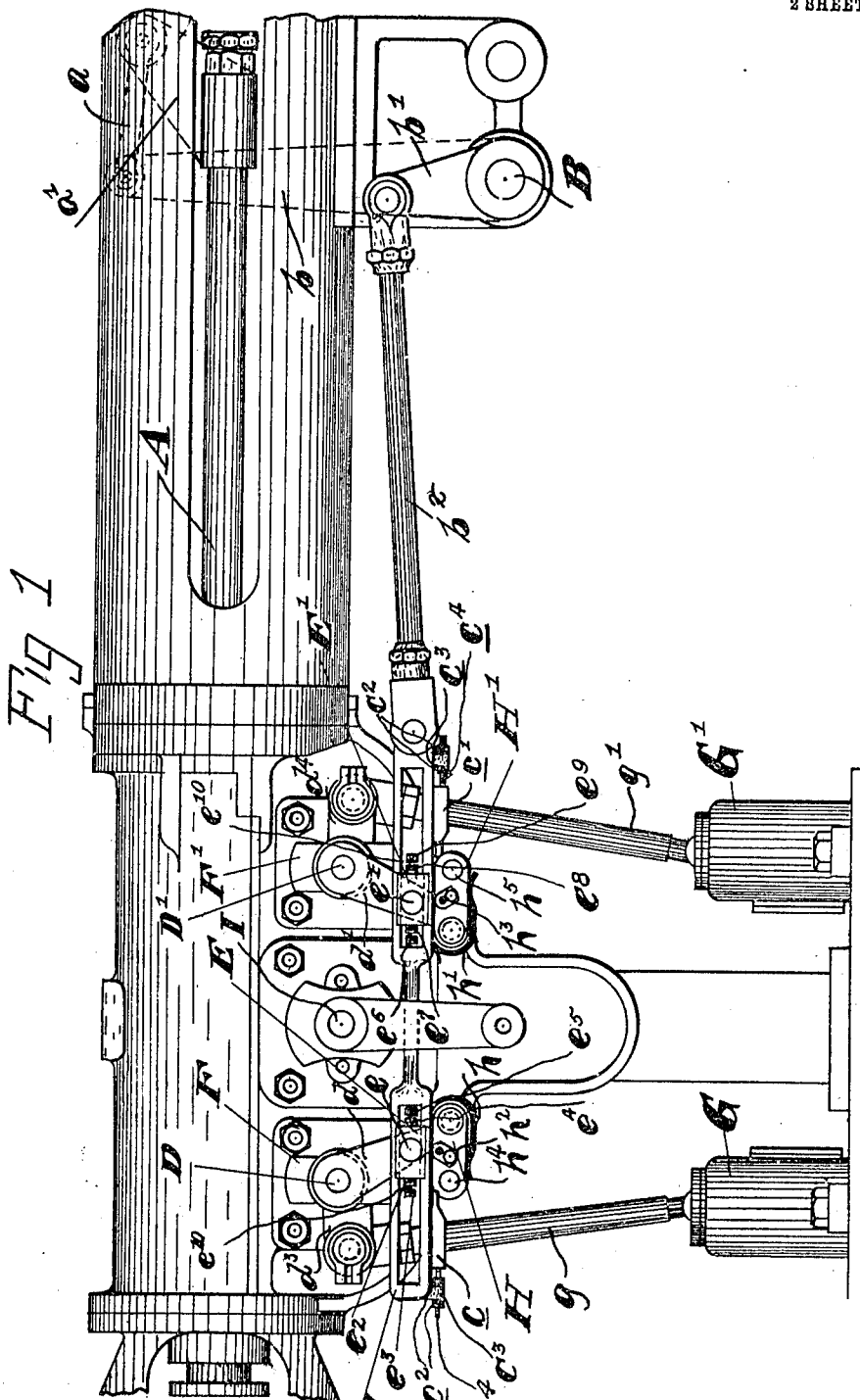


H. H. VAN WINKLE & F. S. HEALEY.
VALVE MECHANISM FOR FLUID ENGINES.
APPLICATION FILED JAN. 28, 1908.

950,644.

Patented Mar. 1, 1910.

