(Model.)

4 Sheets—Sheet 1.

C. A. CARLSON.

VALVE FOR STEAM ENGINES.

No. 326,398. Patented Sept. 15, 1885.

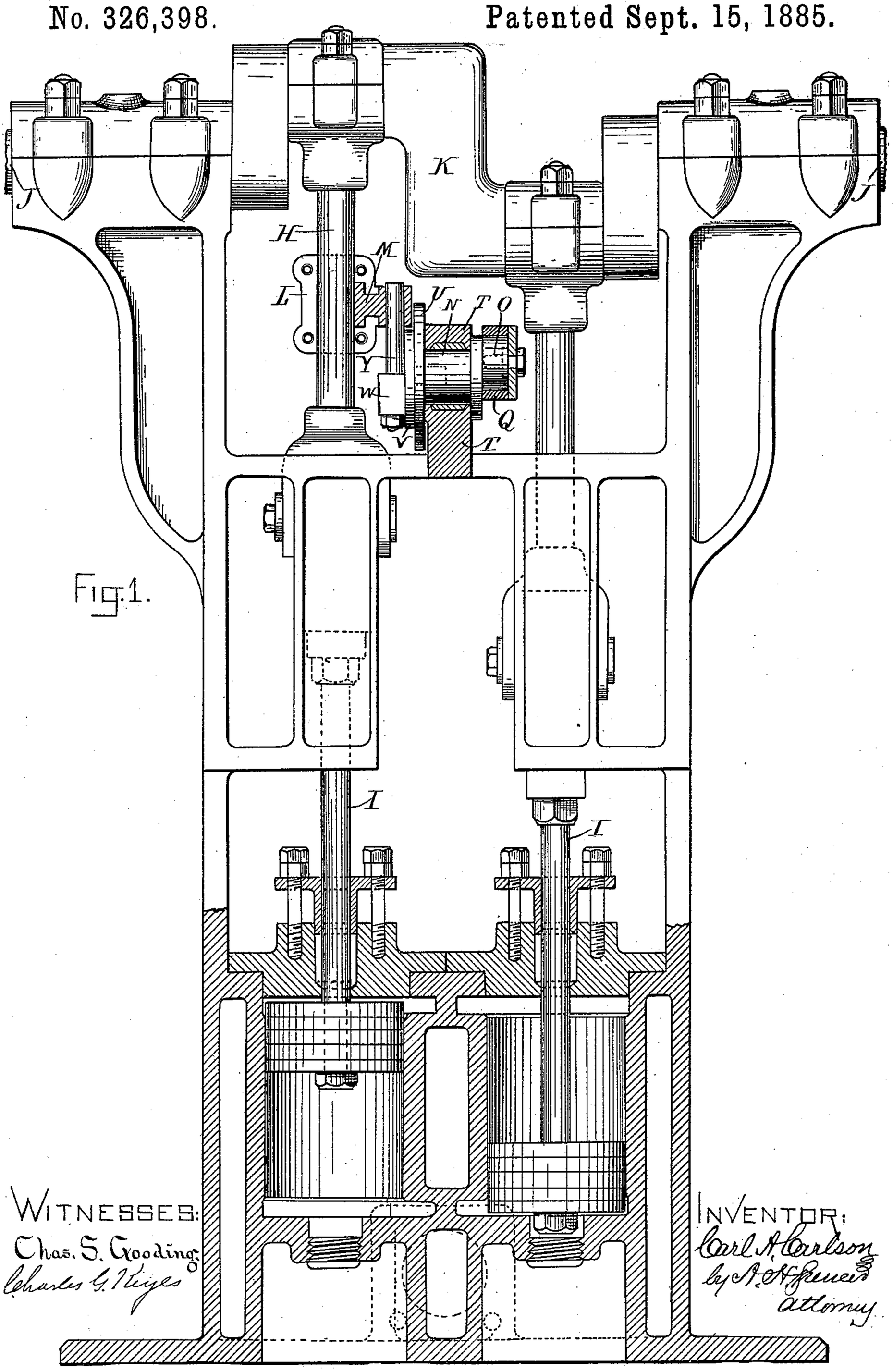

Fig. 1.

WITNESSES:
Chas. S. Gooding.
Charles G. Keyes

INVENTOR:
Carl A. Carlson
by A. H. Spencer
attorney

(Model.)

