

(No Model.)

P. JENNINGS.
VALVE GEAR.

No. 555,955.

Patented Mar. 10, 1896.

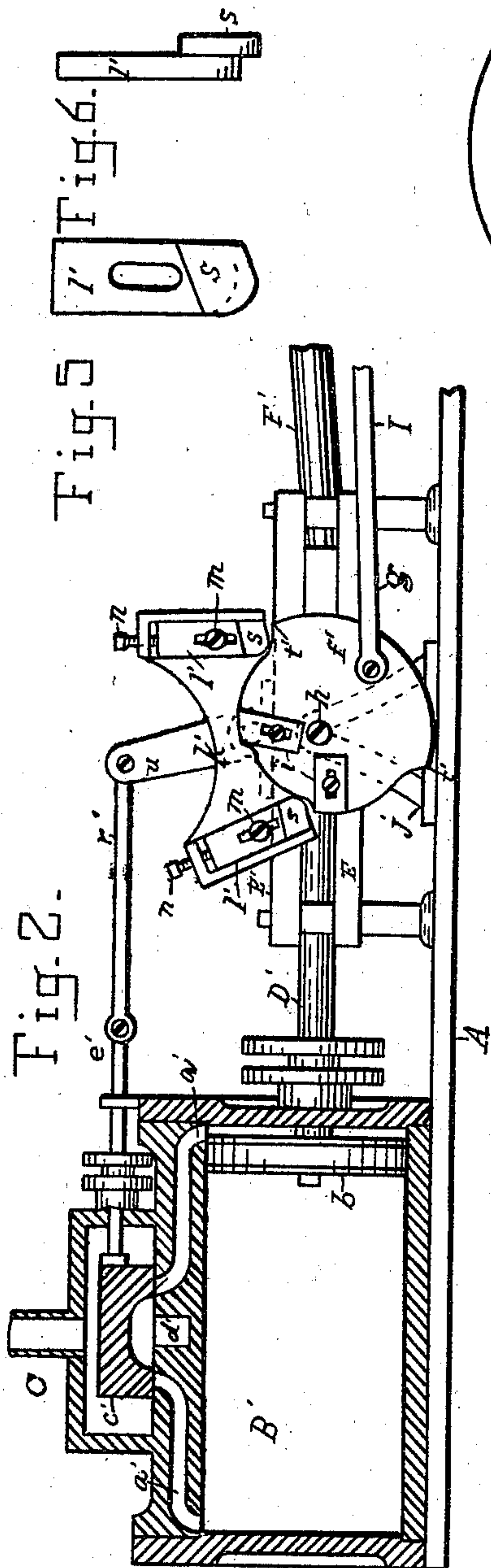


Fig. 2.

