

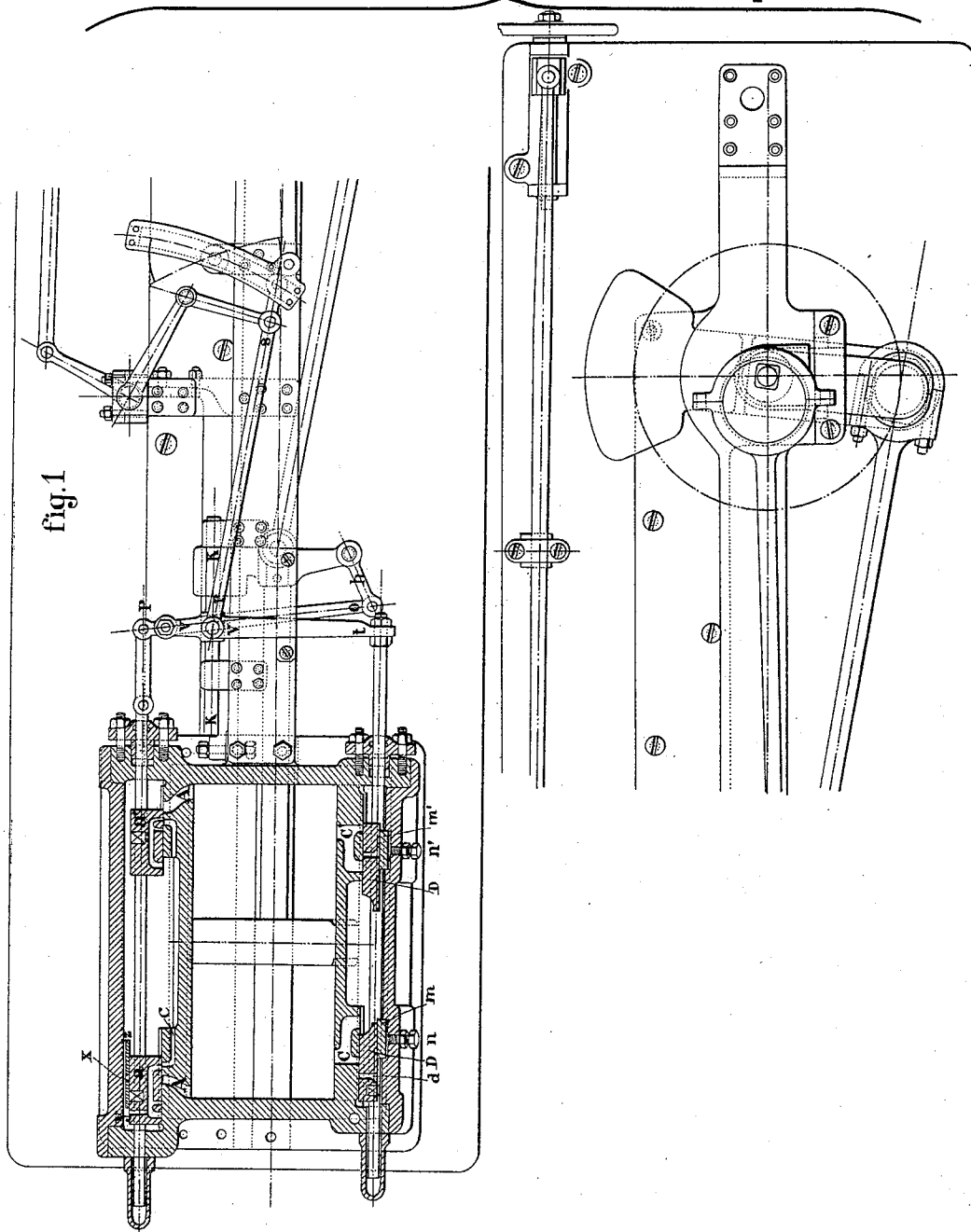
(No Model.)

2 Sheets—Sheet 1.

E. ROY.
VALVE GEAR.

No. 436,266.

Patented Sept. 9, 1890.