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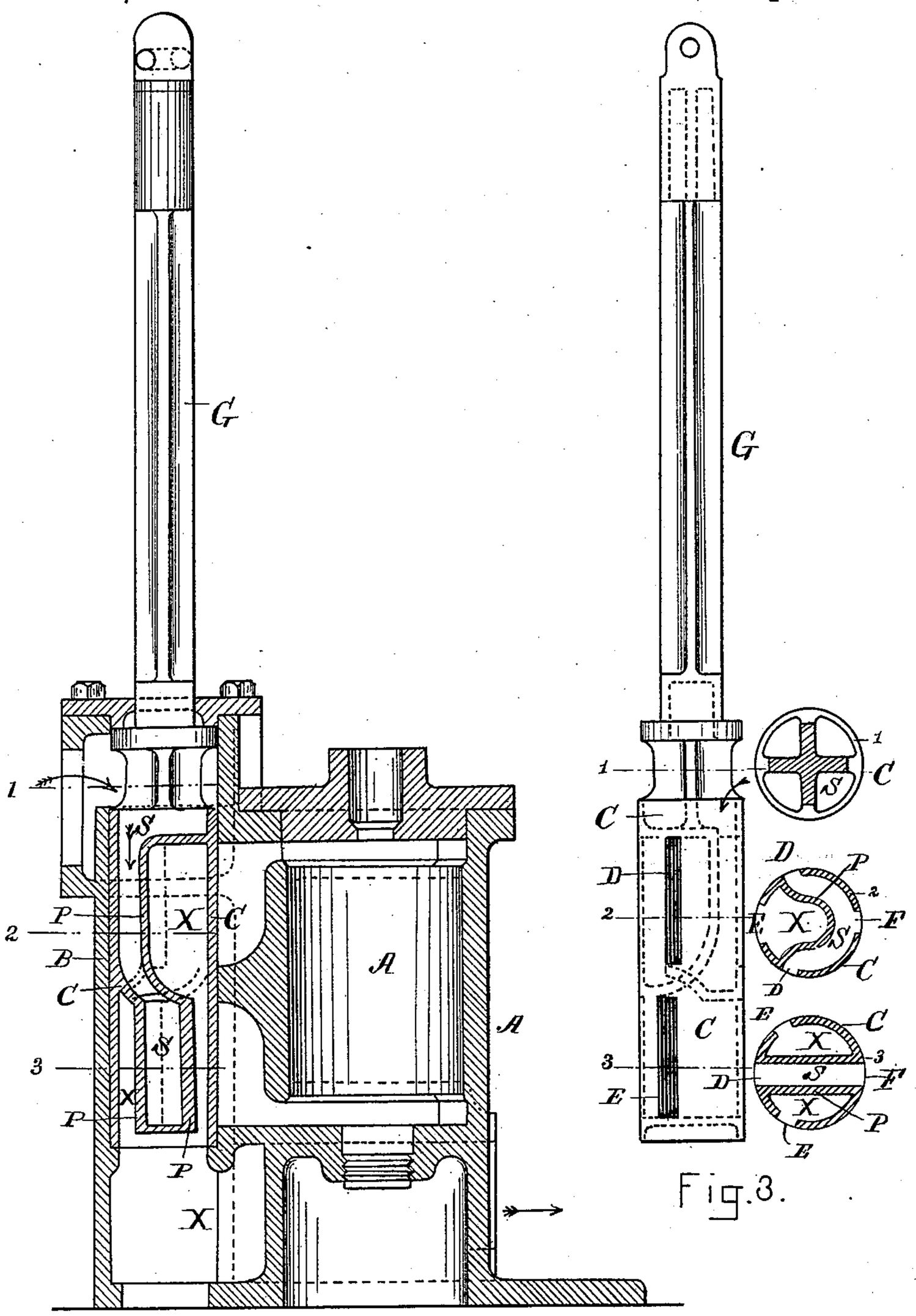

Fig. 2.

Fig. 3.

WITNESSES:

Chas. S. Grooding.

Charles G. Keyes

INVENTOR

Carl A. Carlson

by A. F. Pruce & atty

(Model.) 4 Sheets—Sheet 3.

C. A. CARLSON.

VALVE FOR STEAM ENGINES.

