(No Model.) 2 Sheets—Sheet 1.

G. W. PRICE.

CUT-OFF VALVE FOR ENGINES.

No. 324,593. Patented Aug. 18, 1885.

Fig. 1.

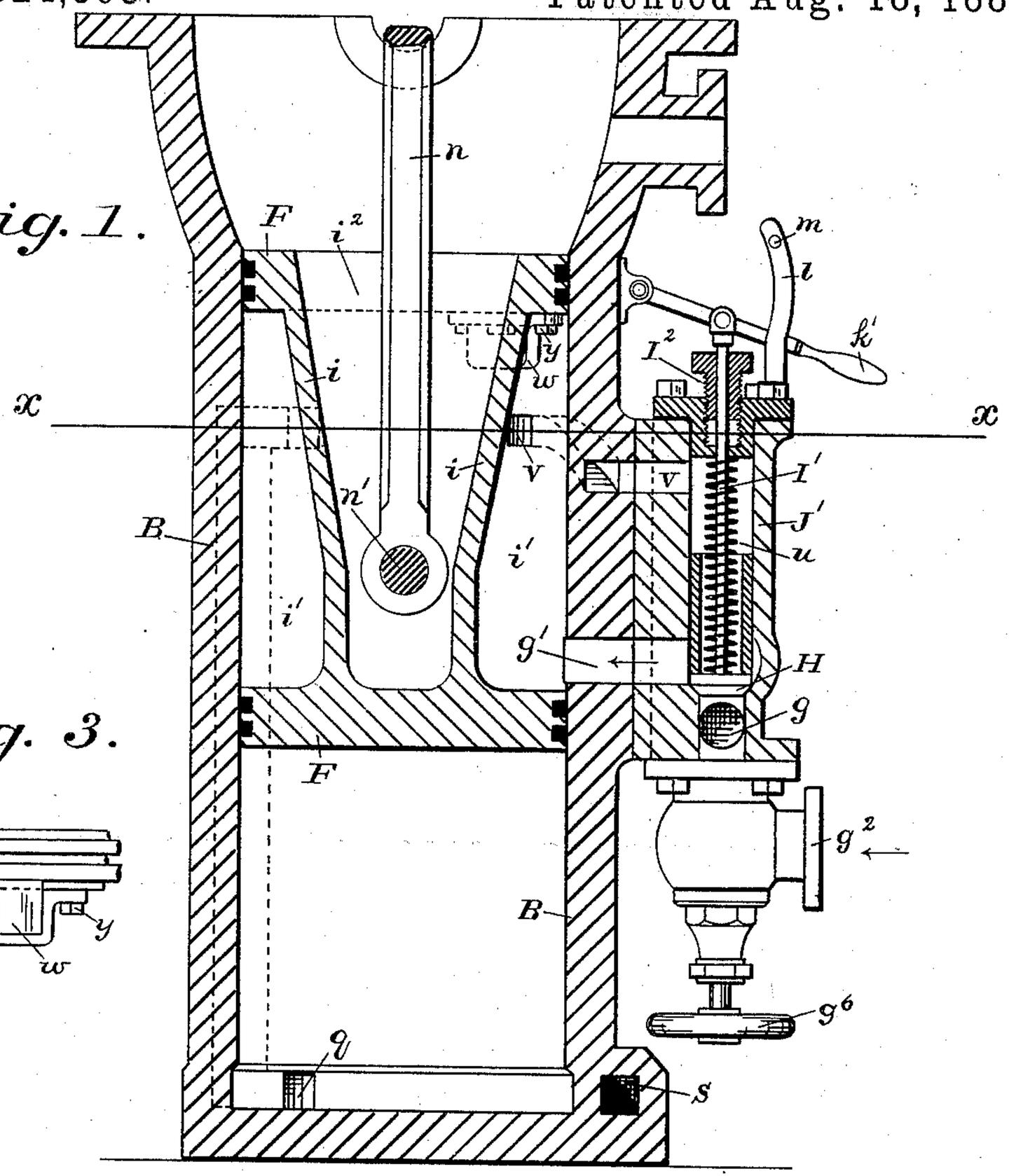


Fig. 3.