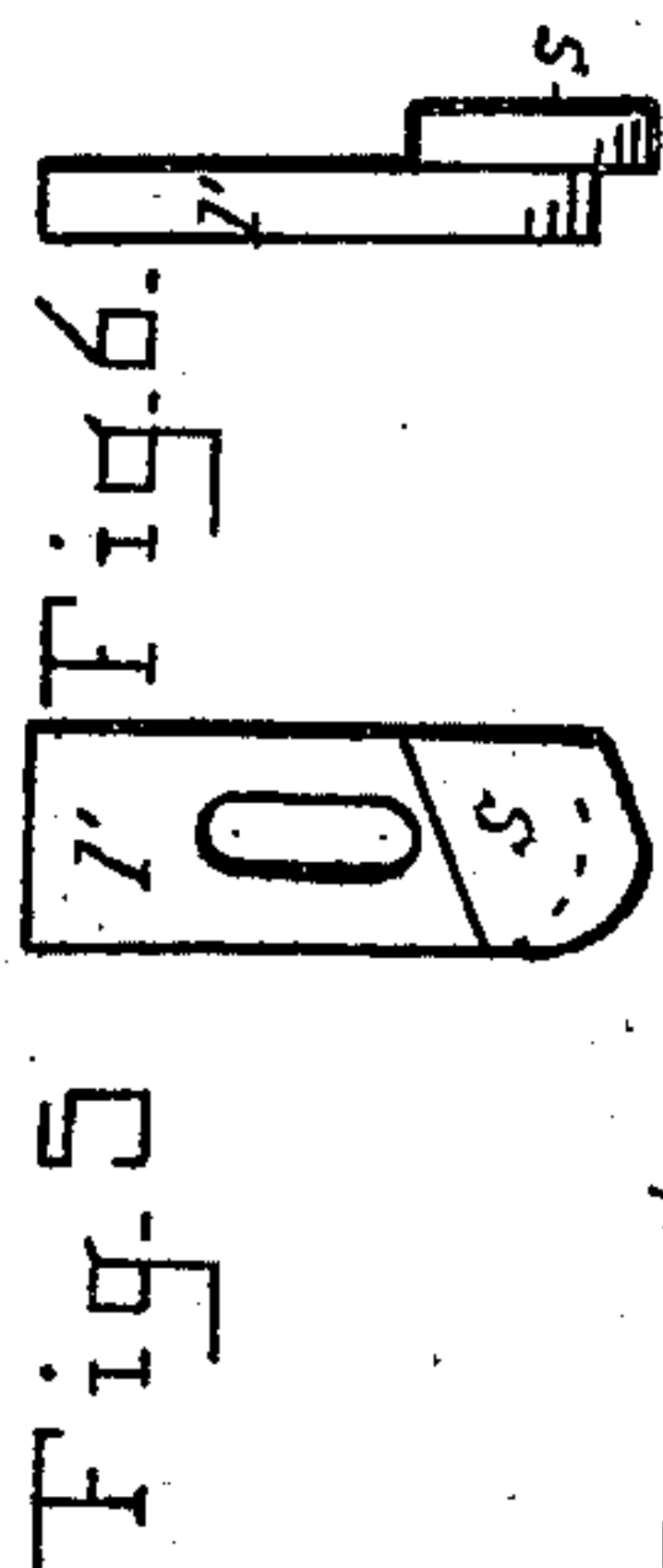


Fig. 5.

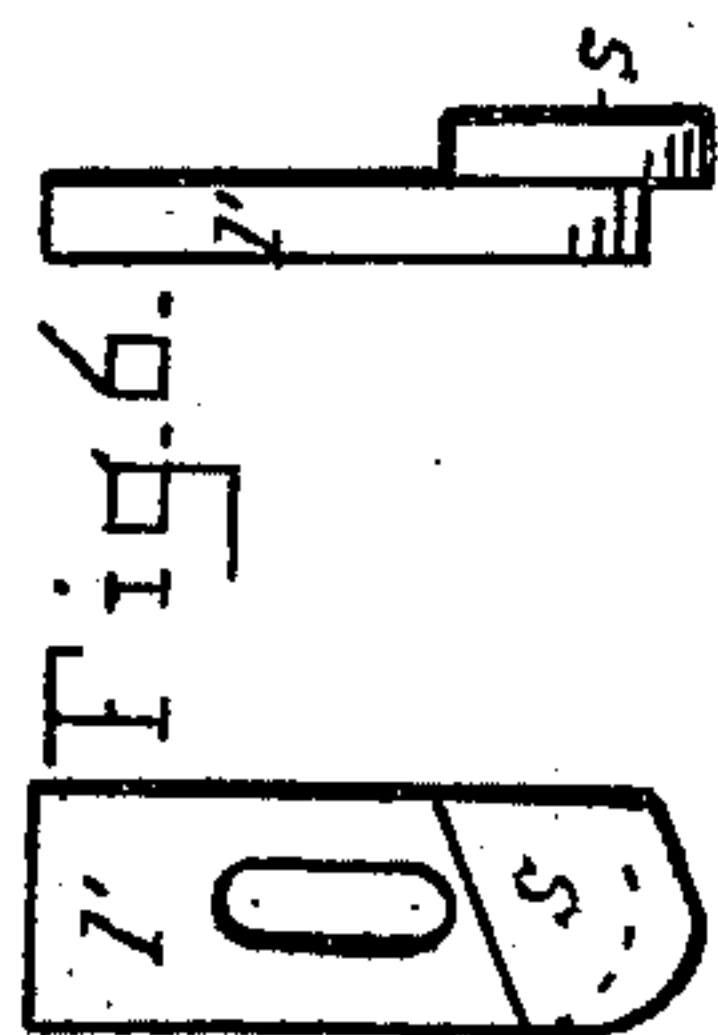


Fig. 6.