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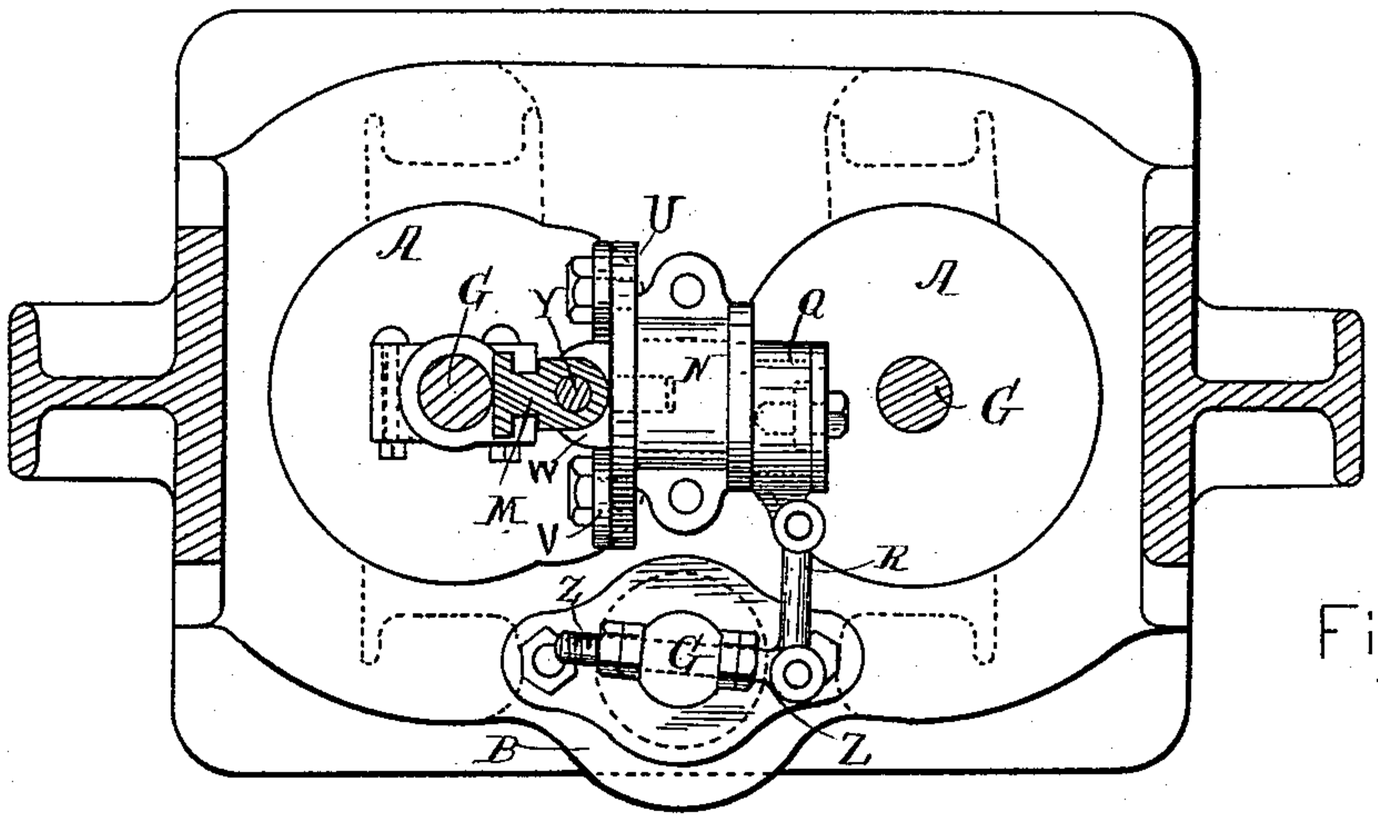

Fig. 4.

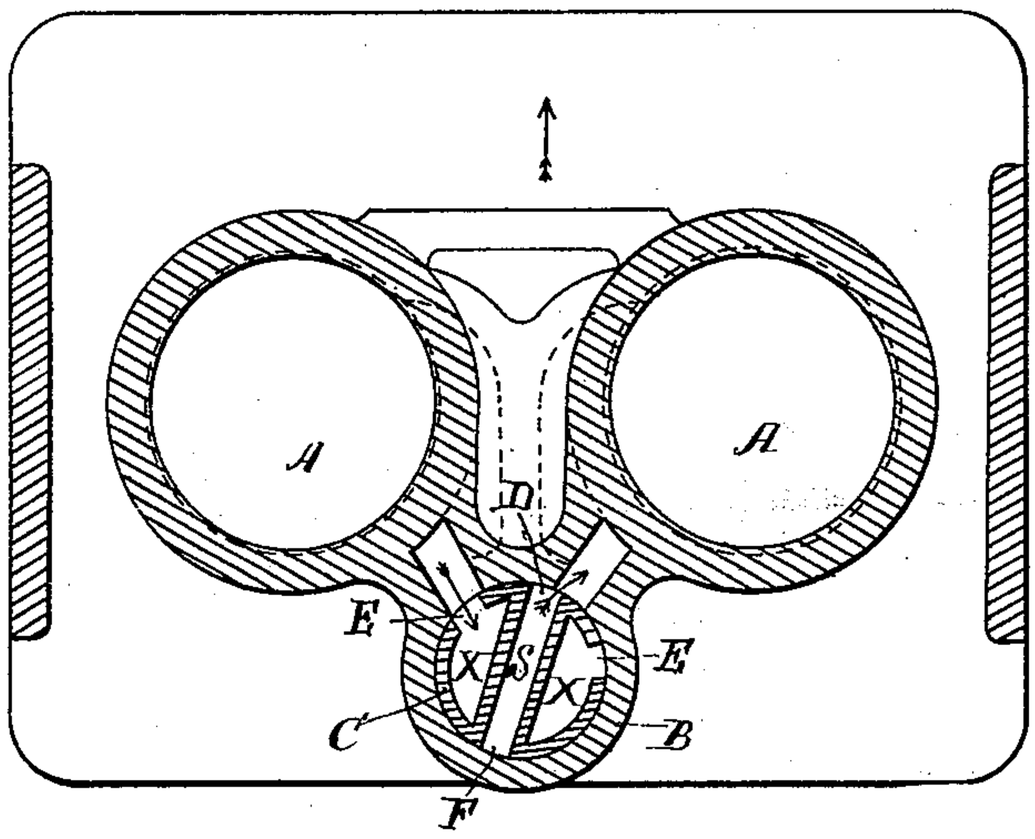

Fig. 5.

