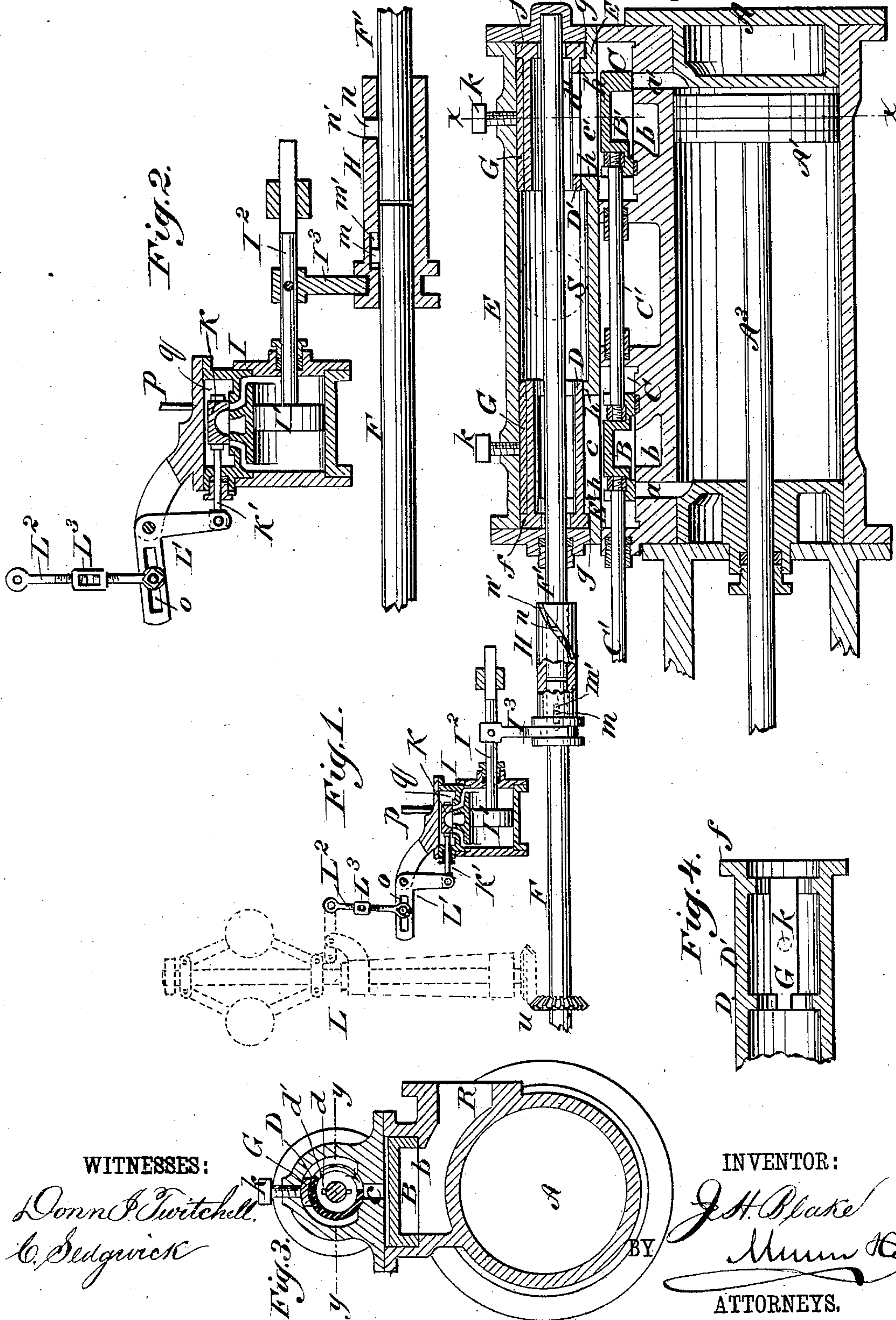


(No Model.)

J. H. BLAKE.
CUT-OFF VALVE GEAR.

No. 247,006.

Patented Sept. 13, 1881.



WITNESSES:

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JOHN H. BLAKE, OF BATAVIA, NEW YORK.

CUT-OFF-VALVE GEAR.

SPECIFICATION forming part of Letters Patent No. 247,006, dated September 13, 1881.

Application filed January 24, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. BLAKE, of Batavia, in the county of Genesee and State of New York, have invented a new and Improved Cut-Off-Valve Gear, of which the following is a full, clear, and exact description.

The object of this invention is to increase the sensitiveness of the engine-governor and to make the action of the cut-off devices more prompt and decided.

The invention consists of two slide-valves, one at each end of the cylinder, each having a separate steam-chest, into which steam is admitted throughout the whole stroke of the engine, the point of cut off being regulated by rotary valves that are placed in supplemental steam-chests over each slide-valve; and it consists, further, of a hydraulic cylinder designed to be operated by water under pressure, provided with suitable valve and piston, which cylinder forms the connection between the governor and rotary or cut-off valves and facilitates and regulates the action of the latter; and the invention further consists of improved mechanical devices for operating the parts, all of which will be hereinafter described.

