No. 837,876. PATENTED DEC. 4, 1906.

A. E. NORRIS.

VALVE.

APPLICATION FILED OCT. 13, 1904.

2 SHEETS—SHEET 1.

Fig. 1

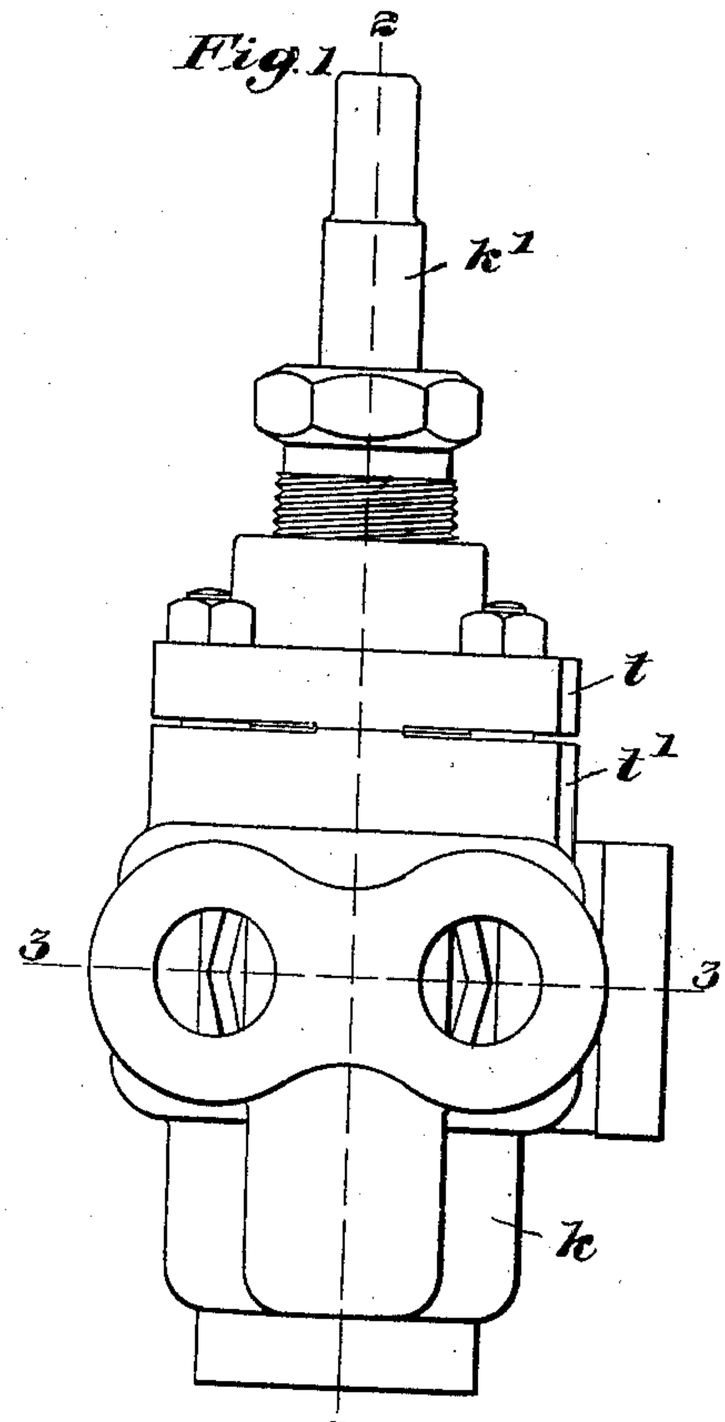



Fig. 2

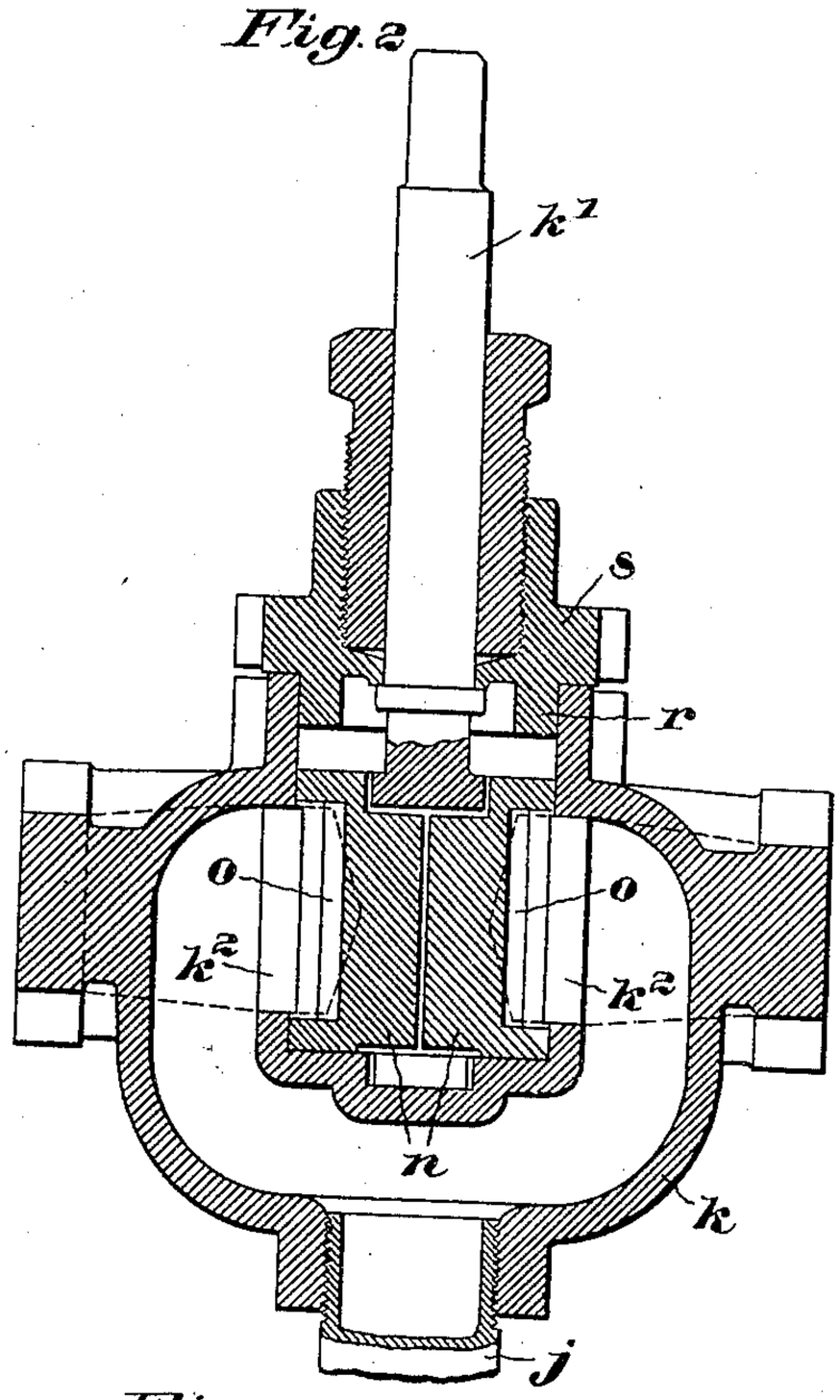



Fig. 3