2 SHEETS—SHEET 1.



WITNESSES
Carroll H. Richards
Joseph R. Gardner

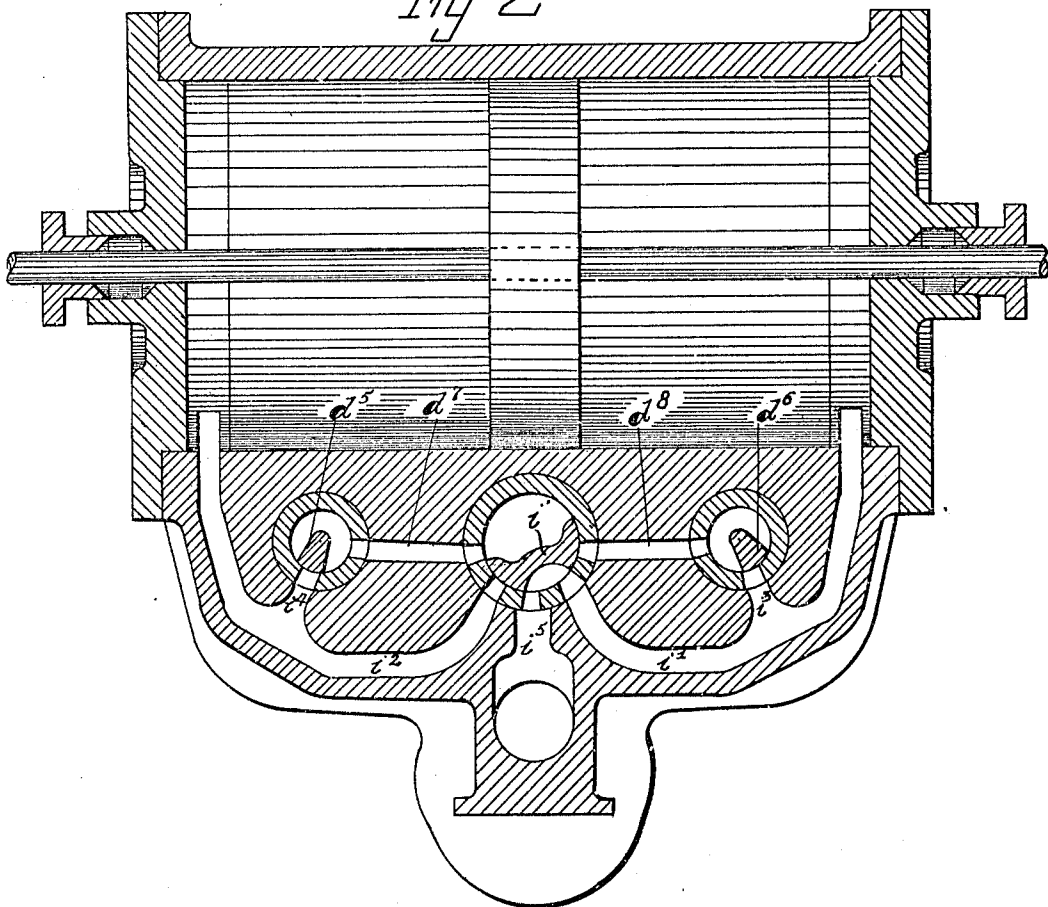
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VALVE MECHANISM FOR FLUID ENGINES.

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2 SHEETS—SHEET 2.

Fig 2



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UNITED STATES PATENT OFFICE.

HERBERT H. VAN WINKLE, OF CINCINNATI, AND FRED SUTTON HEALEY, OF HARTWELL, OHIO, ASSIGNORS TO THE JOHN H. MCGOWAN CO., OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

VALVE MECHANISM FOR FLUID-ENGINES.

950,644.

Specification of Letters Patent.

Patented Mar. 1, 1910.

Application filed January 28, 1908. Serial No. 413,145.

To all whom it may concern:

Be it known that we, HERBERT H. VAN WINKLE and FRED SUTTON HEALEY, citizens of the United States, residing at Cincinnati and Hartwell, respectively, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in Valve Mechanism for Fluid-Engines, of which the following is a specification.

This invention relates to new and useful improvements in the valve mechanism of direct acting reciprocating fluid engines of any type, and especially those types commonly employed in pumping practice.

Heretofore pumping engines have had their cut-offs controlled by mechanism operating in proportion to the travel of the main piston and causing what is commonly known as wire-drawing of the fluid, which lowers the actual efficiency of the machine. Furthermore the expansive force of all the fluid has not been utilized and the fluid consumption has been abnormally high. Also no valve gear affording instantaneous cut-off, has been applied to engines of variable stroke.

The object of this invention is to provide valve mechanism which will afford an instantaneous cut-off independently of the main valve and which will eliminate the wire-drawing; facilitate the utilization of more of the expansive force of the fluid and lower the fluid consumption. Also to provide a valve mechanism that will comprise a valve gear which will afford instantaneous cut-off and can be applied to engines of variable stroke. To obtain these features, three valves have been provided one of which is the main valve operated by any chain of links commonly used in practice and the other two cut-off valves operated by a novel gear, which will hereinafter be fully explained.