Figure 1 is a longitudinal sectional elevation, showing the improved device applied to an engine-cylinder. Fig. 2 is an enlarged sectional side elevation of the hydraulic cylinder and its immediate connections. Fig. 3 is a vertical sectional elevation on line *x x*, Fig. 1. Fig. 4 is an enlarged cross-section on line *y y*, Fig. 3.

Similar letters of reference indicate corresponding parts.

In the drawings, A represents an engine-cylinder, and A' A³ the piston and piston-rod, respectively.

The valve-gear consists of two slide-valves, B B', one at each end of the cylinder, and each having a separate steam-chest, C, into which steam is admitted throughout the whole stroke, and having a common shaft or stem, C'. The steam inlet and exhaust ports from the steam-chests C into the cylinder A are shown at *a a'*, and the exhaust-ports from steam-chests C are shown at *b b*. These slide-valves B B' are designed to be moved by means of the usual mechanisms connecting their stems C' with the crank-shaft of the engine.

The point of cut off is regulated by the two

hollow rotary valves D D', that are placed in a supplemental steam-chest, E, respectively over each slide-valve B B', said steam-chest E having communication with the valve steam-chest C by means of the ports *c c'* immediately below said valves D D'. These rotary valves D D' make each revolution in time with the engine-stroke, and are cut away on their faces, as shown at *d'*, for half their diameter less the amount of the width of their respective ports *c c'*, and they occupy opposite ends of the steam-chest E, and are firmly keyed, as shown at *d*, or otherwise secured, with their faces *d'* in opposite directions to the shaft F F', which extends out through one end of said steam-chest E. Each rotary valve D D' is provided with an annular flange, *f*, on that end which is toward the end of the steam-chest E, of a width sufficient to fill the corresponding semicircular space *g* between the end of said steam-chest E and the valve-seat E', whereby any lateral movement of a valve, D, on its seat is prevented. These valves D D' are retained in line with their shaft F F' by the steam-chest ribs *h*, that encircle said valves D D', as shown, and they may be kept seated at all times by means of the adjusting-plates G G, that are placed between their upper surfaces and the top of the chest E, and are held by the set-screws *k k*, which are entered through the top of chest E. Instead of being keyed to the shaft F F', these valves D D' may be held thereon by forming a collar of square cross-section on the said shaft F F'; or the shaft itself may be left square and fitting said collars in corresponding square openings in the outer end of each valve D D', the openings in the valves to be a little larger than the collars or square portions of the shaft F F', in order to permit the valves D D' to seat themselves as they wear without disturbing the valve-shaft F F'.

The shaft F F', which gives movement to the rotary valves D D', is cut in two at some convenient point, and motion is transmitted from one section, F, to the other section, F', through the coupling-sleeve H. This sleeve H is capable of longitudinal movement on the shaft F F', and is connected to the section F by a feather, *m*, that projects from said section into a corresponding straight slot, *m'*, in the said

sleeve H, and is connected to the section F' by a stud, *n*, projecting from said section into a spiral slot, *n'*, in said sleeve H, and extending around it for about one-half of its diameter.

5 Hence it will be seen that any longitudinal movement of the sleeve H will produce rotation of the section F' of the rotary valve-shaft, and consequently of the valves.

10 The longitudinal movement of the sleeve H may be produced by the governor through proper connecting-rods in the usual manner; but in this instance I make use of the hydraulic cylinder I, set immediately over and parallel with the rotary valve-shaft F F'; and to the
15 piston-rod I² is keyed one end of a vertical arm, I³, whose other end embraces or is otherwise connected with the sleeve H, as shown, so that any motion communicated to the piston I' will be transmitted to the sleeve H. This hydraulic
20 cylinder I is provided with the ordinary D slide-valve, K, whose stem K' is connected with a governor, L, (indicated in dotted lines, Fig. 1,) by the right-angled lever L', as shown. The upper arm of this lever L' is provided with a
25 slot, *o*, or several holes, so that the point of attachment for the connecting-rod L² from the governor L may be regulated according to the sensitiveness desired.

30 The connecting-rod L² is made in two parts, with screw-threaded ends, and a nut, L³, is fixed thereon, by means of which said rod L² may be lengthened or shortened to bring the hydraulic valve K in the center of its seat in relation to any desired height of the governor
35 L. This governor L is designed to be driven from the rotary valve shaft or stem F F' by gear M, and the valve shaft or stem F F' can be driven by a train of gears from the main shaft or by other suitable device.

40 It is proposed to use in the hydraulic cylinder I, to produce the desired motion of the piston I' and its connections, water under pressure. This water-pressure may be obtained from a boiler by connecting therewith a pipe
45 considerably below the water-level of the boiler, and connecting the other end of said pipe, as represented at *p*, with the valve-chamber *q* of the cylinder I. This connecting-pipe *p* should be of sufficient length to insure the condensation of any steam that may enter or form in it;
50 or for the purpose of such condensation the said pipe *p* may be passed through the cold feed-water.