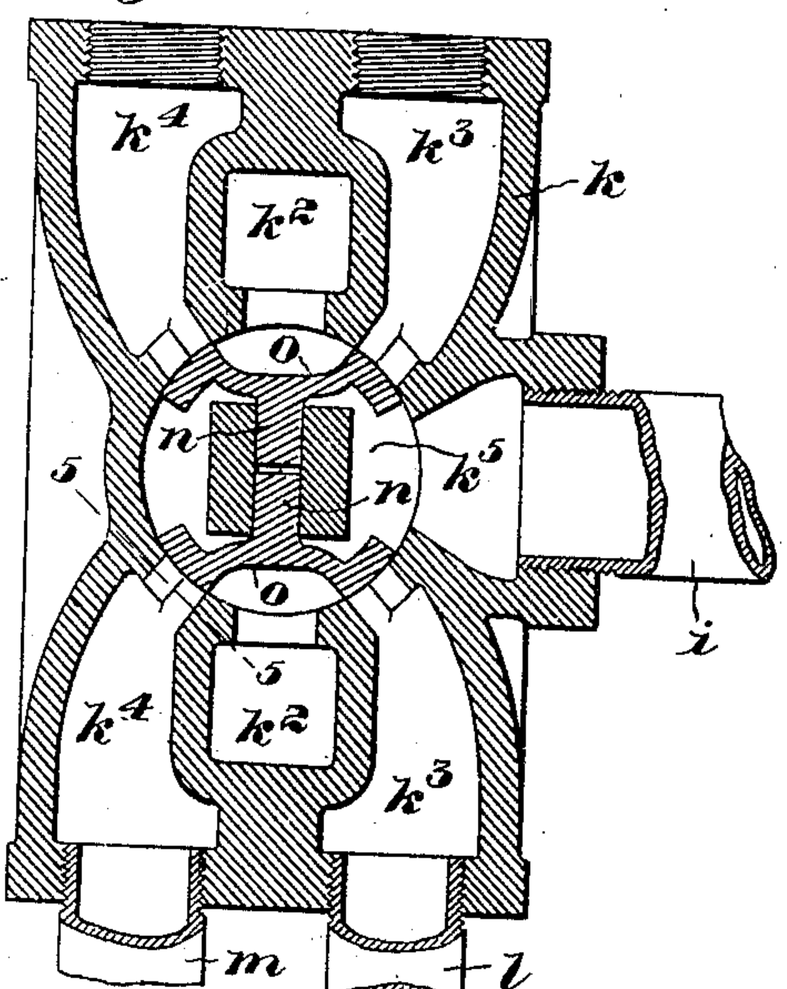



Fig. 4

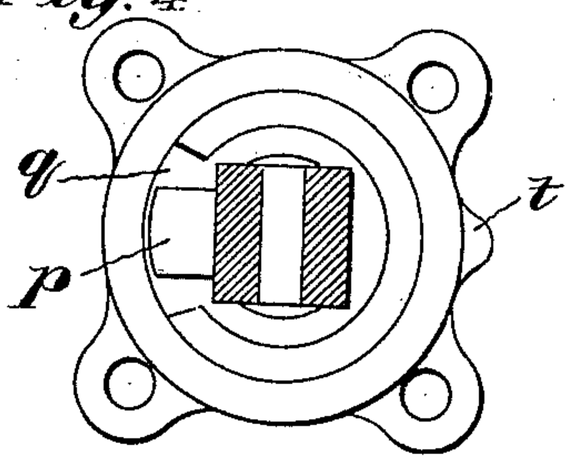
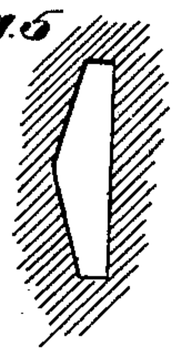



Fig. 5



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2 SHEETS—SHEET 2.