In the particular embodiment of this invention selected for illustration, we have shown the accompanying drawings, in which:

Figure 1 is a side elevation of this invention, as applied to a multiple expansion pumping engine, part of which is broken away. Fig. 2 is a longitudinal section taken through the valves of such an engine provided with this invention.

Referring to the drawings, A is the piston

rod connected, so as to oscillate shaft B through the proper angle, by means of cross-head a^1 , link a , and crank b , said crank b being fixed to shaft B and capable of oscillating with it. Crank b^1 is rigidly attached to shaft B and is connected to the double open link C by link b^2 oscillatingly fastened to each of the members it connects. Slidably attached to the bottom of said open link C are cam blocks c and c^1 , which are held in position relative to the said open link and adjusted, by lock nuts c^2 , and threaded rods c^4 , said rods being rigidly fastened to said cam blocks c and c^1 and pierce lugs c^3 .

Slidable in the eyes of the double open link are blocks E and E^1 pierced by pins e and e^1 respectively and carrying threaded rods e^{10} rigidly attached to them. Threaded to rods e^{10} are nuts $e^2, e^3, e^4, e^5, e^6, e^7, e^8$, and e^9 ; and those designated as e^3, e^5, e^6 , and e^9 provide by their adjustment, means for the regulation of the travel of the blocks E and E^1 , said travel being caused by the approximately longitudinal reciprocating motion of the double open link. Pins e and e^1 are loosely fastened in cranks d and d^1 respectively, and may oscillate or rotate in said cranks or in blocks E and E^1 . Cranks d and d^1 are rigidly fastened to the valve stems D and D^1 respectively, said stems being journaled at their outer ends in the yokes F and F^1 , which may be of any type commonly used in combination with steam engine rotary valves. The inner ends of said stems D and D^1 are rigidly fastened to or integral with the valves proper. They are also journaled in a stuffing box in the steam chest, said box not shown in the drawings. Cranks d^3 and d^4 are rigidly fastened to their respective valve stems on the portion inside the loop of the yoke. They are also pivoted to the connecting rods g and g^1 respectively of the dash pots G and G^1 , or they may connect with rods which connect with substitutes for dash pots such as weights or equivalents.

Hook blocks H and H^1 are pivoted to castings or their equivalents, said castings being integral with or fastened to the yokes F and F^1 . Said blocks are pressed upward by springs h and h^1 respectively, which pressure facilitates the engaging and disengaging of the catches h^2 and crank d and catch h^3 and crank d^1 . Catches h^2 and h^3 comprise small blocks of suitable shape, fas-

tened rigidly to the hook blocks H and H¹ respectively. Rollers h⁴ and h⁵ are rotatively fastened to the said hook blocks and are adapted to contact with the cam blocks c and c¹ respectively, the engaging of said blocks being adapted to disengage the crank d and catch h², and the crank d¹ and catch h³ respectively.

Fig. 2 shows a section through the valves and cylinder of the engine. Valves d⁵ and d⁶ are cut-off valves and are connected to the main valve chamber by means of ports d⁷ and d⁸ respectively. The main valve i is rigidly fastened to valve stem I, and is connected to the head-end and crank-end of the cylinder by means of ports i¹ and i². Ports i³ and i⁴ connect the cut-off valve chambers to the main ports i¹ and i² respectively, which indirectly connect said valve chambers to the crank-end and head-end of the cylinder. Port i⁵ connects the main valve with the exhaust. Steam from the boiler is admitted to the main valve chamber and is there directed by the operation of the valve so as to cause it to flow into the proper ports. The operation of the main valve i, controls all the events except cut-off, which can only be brought about by the cut-off valves d⁵ and d⁶.

The operation is as follows:—Assume that the engine is on its head-end stroke, the main valve i is then in a position to connect the crank-end port i¹ to the exhaust i⁵ and to close port d⁸ of the crank-end cut-off valve d⁶. Port d⁷ of the head-end cut-off valve d⁵ is directly connected to the live steam and said steam passes through said port d⁷ into the chamber of the head-end cut-off valve d⁵, which now does not cover its port i⁴, which connects with the main head-end port i². The crank-end cut-off valve d⁶, is now rotating and is uncovering its port i³. The live steam is passing from the main valve chamber through the port d⁷ to the head-end cut-off of valve d⁵ and from there is conveyed through ports i⁴ and i² to the head end of the cylinder. The double open link C is moving in the same direction as the piston. The nut e⁶ has contacted with the adjacent end of the open link and has transmitted the motion of said link to the block E¹, which in turn has caused crank d¹ to rotate the valve stem D¹. Crank d⁴, which is rigidly attached to the valve stem D¹, has rotated with said stem and has caused the piston in the dash pot G¹ to rise. After sufficient longitudinal travel of the double open link C, the block E¹ carried with said link and to which is attached crank d¹ by means of a pin joint or its equivalent, comes to a position where the lower end of crank d¹ engages with catch h³ of the hook block H¹, the spring h¹ being slightly depressed in this operation. The valve stem ceases to rotate and is at rest, which condition is due