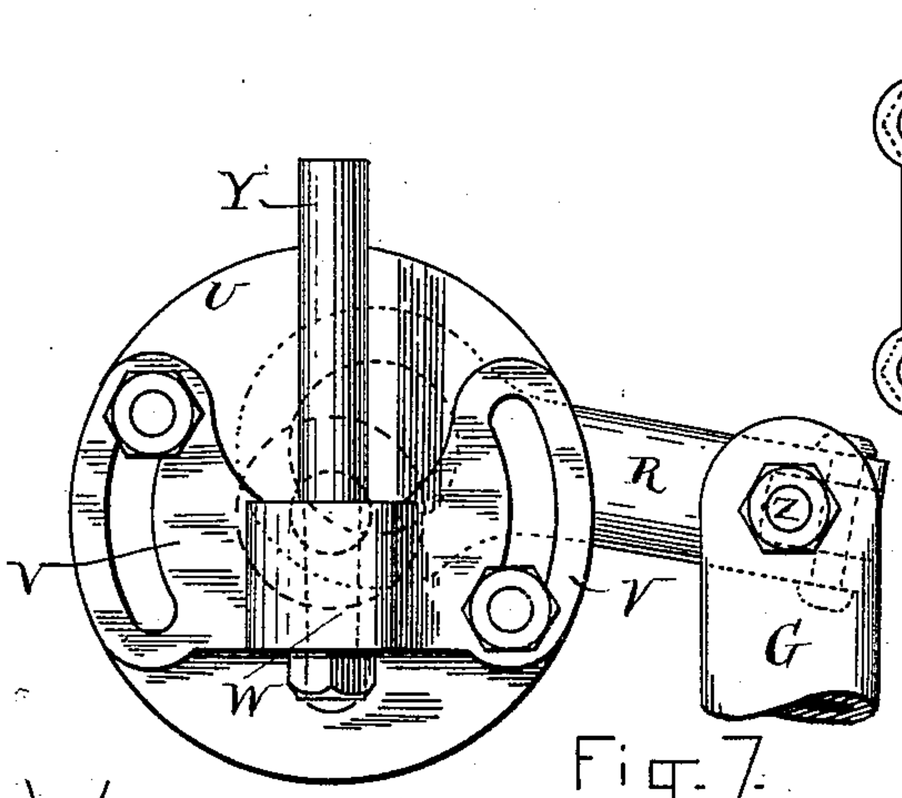

Fig. 7.

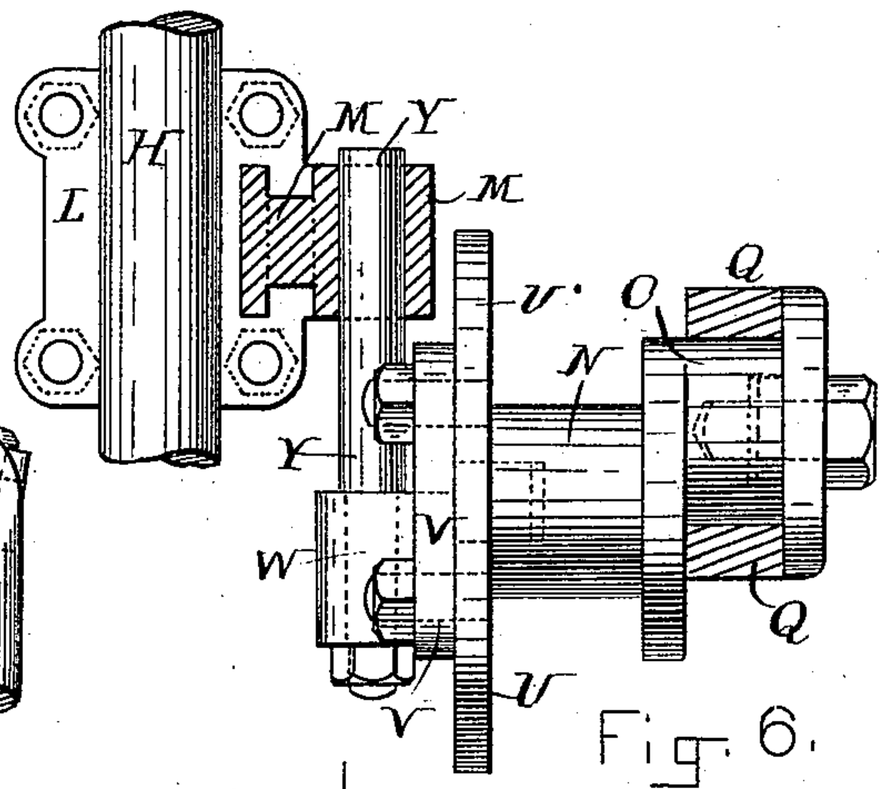

Fig. 6.

WITNESSES:
Chas. S. Gooding.
Charles G. Keyes

INVENTOR:
Carl A. Carlson
by A. H. Spencer atty

(Model.) 4 Sheets—Sheet 4.

C. A. CARLSON.

VALVE FOR STEAM ENGINES.

No. 326,398. Patented Sept. 15, 1885.