*Fig. 6*

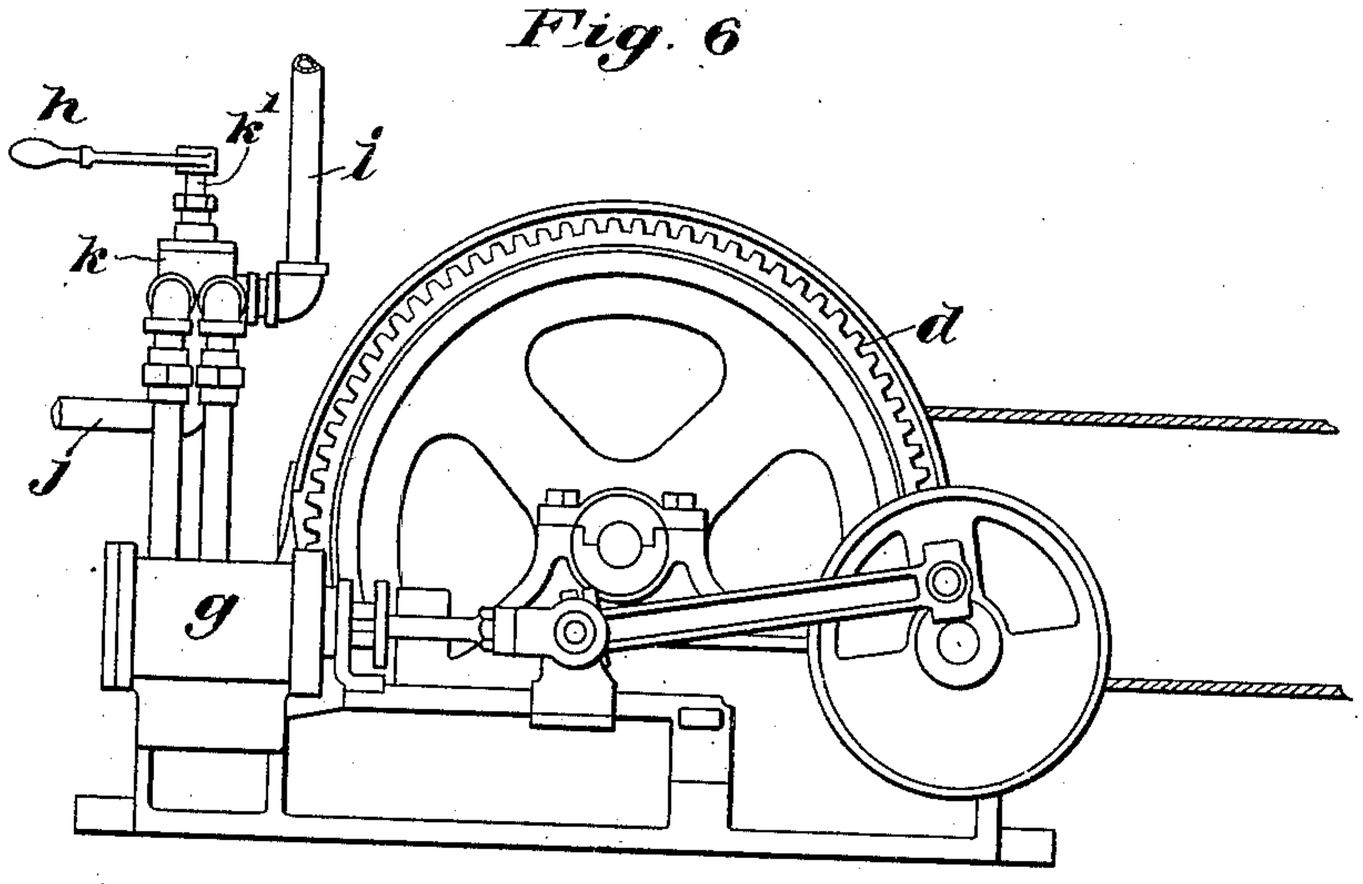