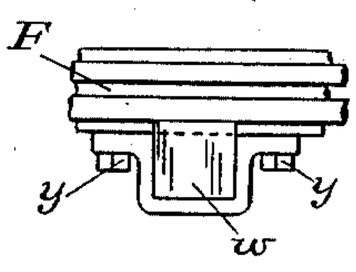
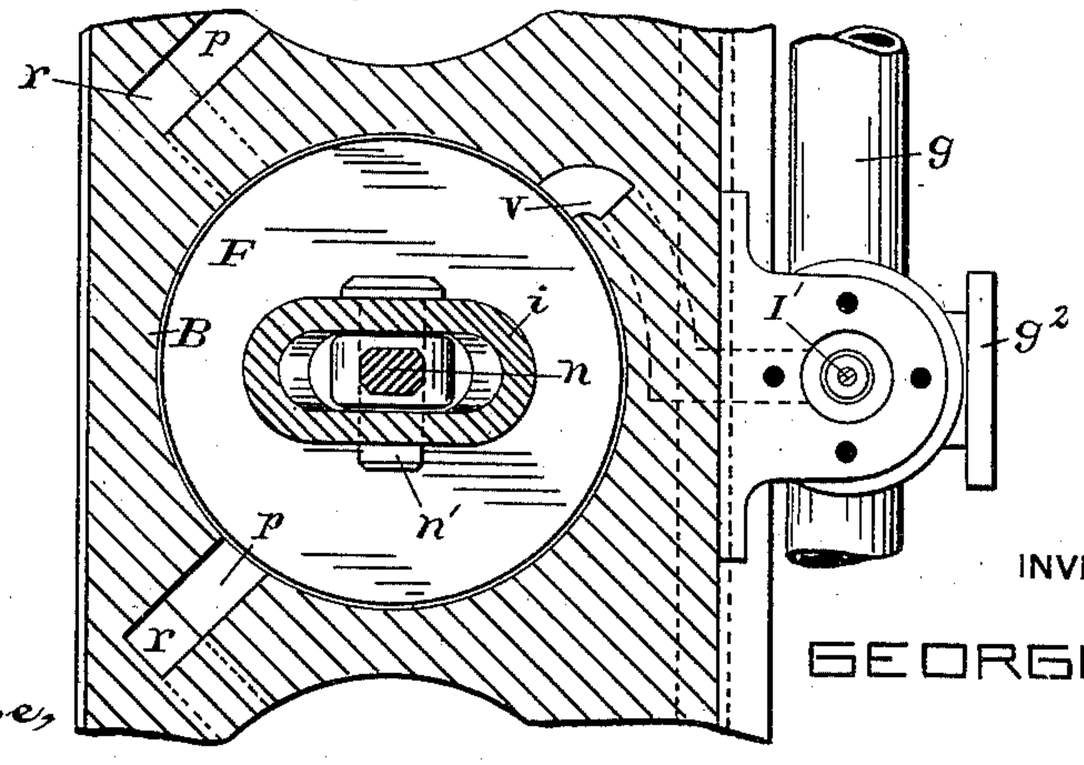