Witnesses:

[Signature]
[Signature]

Inventor:

Edmund Roy

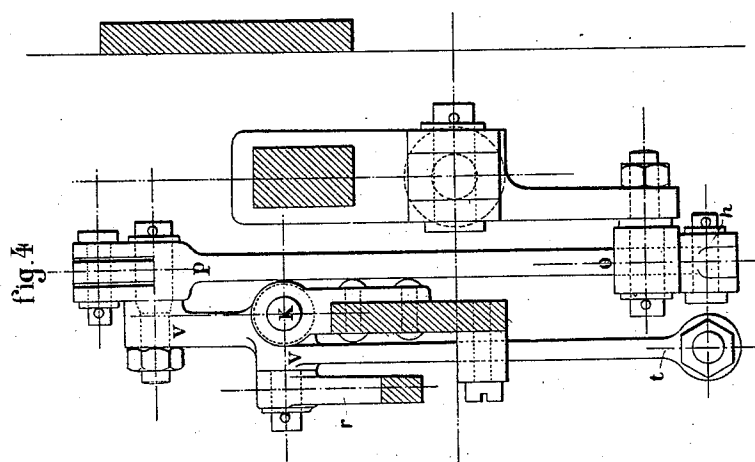
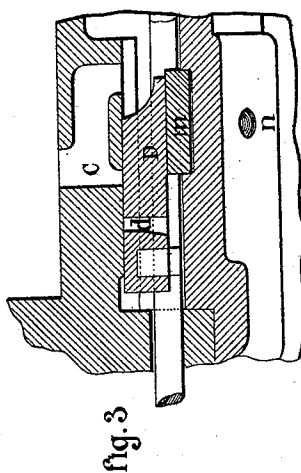
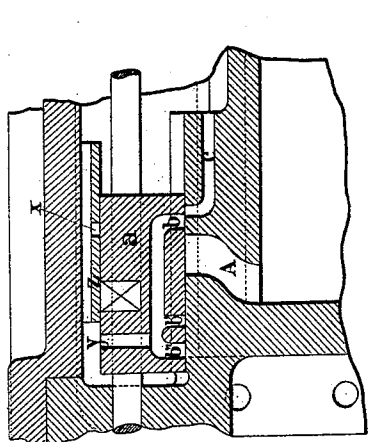
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2 Sheets—Sheet 2.

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VALVE GEAR.

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Patented Sept. 9, 1890.



Witnesses:

Wm. L. Jones

Inventor:

Edmond Roy

UNITED STATES PATENT OFFICE.

EDMOND ROY, OF PARIS, FRANCE.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 436,266, dated September 9, 1890.

Application filed July 5, 1890. Serial No. 357,721. (No model.)

To all whom it may concern:

Be it known that I, EDMOND ROY, a citizen of France, residing at Paris, in the Department of the Seine, France, have invented a new and useful Improvement in Valve-Gears for Motive-Power Engines, of which the following is a specification.

The distribution of steam by a simple slide-valve, plane or cylindrical, in which a straight or a reversing link-motion is employed for obtaining change in the direction of operation in the engine and a cut-off, presents, while possessing great simplicity in the operating elements by which either one of said results are obtained, considerable inconveniences in regard to beneficial utilization of the cut-off of the steam. Said inconveniences consist in, first, the slight opening of the steam-inlet ports into the cylinders, which reduces to a considerable extent the pressure of the steam upon the pistons during the periods of slight admission or inlet in proportion to the pressure in the generator; second, the fact that the opening of the exhaust-ports of the cylinders at periods in the stroke of the piston are as much premature as the inlet-ports are too small, which causes a loss of up to fifty per cent. of the useful and collected power of the cut-off; third, the premature closing of the exhaust, which is as much too great as the period of inlet or admission of a full head of steam is too small, which fact causes compression of steam or back-pressure upon the pistons, which to a considerable extent destroys the useful work of the steam. It has been attempted to remedy said various inconveniences.

For the slowness of opening of the inlet-ports the Trick-Allan slide-valve, which doubles the size of opening during the weak inlet or admission of steam, has been provided with slides or stops set in motion by eccentrics or cams which act by pawls upon said slides or stops. The inlet-openings are thus widely opened and quickly shut at varying periods of the stroke of the piston in such a manner that the inlet-passage of the steam into the cylinder is not strangled, and the cut-off is more advantageously utilized; but said arrangements for the improvement of the work of the steam can only be obtained

by more numerous and complicated elements of distribution than are employed with simple slide-valves moved by ordinary eccentrics and slides or in systems where the control of the engine and of the period of admission or inlet is performed by one single lever or flier. This is the case in locomotive-engines, marine or others, in which it is necessary to have equally perfect revolution in both directions, with facility for rapidly changing the direction according to the work required by them.