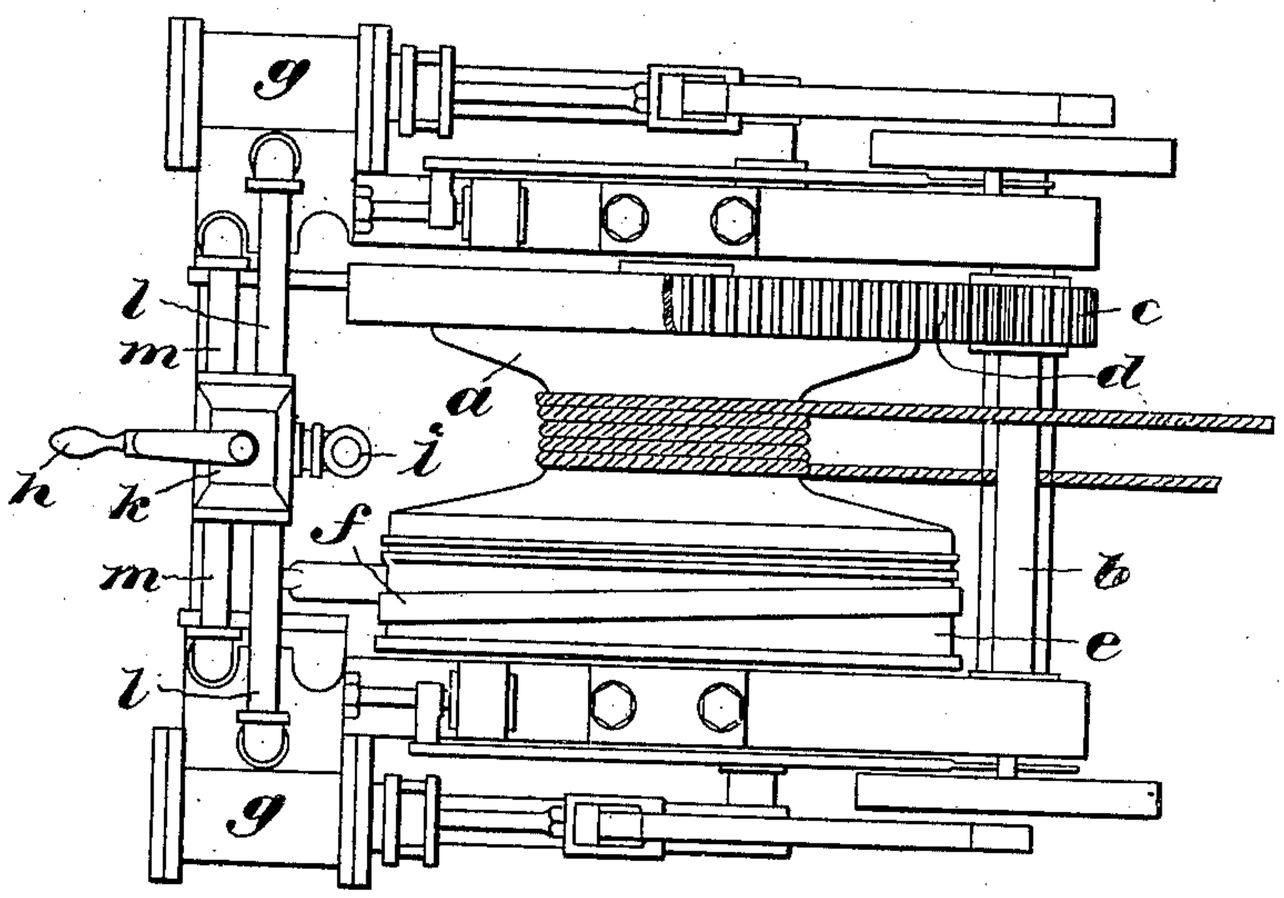