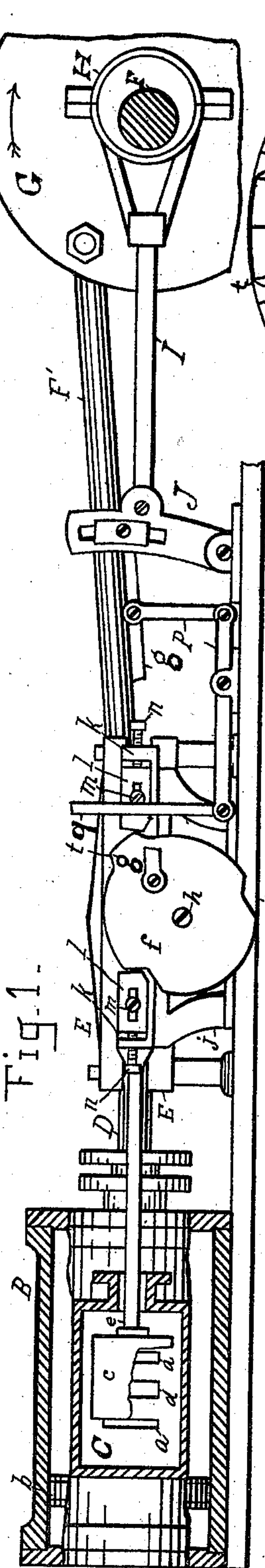


Fig. 1.

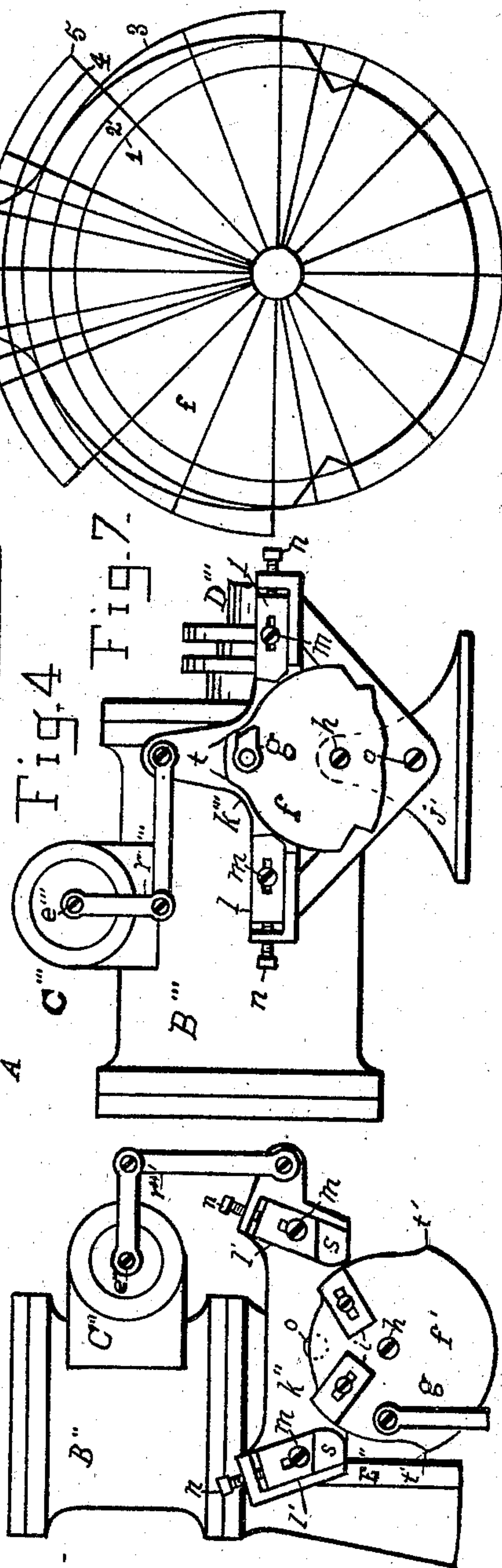


Fig. 3.