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

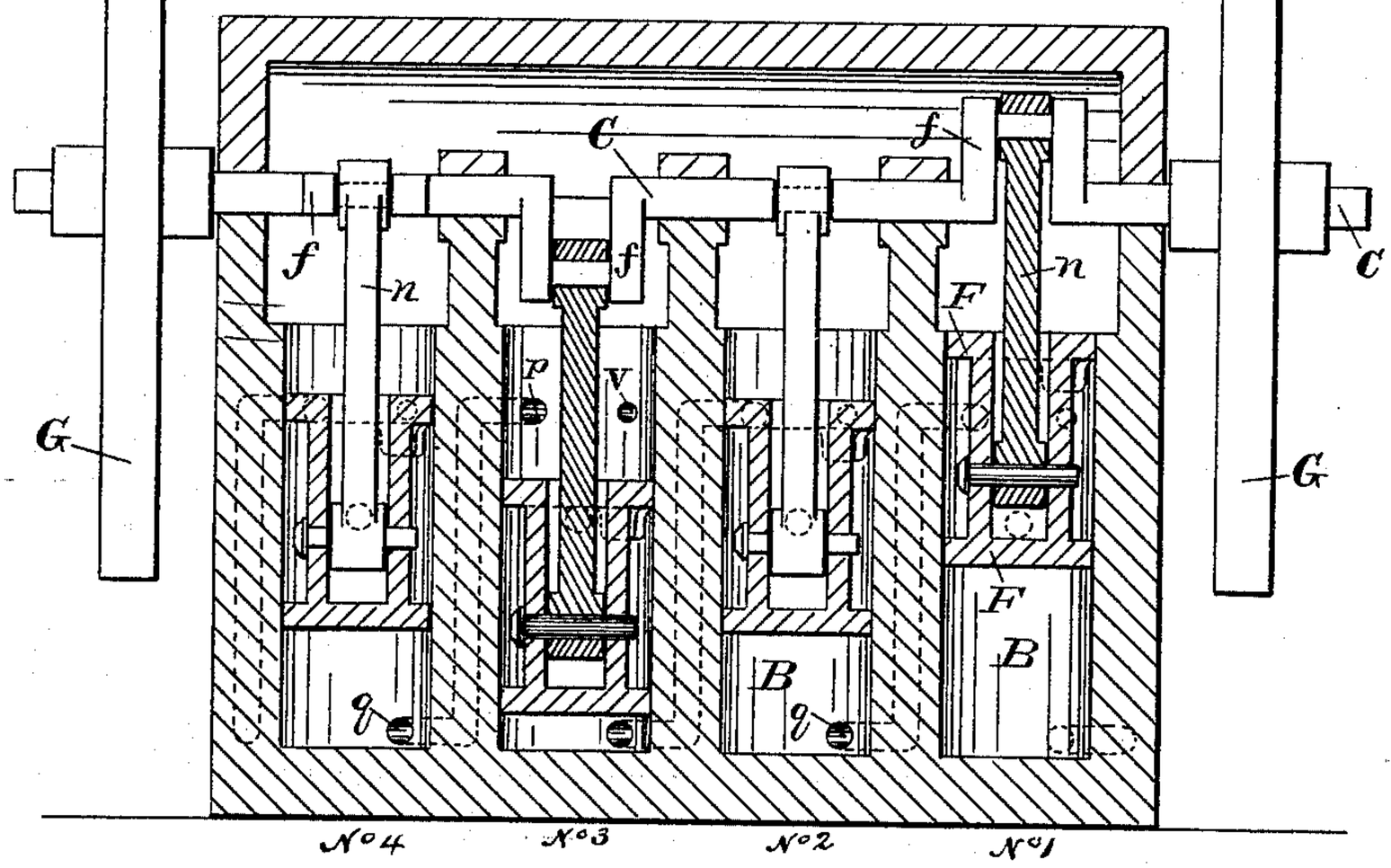
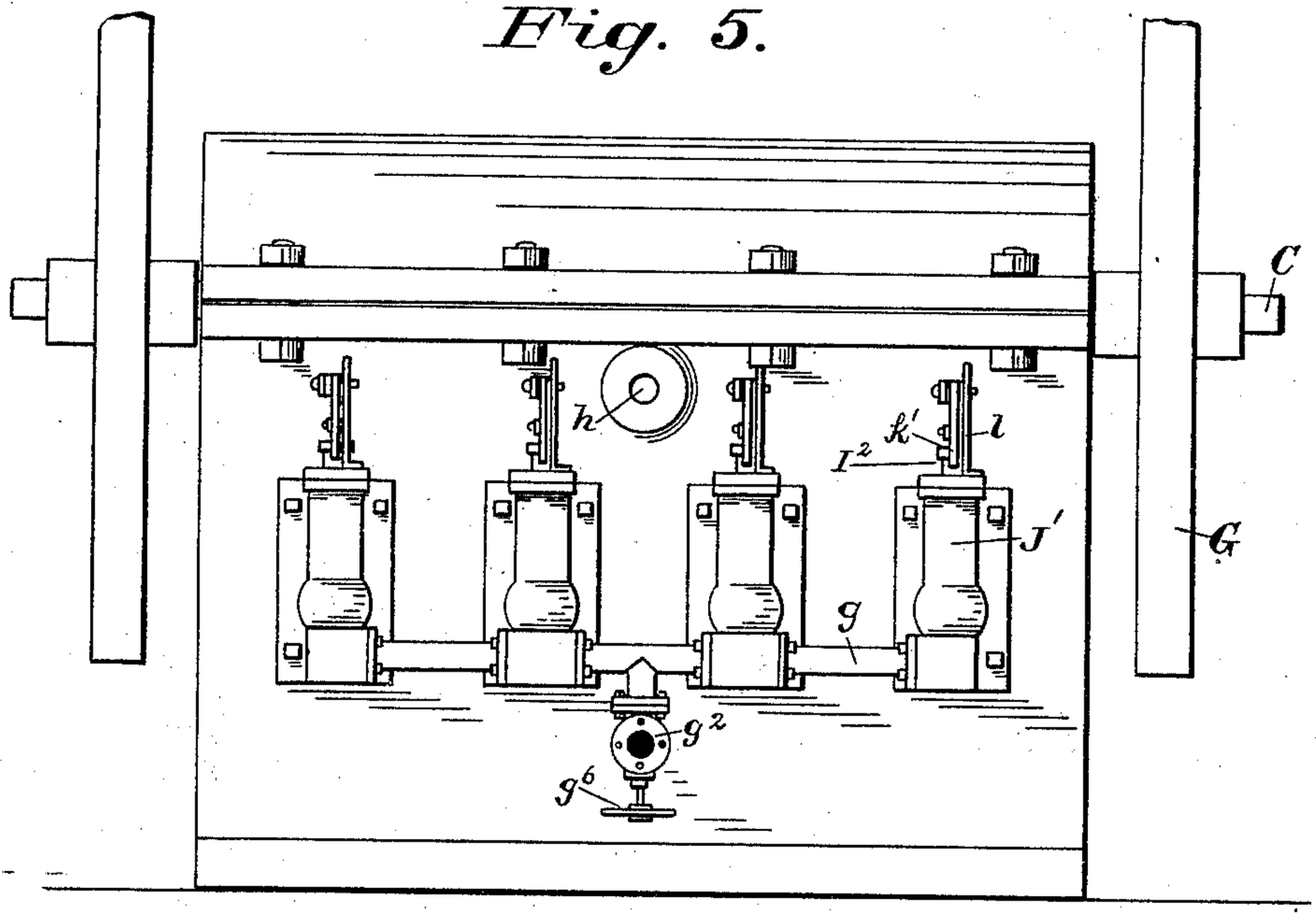


Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE W. PRICE, OF BALTIMORE, MARYLAND, ASSIGNOR OF ONE-HALF TO WILLIAM J. HOOPER, OF SAME PLACE.

CUT-OFF VALVE FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 324,593, dated August 18, 1885.

Application filed September 22, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. PRICE, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Cut-Off Valves for Engines, of which the following is a specification.

My invention relates to an improved engine and a cut-off valve for engines, and is designed more particularly for steam-engines of the kind shown and described in my application for Letters Patent of the United States filed September 17, 1884. In my said application for a patent no provision is made for using steam expansively. The purpose, therefore, of this invention is to provide for the attainment of that object.

The invention is illustrated by the accompanying drawings, in which Figure 1 is a vertical section through one of the cylinders and the cut-off-actuating mechanism. Fig. 2 is a horizontal section through one of the cylinders on the line *x*, Fig. 1. Fig. 3 is a face view of the cut-off duct-closer on the piston-head. Fig. 4 is a vertical section of the engine for which the cut-off valve is designed. Fig. 5 is a side elevation of the engine showing the position of the cut-off valves.

A brief description will first be given of the engine in order that the requirements of the "cut-off" may be fully understood.

Three cylinders, B, or any number greater than three, may be used. Each cylinder is fitted with a double piston—that is, one having two heads, F—which are separated a distance somewhat greater than the stroke which the piston is to have. The two piston-heads are connected by a tubular structure, *i*, the shape of which, in the present instance, in cross-section is flattened or oval, as seen in Fig. 2, and is tapering, being largest at the end nearest the crank, as seen in Fig. 1, and the piston end or head nearest the crank has an opening, i^2, corresponding with the large end of the tubular structure, which latter fits about and closes the said opening. The purpose of this tubular structure in the piston is to allow the pitman *n* to be jointed or pivoted, as designated by *n'*, at a point between the two piston ends or heads F, thereby providing for the use of a longer pitman than would otherwise be possible.

A shaft, C, extends across the open ends of all the cylinders, and has the same number of cranks *f* as there are cylinders. Each crank, if there are four, as in the present case, should have a relative angle of ninety degrees with respect to the one next to it. Driving-pulleys G are on the shaft; from these belts may connect with machinery.

A supply-pipe, *g*, extends in a direction cross-wise and at one side of all the cylinders. An induction or supply port, *g'*, enters the side of each cylinder near its center—that is, at a point about midway of its ends. This center or supply port is always in communication with the steam space or recess *i'*, formed in the piston between its two heads.