*Fig. 7*

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# UNITED STATES PATENT OFFICE.

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## VALVE.

No. 837,876. Specification of Letters Patent. Patented Dec. 4, 1906.

Original application filed March 5, 1903, Serial No. 146,265. Divided and this application filed October 13, 1904. Serial No. 228,253.

*To all whom it may concern:*

Be it known that I, ALMON E. NORRIS, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Valves, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention consists in improvements in valves, the illustrated embodiment thereof herein described comprising a combined reversing and throttling valve and which is intended particularly for use in connection with drum or winch apparatus for winding and unwinding cables.

My invention will be best understood by reference to the following specification when taken in connection with the accompanying illustration of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a side elevation of one form of valve constructed in accordance with my invention. Fig. 2 is an elevation in section on the line 2 2 in Fig. 1. Fig. 3 is a sectional plan taken on the line 3 3 in Fig. 1. Fig. 4 is a detail showing an inverted plan of the cap for the valve-casing with the valve-spindle in section, the latter, together with the cap, being removed from the casing. Fig. 5 is a detail of the valve-ports shown in section, taken on the line 5 5 in Fig. 3. Fig. 6 shows in elevation the application of the valve illustrated in Figs. 1 to 5 to a rope-winding engine, and Fig. 7 is a plan view of the same.

Referring first to Figs. 6 and 7, the apparatus there shown is one to which the application of my improved valve is accompanied with peculiar advantages. This is a rope-winding apparatus intended particularly for use in controlling the movement of heavy weights—such, for example, as a derrick—and is an apparatus described and shown and representative of a type broadly claimed in my copending application, Serial No. 146,265, of which the present application is a division.