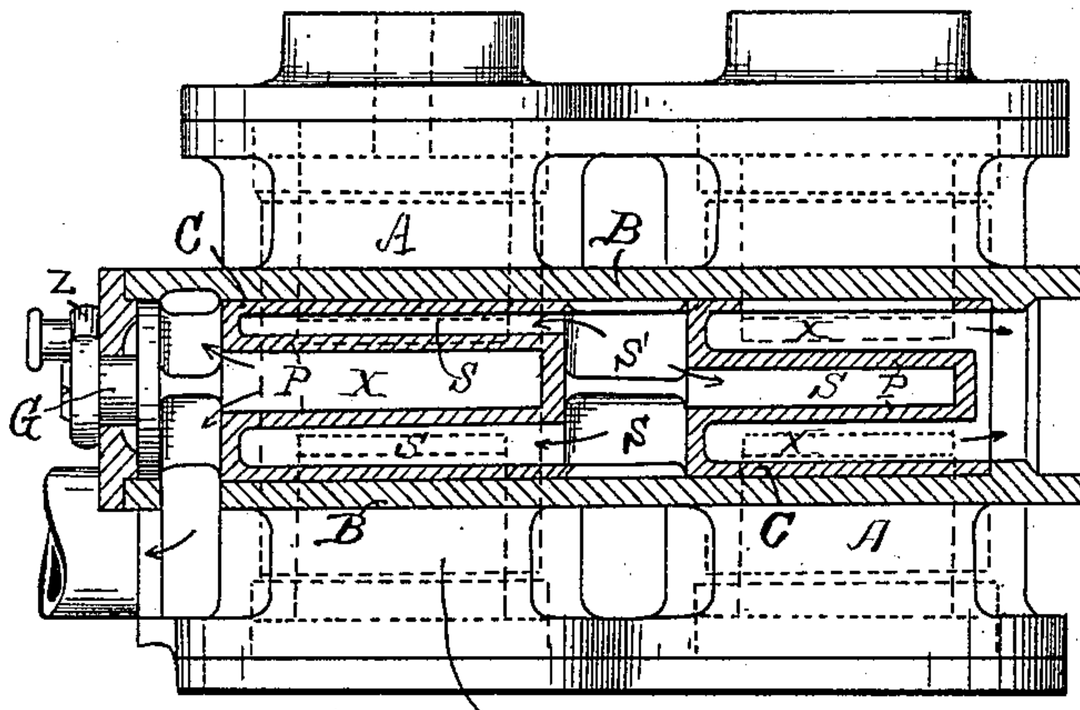

Fig. 8

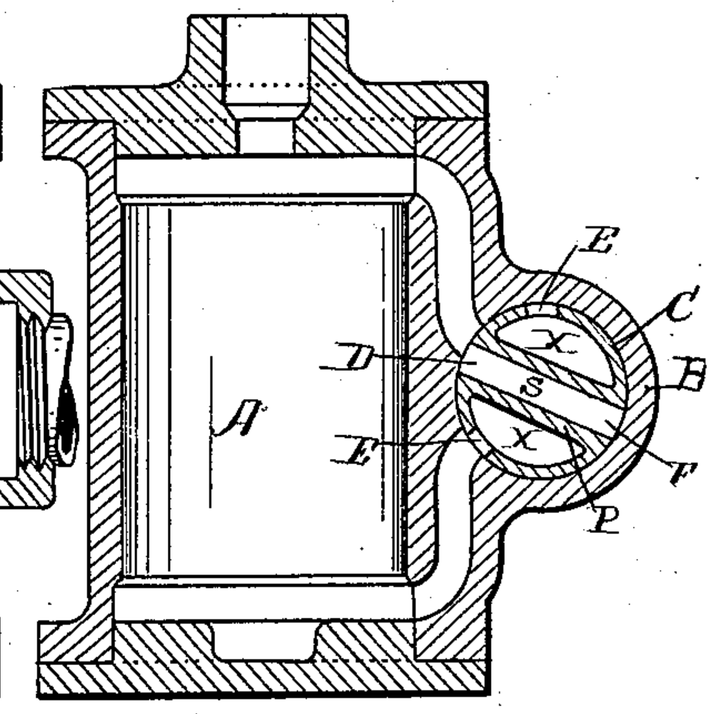

Fig. 9