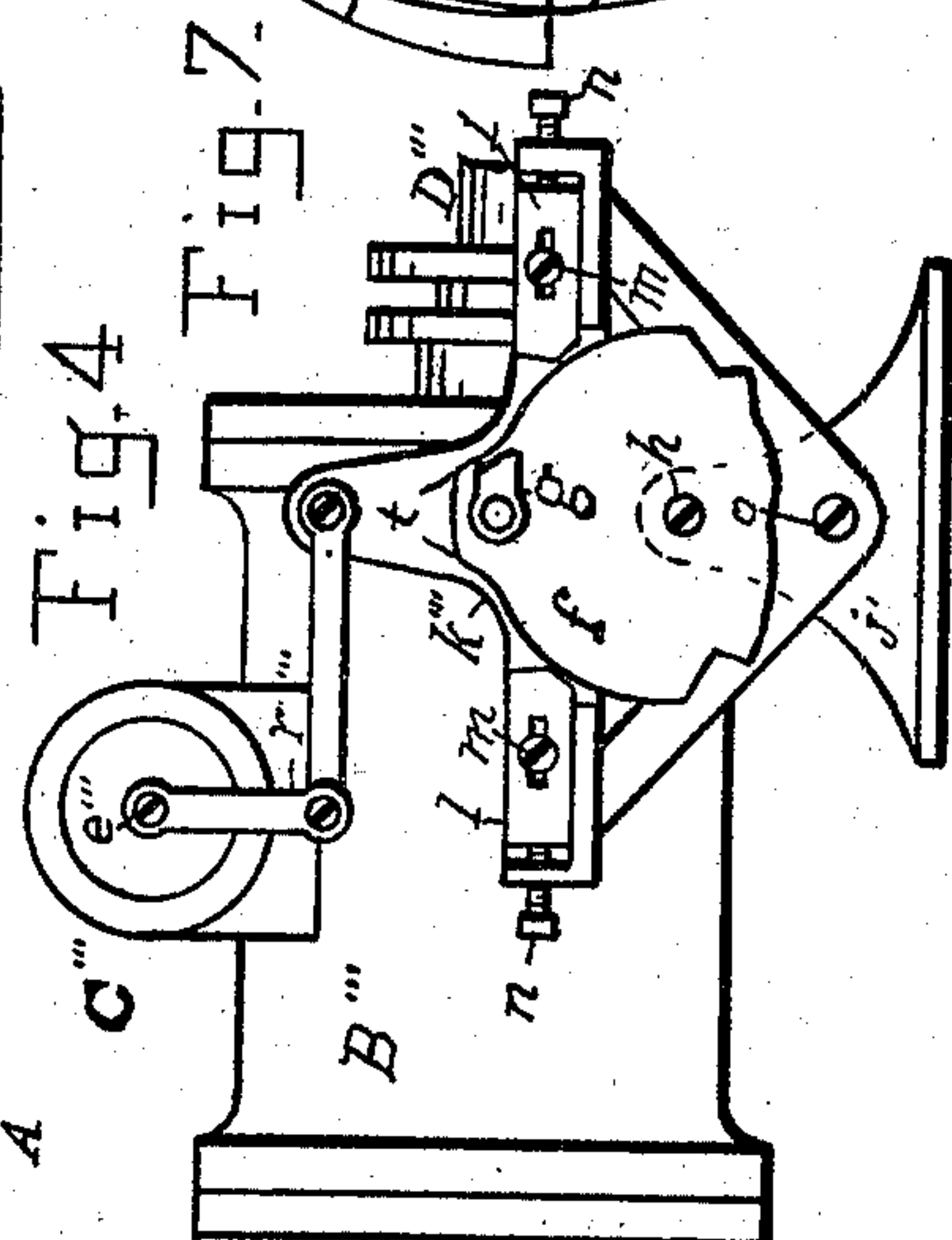


Fig. 4.