An inlet, g^2, is for the connection of a steam-pipe from the boiler with the cross-pipe *g*. This inlet is guarded by a valve, g^6.

Each cylinder has a port, *p*, near its crank end, which, by the movement of the piston, is alternately opened and closed to the space or recess *i'* in the piston. It also has a port *q* near the other end, which is never closed by the piston. A passage, *r*, connects the crank-end port *p* of one cylinder with the port *q* in the other end of the next adjoining cylinder, thereby, when the crank-end port *p* of one cylinder is open to the space or recess *i'* in the piston, the steam from port *g'* entering said space will have access to the piston-head in the next cylinder. The cylinders Nos. 1, 2, and 3 are connected as just described; but cylinder No. 4 is connected with No. 1 by means of a horizontal passage, *s*, leading from the lower end of its vertical passage *r* to the lower port, *q*, of said cylinder No. 1. All the cylinders being connected, it will be understood the ports *p* and *q* serve alternately for the induction and exhaustion of steam.

A cut-off valve, H, guards the induction or supply port *g'* of each cylinder. In Fig. 1 of the drawings this valve is shown seated, and in this position the steam is cut off from the space or recess *i'* of the piston, and consequently from the next cylinder. A stem, I', is attached to the valve and projects up through a stuffing-box, I^2, in the top of the valve-case

J′, which latter is fluid-tight and is secured to the side of the cylinder. A spiral or other spring, *u*, by pressing slightly on the valve, serves to retain it normally to its seat. A lever, *k′*, has one end pivoted to the side of the cylinder, and is attached to the valve-stem, and a standard, *l*, projects above the top of the valve-case and has a set-screw, *m*, by which the lever, when raised, may be made fast. By means of this lever, therefore, if desired at any time, the cut-off valve may be raised from its seat and fastened up, thereby preventing its action and allowing the induction-port *g′* to remain open during the entire stroke of the piston. The upper part of the valve-case has communication with the inside of the cylinder by means of a duct, *v*. This duct commences on the outer side of the wall of the cylinder on a direct line with the induction-port *g′*, and then deflects or curves to one side in its passage through the wall, as seen in Figs. 1 and 2. By this means it avoids opening on the inner side of the wall on a line direct above the induction-port. Thereby the duct-closer *w* on the piston-head will not cover the induction-port. The duct-closer is a lip rigidly attached to the upper piston-head by screws or bolts *y*, and depends therefrom into the space *i′* between the two heads. This duct-closer bears steam-tight against the inner wall of the cylinder and is adapted to cover the inner opening of the duct *v*.

The cut-off valve is operated without direct or connected mechanical agency, as follows: The valve g^6 being opened, steam will be admitted and will raise the cut-off valve H, the steam entering the space or recess *i′* in the piston. (See Fig. 1.) If the port *p*, leading to the next adjoining cylinder, be open to this space, the steam will enter said next cylinder below its piston. The pressure thereupon exerted will cause the crank-shaft C to turn, and the piston in each cylinder will begin to move. When the piston (see Fig. 1) moves up far enough for the duct-closer *w* to uncover the duct *v*, the steam passing through the duct will enter the valve-case J′ and cause a pressure on top of the valve H, thereby producing an equilibrium of pressure above and below said valve, whereupon by the down-pressing action of the spring *u* the valve will be seated, and thus the steam for the next adjoining cylinder is cut off and the piston therein completes its stroke by the expansive action of the steam.

When the piston in the first cylinder (see Fig. 1) moves down far enough for the duct-closer *w* to cover the opening to duct *v*, the steam will be cut off from the valve-case J′, relieving the pressure above the cut-off valve H, and then the pressure below the said valve will raise it and steam will again be admitted to the space or recess *i′*, and from thence to the next cylinder.

Having described my invention, I claim—

1. The combination of a cut-off valve having a fluid-tight valve-case, J′, and an engine-cylinder having an induction-port which is guarded by the said cut-off valve and provided with a duct, *v*, which communicates with the valve-case above the valve, as set forth.

2. The combination of a cut-off valve having a fluid-tight valve-case, J′, an engine-cylinder having an induction-port which is guarded by the said cut-off valve and provided with a duct, *v*, which communicates with the valve-case above the valve, and a piston in the cylinder having a lip, *w*, for closing the said duct, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. PRICE.

Witnesses:

WM. B. NELSON,

JOHN E. MORRIS.