In the use of engines of this description it is desirable to control the load, as by starting it in motion, stopping it, or holding it effectively and quickly, and to this end my improved valve provides the engineer with means for starting and stopping the engine and determining its direction of movement and its rate of speed effectively and efficiently through the use of a single throttle-lever.

Specifically the apparatus shown comprises the rope-winding drum *a*, to which movement is communicated at a reduced speed through the counter-shaft *b*, driving-pinion *c*, driven gear *d*, and a train of planetary gearing, which latter is not herein shown, but which, together with the friction member *e* and the friction-band *f* for resisting sudden changes of movement in the rope-winding drum, are fully disclosed and described in my aforesaid copending application.

The counter-shaft *b* is driven by two directly-connected engines mounted on the opposite sides of the engine bed-plate, these engines, except as to their controlling and valve connections, being of ordinary and usual construction and having similar engine-cylinders *g g*. Midway between the engine-cylinders is arranged the engine throttle-valve provided with an operating-lever *h*, said valve acting also when required to reverse the engines and the winding-drum in the place of the usual reversing-link, which latter is here omitted. Live steam is admitted to the valve through the pipe *i*, and the exhaust is discharged through the pipe *j*. The valve-casing *k*, to which the said inlet and exhaust pipes are connected, is provided at each end with two outlets, to which are connected, respectively, the pipes *l* and *m*, leading to the steam-chest of the engine-cylinder at that particular side of the valve.

Each engine-valve is provided with a usual piston or other valve device of well-known construction, whereby when steam is admitted, say, at the ends of the valve the engine will operate in one direction and when admitted, say, at the middle of the valve the engine will operate in a reverse direction. Consequently one of these pipes, as *m*, leads to the outside or ends of the valve and the other, as *l*, to the inside or middle of the valve, so that if steam be admitted through the pipes *l m* to the respective cylinders the engines will operate in one direction, and if steam be admitted through pipes *m l* to the same cylinders the engines will operate in a reverse direction, the live steam and exhaust in each case entering and leaving through the pipes *i* and *j*.

The valve-stem *k'*, to the projecting end of which is secured the operating-lever *h*, has its opposite end within the valve-casing *k* slotted diametrically to receive the rectangular

lugs *n* of two oppositely-facing D-valves *o*, which are therefore rotatable with the valve-stem, but radially movable on and relative to the same.

Referring particularly to Fig. 3, exhaust-ports $k^2$ $k^2$ are provided, connected, as shown in Fig. 2, with the exhaust-pipe *j* and located between ports $k^3$ $k^3$ and $k^4$ $k^4$, which latter are connected, respectively, with the pipes *l* and *m*. The inlet-pipe *i* being connected to the valve-casing, as shown in Fig. 3, live steam fills the space $k^5$ about and back of the D-valves *o o*, so that as the throttle-valve stem is turned in one or the other direction it will cause the D-valves to be positioned to admit live steam to one of the ports $k^3$ or $k^4$ and place the other of said ports in communication with the exhaust, and the particular port $k^3$ or $k^4$, with its pipe *l* or *m*, through which live steam is admitted, determines, of course, the direction and operation of the engine. The derrick when swinging may thus be quickly stopped by reversal of the engine, the frictionally-held member *e* taking up any resultant shock.

I have found it highly desirable, and particularly in this type of throttle-reversing valve, to cause a rapid accelerated exhaust and a relatively slow and gradual admission as the throttle is opened in one direction or the other and a prolonged exhaust relatively to the admission as the throttle is closed. For this purpose I have made the ports of the shape best shown in Fig. 5, one side of the port—namely, that nearest the exhaust-port—being straight to conform to the valve edge and the opposite side nearest the live-steam space being cut away in the shape of an obtuse angle. When the valve is turned, therefore, to start the engine in one direction or the other, that port which is thereby connected with the exhaust presents immediately its full length to the exhaust-space, while the remaining port, which is opened to the live-steam space, presents to the steam at first a very restricted admission area, gradually increasing until the full length of the port is available. Even when fully opened, however, the admission area is but a fractional part of the exhaust area, in the valve illustrated being two-thirds or three-quarters of the latter. This feature of my valve is of great advantage where heavy loads are to be started or stopped, for it provides for the very gradual application of power and insures the absence of back pressure in the engine-cylinder.