to the engagement of catch h³ and the lower end of crank d¹. The cut-off valve d⁶ of the crank end is open and the main valve may now be operated to turn the live steam into the crank end of the cylinder and the engine started on its return stroke. The head-end cut-off valve d⁵ has been hooked up on the stroke preceding the one under consideration, which would be the crank-end stroke. Since then catch h² and crank d have engaged; the piston of the dash pot G has been raised and the head-end cut-off valve d⁵ has then opened; which operation constitutes the act termed hooking up. A disengagement of crank d and catch h² and the coöperation of the dash pot G would cause a substantially instantaneous head-end cut-off or the closing of the head-end cut-off valve d⁵. On the same stroke as the one considered in the description of the hooking up of the crank-end cut-off valve, the cam block c has been carried longitudinally in the direction of the piston by the motion of the double open link C to which it is attached. After sufficient longitudinal motion of the said double open link, the inclined surface of the cam block c contacts with the roller h⁴, spring h is depressed, the hook block H is swung downward about its pivoted point and the catch h² and crank d are disengaged. Instantaneously the valve stem D is revolved by the operation of the dash pot G acting through connecting rod g and crank d³, causing instantaneous cut-off on the head-end stroke, by the rotation of valve stem D, which caused the valve d⁵ to cover its port. A further description of the operation would be a repetition of the foregoing, except that the function of the parts at the ends of the double open link would be reversed.

What we claim as new and desire to secure by Letters Patent of the United States, is:

1. In a valve-gear for reciprocating engines, the combination of a suitably operated main valve and a pair of cut-off valves adapted to operate independently thereof; a crank connected to each cut-off valve carrying a slide-block; hook-blocks pivoted to a fixed part of the engine and adapted to engage the slide-blocks respectively; a link-bar having a slot adapted to receive each of the said slide-blocks and move the same; cam-blocks attached to said link-bar and adapted to disengage said hook-blocks from said slide-blocks; and yielding means operatively connected with said valves to close them and produce immediate cut-off when said slide-blocks and hook-blocks are disengaged.

2. In a valve-gear for reciprocating engines the combination of a suitably operated main valve and a pair of cut-off valves adapted to operate independently thereof; a

crank, connected to each cut-off valve and carrying a slide-block; a double-slotted link-bar adapted to carry and operate the slide-blocks; hook-blocks yieldingly secured to a
 5 fixed part of the engine and adapted to engage the slide-blocks, respectively; adjustable cam-blocks attached to said link-bar and adapted to disengage said slide-blocks from the hook-blocks; and yielding means
 10 connected with said valves to close them immediately upon release of the slide-blocks.

3. In a valve-gear for reciprocating engines, the combination of a suitably operated main valve and a pair of cut-off valves
 15 adapted to operate independently thereof; a crank connected to each cut-off valve carrying a slide-block; hook-blocks pivoted to a fixed part of the engine and adapted to engage the slide-blocks respectively; a link-
 20 bar having a slot adapted to receive each of the said slide-blocks and move the same; cam-blocks attached to said link-bar and adapted to disengage said hook-blocks from said slide-blocks; and dashpots operatively
 25 connected with said valves to close them and produce immediate cut-off when said slide-blocks and hook-blocks are disengaged.

4. In a valve-gear for reciprocating engines, the combination of a suitably oper-
 30 ated main valve and a pair of cut-off valves

adapted to operate independently thereof; mechanism adapted to operate said cut-off valves, comprising crank-arms upon the valve-spindles; a double open link operated
 35 by a connection with any suitable reciprocating part of the engine; slide-blocks carried in the link-slots and attached to the said cranks; adjustable cam-blocks attached to said link; spring-actuated hook-blocks,
 40 suitably pivoted to a fixed part of the engine, and provided with rollers adapted to contact with the cam-blocks and catches adapted to engage with said cranks and be disengaged by said cam-blocks; and dash-
 45 pots operatively connected with said cut-off valve spindles, and adapted by their operation to rotate the cut-off valves and cause instantaneous cut-off when the hook-blocks and cranks are disengaged, and to allow
 50 their pistons to be raised during the forward valve motion when the engagement of the hook blocks and cranks is occurring.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

HERBERT H. VAN WINKLE.
 FRED SUTTON HEALEY.

Witnesses:

CARROLL H. RICHARDS,
 JOSEPH R. GARDNER.