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.

Fig 1

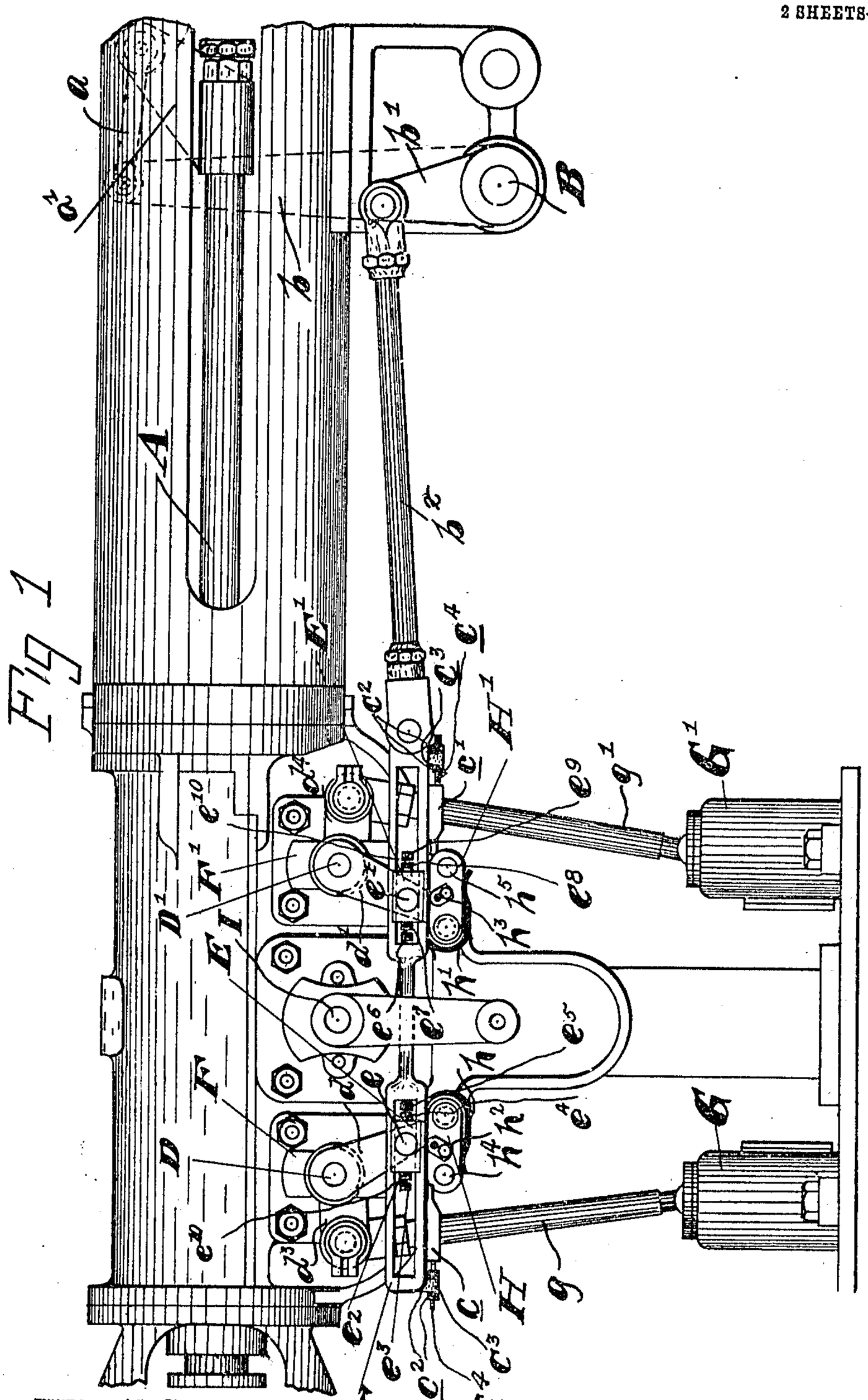

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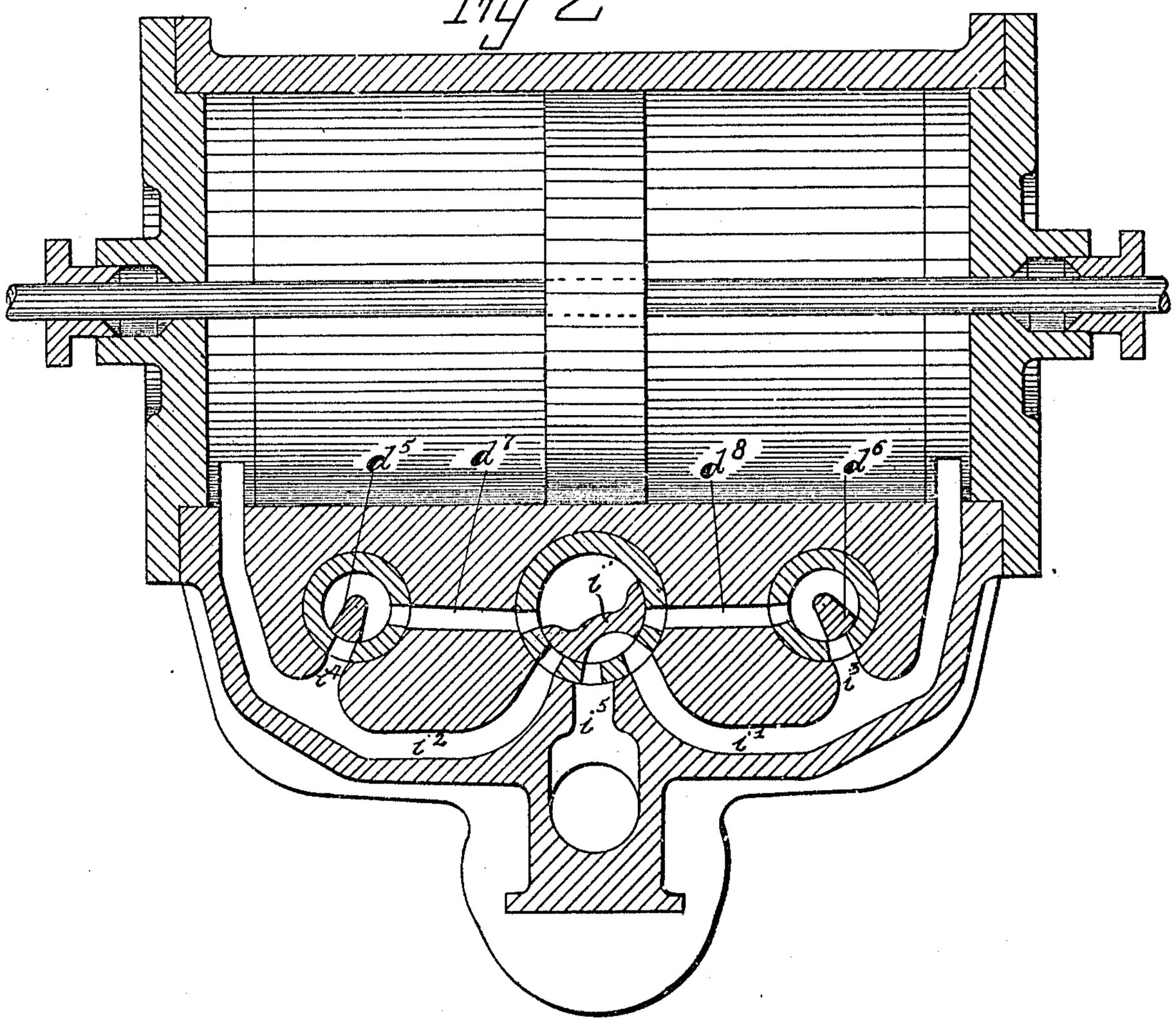
Fig 2



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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 crosshead 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 H[1] respectively. Rollers h^4 and h^5 are rotatively fastened to the said hook blocks and are adapted to contact with the cam blocks c and c^1 respectively, the engaging of said blocks being adapted to disengage the crank d and catch h^2, and the crank d^1 and catch h^3 respectively.

Fig. 2 shows a section through the valves and cylinder of the engine. Valves d^5 and d^6 are cut-off valves and are connected to the main valve chamber by means of ports d^7 and d^8 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 i^1 and i^2. Ports i^3 and i^4 connect the cut-off valve chambers to the main ports i^1 and i^2 respectively, which indirectly connect said valve chambers to the crank-end and head-end of the cylinder. Port i^5 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 d^5 and d^6.

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 i^1 to the exhaust i^5 and to close port d^8 of the crank-end cut-off valve d^6. Port d^7 of the head-end cut-off valve is directly connected to the live steam and said steam passes through said port d^7 into the chamber of the head-end cut-off valve d^5, which now does not cover its port i^4, which connects with the main head-end port i^2. The crank-end cut-off valve d^6, is now rotating and is uncovering its port i^3. The live steam is passing from the main valve chamber through the port d^7 to the head-end cut-off of valve d^5 and from there is conveyed through ports i^4 and i^2 to the head end of the cylinder. The double open link C is moving in the same direction as the piston. The nut e^6 has contacted with the adjacent end of the open link and has transmitted the motion of said link to the block E[1], which in turn has caused crank d^1 to rotate the valve stem D[1]. Crank d^4, which is rigidly attached to the valve stem D[1], has rotated with said stem and has caused the piston in the dash pot G[1] to rise. After sufficient longitudinal travel of the double open link C, the block E[1] carried with said link and to which is attached crank d^1 by means of a pin joint or its equivalent, comes to a position where the lower end of crank d^1 engages with catch h^3 of the hook block H[1], the spring h^1 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 h^3 and the lower end of crank d^1. The cut-off valve d^6 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 d^5 has been hooked up on the stroke preceding the one under consideration, which would be the crank-end stroke. Since then catch h^2 and crank d have engaged; the piston of the dash pot G has been raised and the head-end cut-off valve d^5 has then opened; which operation constitutes the act termed hooking up. A disengagement of crank d and catch h^2 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 d^5. 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 h^4, spring h is depressed, the hook block H is swung downward about its pivoted point and the catch h^2 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 d^3, causing instantaneous cut-off on the head-end stroke, by the rotation of valve stem D, which caused the valve d^5 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 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 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 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 dashpots operatively 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 operated 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 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, 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 dashpots 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 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.