The arrangements for steam-distribution which I have invented, and for which I desire a patent, have for their object to remedy the various inconveniences above stated, while at the same time they are controlled by a single lever or flier for setting the engine in motion and for regulating the inlet periods by the ordinary direct or reversing link-motion for changing the direction of revolution usually employed in locomotives and marine engines. The inlet and exhaust take place through four openings instead of two.

In the drawings attached to the present specification, Figure 1 is a longitudinal section, partly in elevation, of my distributing mechanism, in which the controlling mechanism is the well-known Walschaert system, which I have adapted without modification to a distributing mechanism. This figure has been divided into two parts, meeting end to end, and the Walschaert mechanism has not been described, as it is well known, and, moreover, my novel arrangements do not depend upon it. Fig. 2 is a section, on a larger scale, of the inlet slide-valve. Fig. 3 also represents, on a larger scale, the exhaust slide-valve. Finally in Fig. 4 a sectional end elevation of the distributing mechanism is shown.

The inlet-ports A A' are arranged at the extremities of the cylinders and at the upper sides of the same when the latter are placed horizontally. The exhaust-ports C C' are placed at the side and toward the bottom; but are not placed at the extremities of the cylinders, for reasons hereinafter explained.

Inlet.—The opening and closing of said ports are performed by slide-valves or stops a a' for live steam; D D', for exhaust. Each

pair is fastened upon the same rod and constitutes the inlet-valve of one part and the exhaust-valve of the other part. The two rods and their slide-valves are operated by a distributing movement of the well-known and considerably-used system of Walschaert, to which I have had to add a slight modification and improvement on account of the separation and different movement to be given to the live-steam and exhaust valves. Thus, as has already been stated, and as the drawings attached to the present description indicate, the live-steam or inlet ports $A A'$ are alternately opened and closed by the valves $a a'$. The rod and its valves are controlled by the end P of the lever $P O$, pivoted upon a pivot which forms part of the guide $K K$. This latter receives its alternating motion, first, from the connecting-rod $r s$ of the link-motion, which is controlled by the link for changing the direction of revolution and for cut-off, and, second, from the small connecting-rod h , connected to the head of the piston-rod and to the other extremity O of the lever $P O$. This second movement gives the necessary advance to compensate for the overlap of the valve upon the live-steam ports and to obtain the desired cut-off on account of the position of the link at the head of the connecting-rod $r s$ in the slide. These overlaps may also be compensated for by a second eccentric, as is practiced in many engines in which the distributing mechanism is not of the Walschaert type.

Each one of the valves $a a'$ has three channels with steam-ports $b b' b''$, Fig. 2, arranged in such a manner as to simultaneously present three passages for steam into the large port A of the cylinder at the beginning of the inlet period, so as to triplicate the area of inlet for the steam during short inlets or admissions.

In the top wall of the cylinder and beneath the sliding surface of the valve-chest is formed a steam-channel c , which conducts the steam beneath the stop, and by means of which the outlet is determined by the direction of movement of the slide-valve and the position of the interior passages $b b' b''$ of the stop. In this manner there will be no introduction of steam produced by said passage c into the cylinder at any other moment than when it connects with the large live-steam port A of the cylinder by the external stopping of the slide. In this manner a grated slide-valve is provided, which may as well present four steam-entrances as three toward the large port at the start of admission. It is sufficient to make the stop longer and to make the top of the cylinder as much longer as one-half of the stroke of the slide-valve. A second outlet may be opened for the passage c to correspond to a fourth port in the outlet slide-valve through the general passage or channel of said ports into the large port A of the cylinder. The stops may also be constructed in a prismatic form, and a plate Z may be placed

upon them and held longitudinally by a groove in the sides of the valve-chest, held in place upon the upper side of said stop by a spring and perforated by an aperture x , which corresponds to an aperture y , formed in the slide-valve and opening into the general channel of the interior opening of the slide-valve. It will be seen that by this arrangement a true grated slide-valve for live steam may be constructed, which will give a large opening at the entrance of the steam into the cylinder with a very small period of inlet. Furthermore, I may remark that the ports of the conduit or channel c opening into the slide-valve cause the same to act without pressure, so to speak, which is an important advantage regarding the wear of the slide-valves.