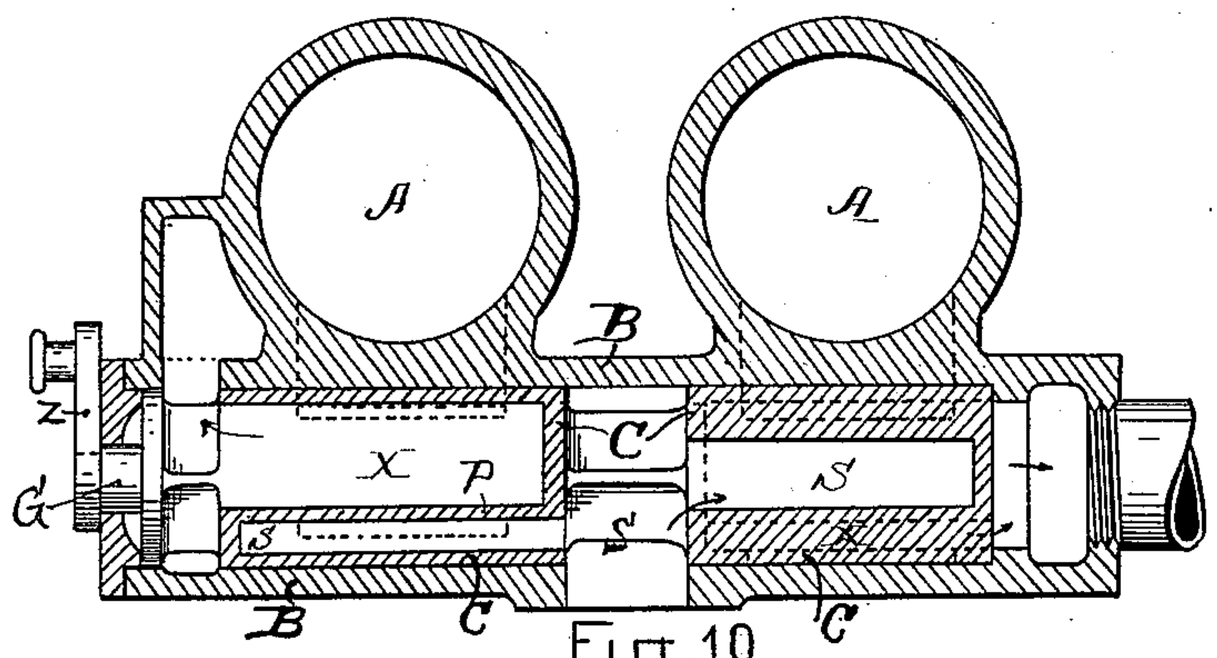

Fig. 10

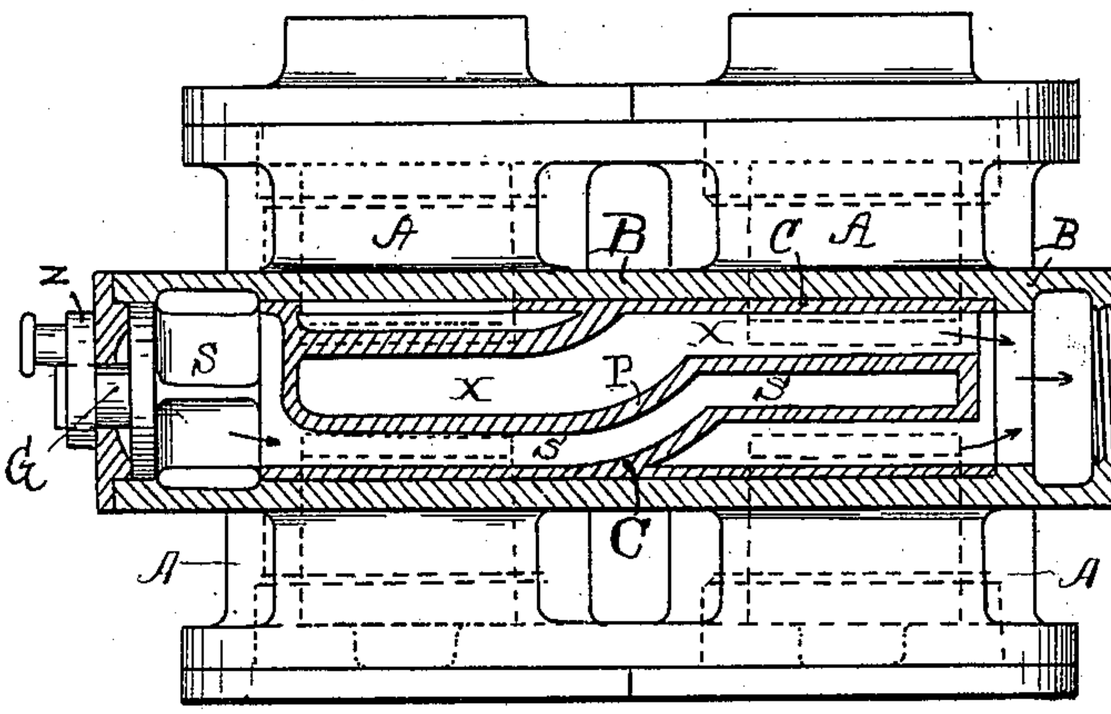

Fig. 11.