In the throttle the valves *o o* are free to move radially in the holding-slot of the throttling-stem, thus permitting the steam-pressure within the throttle-casing to maintain said valves tightly pressed against their respective seats, precisely as with the ordinary slide-valve of a steam-engine. This eliminates all the difficulties, of which the sticking of the valve is one, which result from the use of a valve in the form of a taper core. With the construction here shown the valve always operates easily, yet remains under all conditions perfectly tight. In fact, it wears itself to a tight fit.

In order to insure the movement of the valves within properly-restricted limits, I have provided a stop for this purpose, such stop comprising a lug *p*, secured to or formed upon the valve-stem *k'* and adapted when the valve parts are assembled to move between the walls of a cut-away portion *q*, formed in the inturned flange *r* of the valve-cap *s*. To insure that the valve parts will be assembled properly, I have also provided the cap with a projection *t*, adapted to register with a like projection *t'*, Fig. 1, when the valves, valve-stem, casing, and cap are properly assembled.

In the particular application of my invention herein it would be possible to employ a single valve *o* and a single pair of ports $k^3$ and $k^4$ and pipes *l* and *m*, the latter being connected by branched connections to the separate cylinders of the two engines. I have here employed two valves and two pairs of ports and pipes, since in combination with the winding apparatus it simplifies piping and arrangement. It will of course be obvious that these and many other changes in and variations from the described embodiment of my invention may be made within wide limits without departing from the spirit and scope thereof.

I claim—

1. A throttle-reversing valve comprising a valve-casing having a steam-inlet, a valve-seat into which the steam-inlet opens and ported to communicate with the opposite ends of an engine-cylinder, an exhaust-passage, said ports being shaped to cause a relatively slow and gradual admission and rapid accelerated exhaust as the throttle is opened in one direction or the other and a prolonged exhaust relative to the admission as the throttle is closed, and a movable valve arranged in said valve-seat, a valve-stem operatively connected with said valve and by which it is adapted to be moved to open and close the several ports, said movable valve being adapted to be impinged upon by the steam-pressure within the throttle-casing and being mounted for movement relative to said valve-stem, whereby said valve is steam-seated.

2. A throttle-reversing valve comprising a valve-casing having a steam-inlet, a cylindrical valve-seat into which the steam-inlet opens and ported to communicate with the opposite ends of an engine-cylinder, an exhaust between said engine-ports, said ports being shaped to cause relatively slow and gradual admission and rapid, accelerated exhaust as the throttle is opened in one direction or the other and a prolonged exhaust

relative to the admission as the throttle is closed, and a rotatable valve arranged in said cylindrical valve-seat, a throttle-valve stem operatively connected with said valve and by which it is adapted to be moved to open and close the several ports, said rotatable valve being adapted to move radially with respect to its axis of rotation and that of the throttle-valve stem and being positioned and mounted relative to the throttling-valve stem so as to be impinged upon by the steam-pressure within the throttle-casing, whereby said valve is steam-seated.

3. A throttle-reversing valve comprising a valve-casing having a steam-inlet, a cylindrical valve-seat into which the steam-inlet opens and ported to communicate with the opposite ends of an engine-cylinder, an exhaust between said engine-ports, said ports being shaped to cause a relatively slow and gradual admission and rapid accelerated exhaust as the throttle is opened in one direction or the other and a prolonged exhaust relative to the admission as the throttle is closed, a rotatable valve arranged in said valve-seat and having a projecting throttling-valve-stem-engaging member, a throttling-valve stem having a slotted portion adapted to be engaged by said member upon the rotatable stem, whereby the valve may be moved to open and close the several ports, said valve being adapted to move radially with respect to its axis of rotation and that of the throttling-valve stem and being positioned and mounted relative to the throttling-valve stem, so as to be impinged upon by the steam-pressure within the throttle-casing, whereby said valve is steam-seated.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALMON E. NORRIS.

Witnesses:
THOMAS B. BOOTH,
EVERETT S. EMERY.