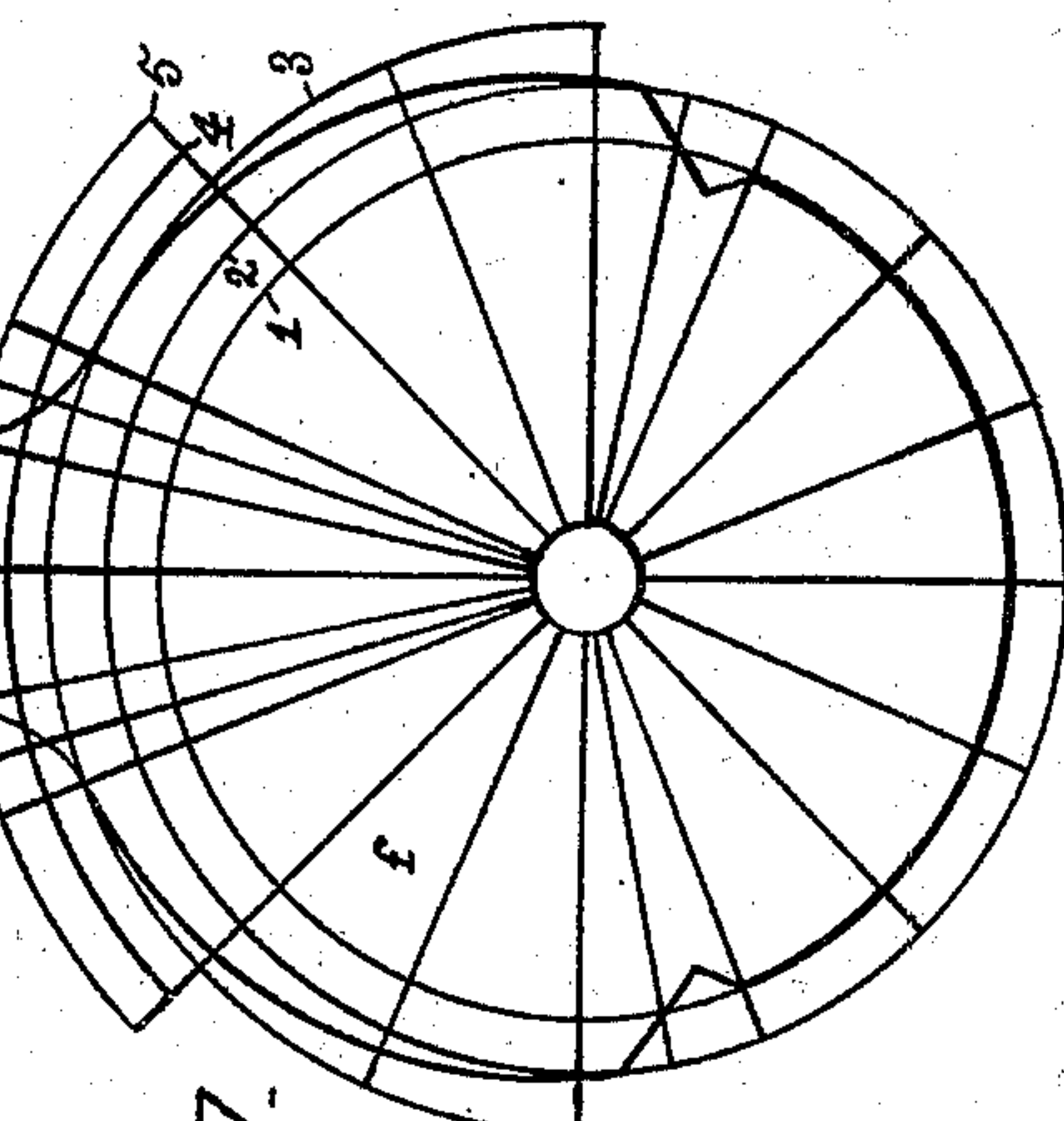


Fig. 7.

Witnesses.
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UNITED STATES PATENT OFFICE.

PETER JENNINGS, OF MENASHA, WISCONSIN.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 555,955, dated March 10, 1896.

Application filed April 9, 1895. Serial No. 545,101. (No model.)