55 The valve K of the hydraulic cylinder I being adjusted to the center of its seat when the governor-balls are at a height necessary to produce the desired speed, any variation will cause the prompt extension or reduction, as the case may be, of the point of cut off.

60 One particular advantage of this system of governing is that so long as the engine is running at the desired speed the valve K of the hydraulic cylinder I will remain in the center of its seat, and, as water is not compressible,
65 will retain the piston I', and consequently the cut-off, at any point it may have assumed, the

height of the governor varying only long enough to produce the proper point of cut off, and then locking it there.

Another advantage of this system is its sensitiveness, as the governor-balls have only to move a small slide-valve, K, and the power of the device can be increased to any desired extent by increasing the size of the cylinder I. When the parts are in the position herein
75 shown the rotary valve D' is just commencing to open its port *c'* and the valve D has just closed its port *c*, and the steam, as it is admitted through the supply-port S into the steam-chest C, passes through the port *c'* into
80 the steam-chest C of the sliding valve B', and the valves B B' moving synchronously, the steam enters through port *a'* into cylinder A in rear of the piston A', while the exhaust escapes through port *a* into and out of the ex-
85 haust-port R. On the return-stroke the steam enters through ports *c* and *a* and exhausts through *a'*. If a rotary valve, D D', were set so as to commence admitting steam to the slide-valve chest C just as the stroke of the engine
90 commenced, the steam would be admitted full stroke; but if this rotary valve were advanced about one-half of a revolution, or the amount that its face was cut away, then it would com-
95 mence to admit steam to the slide-valve chest C just as a valve, B B', covered the steam-port for the return-stroke. Of course, the full steam-pressure would be in the steam-chest C of the slide-valve until the port was opened by that
100 valve for the next stroke; but by that time the revolution of the rotary valve would have cut off steam, and the only steam available for the cylinder A would be that remaining in the slide-valve chest, which steam would be
105 but of small amount. These two points of cut off, as described, would be the longest and shortest, respectively. Between these two points of cut off any one may be obtained by advancing the rotary valves D D' more or less,
110 as may be desired.

This system of governing is not limited to automatic cut-off engines, but is applicable to throttling and marine engines, and, in short, to all purposes to which a governor may be applied.
115

Water-pressure may be obtained for the hydraulic cylinder from other sources than the boiler, and when convenient oil or other fluid may be substituted for water in the said cylinder. As in practice a longer cut-off than
120 half-stroke would probably not be necessary, the faces *d'* of the rotary valves D D' could be made of proper width to produce this effect, and thus reduce the time the slide-valves B B' would be under pressure.
125

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An improved engine-governor and cut-off constructed substantially as herein shown and described, consisting of the rotary valves D D' in supplemental steam-chest E, rotary valve-
130 stem F F', coupled by sleeve H, hydraulic cyl-

inder with piston, piston-rod, and arm $I I' I^2 I^3$, and valve K, lever L' , connecting-rod L^2 , and governor L, arranged and operating as set forth.

5 2. In an engine-governor and cut-off, the combination, with the hollow rotary valves $D D'$, of the valve-stem $F F'$, provided with feather m and stud n , and coupling-sleeve H , provided with straight slot m' and spiral slot n' , substantially
10 as herein shown and described, whereby the advance of the said rotary valves may be accomplished, as set forth.

3. In an engine-governor and cut-off, the combination, with the supplemental steam-chest E,
15 provided with semicircular spaces g , of the rotary valves $D D'$, provided with corresponding flanges f , substantially as herein shown and described, said flanges preventing lateral motion of said valves, as set forth.

20 4. In an engine-governor and cut-off, the combination, with the rotary valve-stem $F F'$, coupling-sleeve H , and hydraulic cylinder, piston, and piston-rod $I I' I^2$, of the arm I^3 , substantially as herein shown and described, whereby
25 the movement of the said piston is transmitted to the said rotary valve-stem, as set forth.

5. In an engine-governor and cut-off, as a means for transmitting the motion of the governor to the cut-off valves, the hydraulic cylinder I, provided with piston and piston-rod I' 30 I^2 and valve K, in combination with the governor L, lever L' , and adjustable connecting-rod L^2 , substantially as herein shown and described.

6. The combination, with the cylinder A, of 35 steam-chests C, containing slide-valves $B B'$, steam-chest E, containing rotary cut-off valves $D D'$, rotary valve-stem $F F'$, coupled with sleeve H, hydraulic cylinder, piston, piston-rod, and arm $I I' I^2 I^3$, respectively, lever L' , 40 connecting-rod L^2 , and governor L, arranged substantially as herein shown and described.

7. In an engine-governor and cut-off, the combination, with the sectional rotary valve-stem $F F'$, provided with feather m and stud n , of 45 the sleeve H, provided with straight slot m' and spiral slot n' , substantially as herein shown and described.

JOHN H. BLAKE.

Witnesses:

C. E. FISH,
F. E. NORTH.