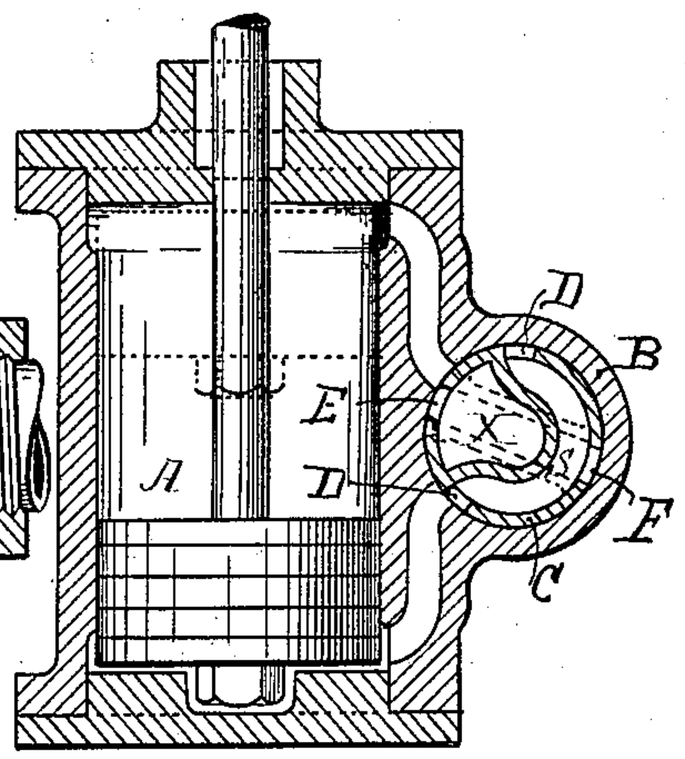

Fig. 12.

WITNESSES.
Chas. S. Gooding.
E. A. Phelps.

INVENTOR.
Carl A. Carlson,
by A. A. Spencer
attorney

UNITED STATES PATENT OFFICE.

CARL A. CARLSON OF BOSTON, MASSACHUSETTS.

VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 326,393, dated September 15, 1885.

Application filed March 28, 1885. (Model.)

To all whom it may concern:

Be it known that I, CARL A. CARLSON, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Valves for Steam-Engines, of which the following is a specification.

This invention relates to valves for steam-engine cylinders, to a single valve supplying steam to two cylinders, and to a peculiar combination of devices for giving motion to such valves.

My improved valve serves as a steam-chest—that is, the steam passes lengthwise through it in passages formed for both the live steam and the exhaust. A limited oscillating motion about its axis is given to the valve, so as to open alternately the ports for the live and the exhaust steam. A peculiarity of the valve-motion is that it is derived from a crank and eccentric connection with the connecting-rod at a point intermediate between its ends, which point moves in an ellipse, and the arrangement is such that the steam-ports close suddenly to cut off the steam at the desired point in the stroke, provision being made for adjustment in this respect. The valve is thoroughly counterbalanced, so as to run with very little friction.

My invention is illustrated as applied to an upright double-cylinder engine, for which it is especially fitted, each cylinder receiving steam at its opposite ends alternately, through the valve common to both, which valve, for the purpose, is oscillated in a short arc about its axis. It is, however, obvious that the cylders may equally well be horizontal, and that my invention is applicable to ordinary single-cylinder engines, and I have contemplated working slide-valves by an attachment to the connecting-rod.

In the drawings, Figure 1 is an elevation of an upright engine provided with my improvement, the cylinders and valve-gear in vertical section. Fig. 2 is a vertical section through one cylinder and the valve, taken on the line *b*, Fig. 5. Fig. 3 is an elevation and three transverse sections of the oscillating valve. Fig. 4 is a plan of the cylinders and valve-gear, the frame in section on line *c*, Fig. 1. Fig. 5 is a horizontal section of the cylinders and valve on line *d*, Fig. 2. Figs. 6 and 7 are details of suitable valve-gear. Figs. 8 to 12 are sectional views showing the valve-chamber and inclosed valve arranged crosswise of the cylinders, Figs. 8 and 10 representing the steam-inlet as midway of the valve-chamber, and an outlet at each end thereof.

A A represent the steam-cylinders, and B the valve-chamber, the walls of which are cast in one with those of the cylinders, as best shown in Figs. 5 and 10.

C is the valve, externally cylindrical to fit snugly within the chamber B, in which it is arranged to have a slight oscillating or reciprocating rotary motion, sufficient to open and close the ports and admit steam at the opposite ends of the cylinders alternately.

G is the valve-stem, a continuation of the valve by means of which it is oscillated.

The valve C is cast hollow, having within it a channel, S, for live steam, and one or more passages, X, for the exhaust-steam, both formed by coring in a manner well known, leaving thin partitions P between them, and an external shell, through which the ports D E are formed. The valve-channels are not of uniform shape throughout.

Figs. 2, 3, and 5 show the positions of the partitions at the several section-points 1, 2, and 3. The steam enters the valve-chamber from the boiler, as indicated by the arrow in Figs. 2 and 11, and passes into the valve through the openings shown in the upper section, 1. The live-steam channel S extends thence in a crescent form around the interior of the valve, to bring the ports D D (formed at the opposite ends of the crescent) into position to supply steam from this one channel to the upper end of each cylinder alternately as the valve oscillates. Midway of its length this live-steam channel changes from the marginal crescent form of section 2 to the central straight form of the lower section, 3, so that at the instant steam is supplied from the crescent portion of the channel to the upper end of one cylinder it is supplied from the straight portion of the same channel to the lower end of the other cylinder, to cause their pistons to reciprocate in opposite directions simultaneously.