To all whom it may concern:

Be it known that I, PETER JENNINGS, a citizen of the United States, and a resident of Menasha, in the county of Winnebago and State of Wisconsin, have invented a new and useful Improvement in Valve-Gears, of which the following is a specification.

My invention relates to a valve-gear for a reciprocating engine, and is adapted for application to both horizontal and vertical ones having slide, piston, or oscillating valves, single or in pairs, which may be operated by an eccentric or eccentrics; and its object is to provide a simple device for giving to said valves a quick opening and closing movement, to shut off the admission of steam at an early point in the stroke of the piston, and to make said point easily changeable by adjusting the operating mechanism. I attain these objects by means of the devices and their arrangement as shown in the accompanying drawings, in which—

Figure 1 is a side view of an engine-cylinder, partly in section, a portion of its bed, the slides, crank-shaft, and eccentric with my improvement applied for operating the valve when the valve is upon the side of the cylinder, the left-hand steam-port being open and the eccentric on its outward center. Fig. 2 is a side view of an engine-cylinder having the steam-chest above it, the steam-chest and cylinder being in section and having a modified form of the valve-operating device, both steam-ports being closed and the piston near the end of its stroke. Fig. 3 is an elevation showing part of an upright engine having the same form of valve-operating device as in Fig. 2, but applied to an oscillating valve. Fig. 4 is an elevation of a horizontal cylinder having still another form of the valve-gear applied for operating an oscillating valve. Figs. 5, 6, and 7 are details upon an enlarged scale, Fig. 5 being a plan of one of the stops used in the modification, Figs. 2 and 3. Fig. 6 is an edge view of the same, and Fig. 7 is a plan of one of the valve-operating cam-plates.

Similar letters and figures of reference indicate like parts in the several views.

A indicates the engine-bed; B B' B'' B''', engine-cylinders; C C' C'' C''', valve-chests; D D' D'', piston-rods; E E' E'', engine-slides; F, crank-shaft; F', crank-shaft connection; G,

crank-wheel; H, an eccentric; I, eccentric-rods; J, eccentric-link; a a', steam-ports; b b', engine-pistons; c c', valve-plates; d d', exhaust-ports; e e' e'' e''', valve-rods; f f', valve-operating cam-plates; g, cam-plate-operating rods; h, pivot-screw, upon which the cam-plates oscillate; i, cam-plate stops; j j', supporting-stands upon which the cam-plates in Figs. 2 and 4 are pivoted and oscillate; k k' k'' k''', valve-operating stop-holders; l l', valve-operating stops; m, securing-screws for said stops and for the valve-plate stops; n, adjusting-screws for the cam-operating stops; o, the pivotal point of the valve-stop holders; p, connections from the cam-plate rod g, which is connected with the link J and the rod q, which rod q is for connecting with a governor; r' r'' r''', rods connecting valve-stop holders with the valve-rods, the stop-holder k in Fig. 1 being connected directly with the valve-rod e; s, a lip upon the stop l'; u, an arm for transmitting the oscillating movement of the stop-holder k' to the valve-rod e' in Fig. 2, both the arm and stop-holder k' being mounted for oscillation upon a shaft which is journaled above the ways E'.

An eccentric upon the crank-shaft operates the valve by giving an oscillating motion to a cam-plate, said cam-plate in its movement coming in contact with stops which are operatively connected with the valve-rod. They may be of various forms for adapting them for engines of different construction, as is shown in Figs. 1 and 4 or Figs. 2 and 3, but the rule which governs the form of said plates applies to all. It is best shown in Fig. 7, the cam being divided into sixteen equal sectors and four of those sectors being subdivided, arcs and circles being drawn at determined distances apart, according to the width of the steam-ports and lap of the valve, for determining the form of the curves upon the edges of the cam-plate and thereby opening and closing the valve as desired. The heavy lines in Fig. 7 show the form of the cams.

The cam-plate in Fig. 7 is a representative of the principle upon which all of the several modifications are made, and is provided upon its opposite edges with cams of peculiar form, which by engaging with stops attached to suitable holders communicate an irregular movement to the valve, as follows: That por-

tion of the cam between lines 1 and 2 closes the valve immediately after the eccentric passes its center. The space from 2 to 3 moves the valve very slowly until the exhaust-port is closed and the opposite steam-port is opened to the exhaust, from 3 to 4 it moves the valve to the point of opening the opposite port for the admission of steam, and from 4 to 5 moves it until the valve is wide open, or as much as may be needed for the work in hand.

