, 10 and 11 and the operation is single expansion. When the handle is turned to the right and set at *c* the channel 43 registers with ports 31 and 33 of the first set, the port 31 of the second set is connected by a channel 44 with the port 32 of the first set, the port 33 of the second set is connected by the channel 46 with the port 34 of the first set, the port 32 of the second set registers with a port 48, and the port 34 of the second set registers with a port 50, as illustrated in Fig. 5, so that fluid will be admitted simultaneously to the chambers 8 and 10 and will flow from these chambers into the respective chambers 9 and 11, the operation being double expansion in character. When the handle is turned to the right and set at *d*, the channel 43 registers with a single port 31 through which fluid is admitted to the chamber 8; thence it is discharged by the opposite port 31, the corresponding channel 44 and the port 32 of the first set into the chamber 9; thence by the second port 32, the corresponding channel 45 and the port 33 of the first set into the chamber 10; thence by the second port 33, the corresponding

channel 46 and the port 34 of the first set into the chamber 11, and thence by the registering ports 34 and 50, as illustrated in Fig. 6, the operation being quadruple expansion. The same operations in the reverse direction can be effected by turning the valve lever from the vertical to the left.

The number of sections with the corresponding valve mechanism, as illustrated, represents the type of the engine and it is to be understood that it is not dependent upon any particular number of sections but that the number with the valve mechanism therefore may be extended or reduced as rendered desirable by the work to be performed.

Having described my invention, I claim:

1. An engine having a cylinder with several compartments, a piston having members operating in the respective compartments, ports for each of said compartments, and a single cylindrical valve having means for controlling said ports and effecting a single expansion, plural expansion and compound action.

2. An engine having a cylinder with several compartments of different diameters, a piston having members operating in the respective compartments, ports for the respective compartments, and a cylindrical valve constructed and coacting with said ports so that said engine can be operated as a single expansion, plural expansion or compound engine.

3. An engine having a cylinder with several compartments of different diameters, partitions telescoping within compartments of larger diameters to close adjacent ends of compartments of smaller diameters, a piston having cylindrical sections revoluble in said partitions and the compartments closed thereby, reciprocating blades carried by said sections and acting in said compartments, a cylindrical valve chamber, ports connecting each compartment with said valve chamber, and a rotary valve in said chamber for controlling said ports.

4. An engine having a plurality of compartments of successively increasing size, a piston having reciprocating blades rotating in the respective compartments, a cylindrical valve chamber, ports connecting each compartment with said valve chamber, a valve revoluble in said chamber, a lever for revolving said valve, a dial for indicating the movements of said valve, and passages formed in said valve in such relation to said dial and compartment ports that said engine can be operated in either direction as a single expansion, plural expansion or compound engine.

5. An engine having a cylinder with several compartments of different diameters, partitions telescoping within compartments of larger diameters to close adjacent ends of compartments of smaller diameters, a piston

having cylindrical sections of different diameters revoluble in said partitions and the compartments closed thereby, the respective partitions being held in position by piston
5 sections adjacent to those revoluble therein, and reciprocating blades carried by said sections and acting in said compartments.

In witness whereof I have hereunto set my name this fourth day of May, A. D. 1908, in the presence of the subscribing witnesses. 10

FRANK G. FREESE.

Witnesses:

ROBERT JAMES EARLEY,
JOS. Q. DENNY, Jr.