During the advance of each piston the valve oscillates, bringing its ports into position to admit live steam to the other end of each cylinder, so as to force the pistons back again;

and these oscillating movements also open the exhaust-ports E at the proper instant. The exhaust-passages X are shown in the sections Figs. 2, 3, and 5 as varying in position to correspond with those formed for the live steam. Thus at the section 2 the exhaust-passage X is seen between the ports formed at the extremities of the crescent-shaped live-steam space; and at the lower section, 3, the single live-steam port D is between the two ports E, as the steam-space S is between the two branches X of the exhaust-passage. These changes of shape and position are to enable the single oscillating valve to supply live steam to the two cylinders through two ports at one end and one at the other end, and to receive the exhaust-steam from both cylinders through one port at one end and two ports at the other.

Figs. 8 and 10 show the same general construction, except that the steam is admitted midway of the valve, and, passing thence to right and left, enters the cylinders, as in Figs. 10 and 12, and the exhaust-steam emerges from each end of the valve. These figures illustrate the application of my invention to single-cylinder engines, either of the cylinders shown in Figs. 8 and 10 being supplied through one-half of the valve.

The valve oscillates with great ease, being perfectly counterbalanced, so that no inequality of pressure in its chamber shall interfere with its proper action. This is illustrated in the sectional views, Figs. 3 and 5. The steam-ports D D, (section 2,) opening through the shell of the valve, would force the valve powerfully against the opposite walls of its chamber. I however form an opening, F, of equal area between the ports D D, so that pressure against the walls is equalized. So at section 3 the single port D is counterbalanced by a like opening, F, through the valve and against the wall of its chamber.

H is the connecting-rod through which the reciprocating movement of the piston-rod I is converted into the rotary motion of the shaft J by means of the crank K.

At a point about midway of its length I secure to the connecting-rod a device for actuating the valve C, and to avoid weakening the rod by drilling through it, I prefer the novel construction indicated in Figs. 1, 6, and 7, although not limiting my general claim thereto. A clamp, L, made in two parts, is bolted fast to the rod H, and a wrist-pin, M, is fitted in a recess formed between the parts of the clamp so as to revolve therein. This wrist-pin moves in an ellipse, and by my devices this movement gives rotation to a short shaft, N, carrying an eccentric, O, which, by its strap Q and rod R, oscillates the valve C through the prolonged valve-stem G. The short shaft N is mounted for rotation in a suitable bracket or standard, T, and has at its end a collar, U, bearing a slotted plate, V, secured to the collar by screw-bolts passing through the curved slots, so that said plate is adjustable on the collar about the axis of the shaft N to provide for reversing the engine and adjusting the cut-off. (See Figs. 6 and 7.) This adjustable plate has a hub, W, from which an arm, Y, projects, passing through and working freely in the head of the wrist-pin M. The arm Y is therefore a crank for the rotary shaft N, and the wrist-pin, (moving elliptically around the axis of said shaft,) engages with the arm at a constantly-varying point, the arm reciprocating through the head of the wrist-pin in its movements.

Instead of the cylindrical arm Y working in a hole in the rotary wrist-pin, I sometimes employ a slotted arm with a solid pin working in the slot to give the sliding connection desired.

The upper end of the valve-stem has an arm, Z, projecting from it at about a right angle and connected at a similar angle to the eccentric-rod R. (See Fig. 7.) This rod R is suitably jointed to its strap and to the arm Z, so as to permit it a swinging movement when the rotation of the eccentric O oscillates the valve; or, if preferred, the arm Z and rod R may have a slot-and-pin connection.

In Figs. 8, 10, and 11 the valve is oscillated by an arm, Z, attached to the shortened stem G of the valve and adapted to be actuated from the connecting-rod or an eccentric on the main shaft.

I do not claim as of my invention the general design nor the detail features of the engine proper herein shown; nor do I limit the application of my invention to engines of this type; but

I claim as my invention—

1. The oscillating steam-valve C, having the longitudinal partition P and steam-passages S X, and provided with the ports D E, substantially as set forth.

2. The oscillating valve C, having steam-passages S X and ports D E, and provided with the prolonged stem G, in combination with the connecting-rod H and means for oscillating the valve and its stem therefrom, substantially as set forth.

3. The combination of two steam-cylinders having reciprocating pistons therein with a single oscillating valve, C, through which all the steam passes longitudinally, said valve having the lengthwise partition P, and at each end the ports D E, adapted to supply steam to both said cylinders simultaneously, substantially as set forth.

4. The cylinders A A and cylindrical valve-chamber B, cast integral with each other, in combination with the oscillating valve C, herein described, actuated from the connecting-rod to supply steam to both cylinders, substantially as set forth.

5. The oscillating valve C, cast hollow, with the partition P, separating its channels for live steam and exhaust steam, as described, the live-steam channel having two ports in its upper portion and one only in its lower part, and the exhaust-passage having one port only in

its upper part and two in its lower, substantially as and for the purpose set forth.

6. The combination of a steam-cylinder with a steam-valve actuated from the connecting-rod of the engine under an arrangement such as described, whereby from the middle of said rod a shaft is rotated to actuate said valve, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 25th day of March, 1885.

CARL A. CARLSON.

Witnesses:
A. H. SPENCER,
E. A. PHELPS.