By means of the mechanism described steam can be used expansively for nearly three-fourths of the stroke of the piston and with the steam-ports fully opened at some point during the throw of the valve.

The movement of the valve may be made variable by introducing a link and connecting it with a governor between the eccentric and cam-plate, or by means of a shaft-governor, the link with rod *q* for connecting with a governor being shown in Fig. 1. The throw of the valve may thus be shortened and the admission of steam contracted so as to cut off at any fraction of the valve-opening necessary.

All of the cam-plates are to be formed upon the same system, although they may differ in form, or operate the valve by engaging different portions of its edge with stops from the one in Fig. 1.

The stop-holders *k k' k'' k'''* may be arranged to slide, as in Fig. 1, or to oscillate upon a pivot, as in Figs. 2, 3 and 4, the pivotal point for the same being located as its particular application may require.

The valve-operating stops *l l' l'' l'''* are made adjustable upon their holders by means of adjusting-screws *n* and are secured in position with bolts *m*.

The valve-operating stops *l'* are formed with a projecting lip *s*. As the eccentric approaches the end of its stroke the lip *t'* of the cam-plate will engage the end of the main part of the stop *l'* at one end of the stop-holder, (said main part being indicated by dotted lines in Fig. 5,) while the stop upon the other end of the holder will swing into the position shown by left-hand stop in Fig. 2, but without coming in contact with it until the direction of the cam-plate's motion is reversed, when the lip *s* will engage with the cam-plate stop *i* and cause a rapid movement of the valve, much more rapid than the cam's engagement with the stops upon holders *k'* or *k''* would produce without the stops *i* and lip *s*.

The stop-holder in Fig. 2 is to be mounted upon a rock-shaft above the slides *E'*, and in Figs. 1, 3, and 4 may be attached to any convenient part of the engine or its frame.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a valve-gear, the combination with the

valve and eccentric-rod, of an oscillating plate having cams projecting outwardly from the edge, or border thereof, said plate being arranged for oscillation between right and left stops which are adjustably secured upon a movable holder, the faces of said cams being adapted for engaging the stops and thereby giving to the valve the movement specified for supplying and cutting off steam and allowing the engine to work from the expansion of said steam, substantially as described.

2. In a valve-gear, the combination with the valve and eccentric-rod, of a plate mounted for oscillation between the eccentric and valve-rod, said plate having cams upon the opposite outer edges thereof, stops for engaging said outer edges adjustably arranged upon a suitable holder, said holder being mounted for movement in a line parallel with the line of oscillation of said cam-plate and being arranged for transmitting the action of the cams of the plate upon said stops to the valve, and thereby giving to the valve the movement specified for supplying and cutting off steam and allowing the engine to work expansively, substantially as set forth.

3. In a valve-gear, the combination with the valve and eccentric-rod, of a plate mounted for oscillation between the eccentric and valve-rod, said plate having cams upon the opposite outer edges thereof, stops for engaging said outer edges adjustably arranged upon a suitable holder, said holder being mounted for oscillation in a line parallel with the line of oscillation of said cam-plate and being arranged for transmitting the action of the cams of the plate upon said stops to the valve, and thereby giving to the valve the movement specified for supplying and cutting off steam and allowing the engine to work expansively, substantially as described.

4. In a valve-gear, the combination with the valve and eccentric-rods, of an oscillating plate having cams upon opposite edges thereof and stops upon the face of said plate, stops arranged in the path of said plate's oscillation for engaging said cams, said last-named stops being provided with a lip *s* for engaging the aforesaid stops upon the cam-plate, the cams of said plate and its engaging-stops being so shaped and arranged as to give the valve the movements specified for supplying and cutting off the steam, and the stops upon the cam-plate and lips *s*, so shaped and arranged as to produce a quicker opening movement of the steam-ports than the cams and their aforesaid engaging-stops, substantially as described.

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Witnesses:

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