The exhaust.—The steam escapes from the cylinder through the two openings $C C'$, by means of which the beginning and the end of the exhaust, as well as the period of compression, are governed not by the stops of the exhaust slide-valve $D D'$, but by the segments of the piston. They are placed at a distance from the ends of the cylinder for the purpose of being opened at the beginning of the exhaust anticipated at the end of the cut-off and closed at the end of the exhaust and the beginning of the compression at a portion of the stroke of the piston which is judged to be most convenient to the perfect operation of the engine. There are three important periods for the perfect operation of the engine and the utilization of the cut-off of the steam, as they are controlled besides by the action of the eccentric and link in a peculiar manner by the segments of the piston, and the consequence is that they are as constant as the period of admission of full steam.

The exhaust-ports $C C'$ of the cylinder open through two ports in the face of the valve $D D'$, each stop of which is provided with a supplemental exhaust-port d for the purpose of providing two outlet-passages for the steam at the beginning of the period of exhaust and of obtaining a larger area of exhaust in the period of slight inlet or admission. This area of exhaust may be triplicated instead of duplicated at the beginning by establishing supplemental ports in an analogous manner to that described for the inlet.

The exhaust-valves $D D'$ are operated by the arm $v t$, which is made in one piece with the guide-rod $K K$, which likewise carries the double pivot for the connecting-rod $r s$ of the shifting mechanism and the controlling-lever $P O$ of the inlet-valve. I have already described that said latter has an alternating movement, which operates together with the head of the connecting-rod of the shifting mechanism $r s$, set in motion by the action of the eccentric upon the link and from the latter upon the piston-rod head. The arm $v t$, which forms part of the guide-rod $K K$, has no other motion but such as is imparted by the action of the head of the shifting connect-

ing-rod *r s* upon its pivot. The eccentric, which solely gives movement to the link and the connecting-rod *r s*, is keyed at a right angle to the crank, so that the exhaust slide-valve does not present any retarding in advance of the opening and closing of the exhaust-ports at the end of the stroke of the piston. On account of the action of the exhaust-valve the exhaust may take place during the entire stroke of the piston, consequently without any period of compression, if this period as well as a slight advance of the exhaust were not produced by the action of the passage of the segments of the piston upon the exhaust-ports *C C'* as they are arranged in the interior of the cylinder.

The difference in the movement of the inlet and exhaust valves, the constant periods for the beginning and the end of the exhaust, and the compression governed by the piston are very important peculiarities in my novel arrangement of distributing elements. This removes from the stroke of the exhaust-valve excessively premature opening of the exhaust-ports and considerable compression or back-pressure, which cause the loss of the greater part of the benefit of the cut-off, while the distribution of the steam is performed by an ordinary simple slide-valve.

The addition of the arm *v t* to the elements of the distributing movement of Walschaert constitutes a real improvement in this distributing mechanism. It admits of the control of the two separate valves by a single shifting connecting-rod without the addition of any intermediate articulation between the head of the shifting connecting-rod and the exhaust-valve rod.

The stops *D D'* of the exhaust-valves are of a prismatic form, as they have to sustain the pressure of the steam while it acts upon the piston, and are held in slight frictional contact upon the cylinder-face by counter-plates *m m'*, applied upon the stops by pressure-screws *n n'*, set in the cover of the exhaust-valve chest. Said screws serve, also, to easily take up any wear of the rubbing-surfaces, so as to insure the hermetic closure of the exhaust-port of the cylinder while the steam performs its work.

The application of my slide-valve arrangement is not exclusively subordinated to the employment of the distributing movement of Walschaert, and I reserve to myself the privilege of employing any other arrangement of distributing mechanism which could satisfactorily operate my arrangement of valve-ports and cylinder-ports.

The entire arrangement for the distribution of steam, as above described, is constructed from a combination of known means, the action of which has for its aim and result to obtain a better utilization of the work of steam without complicating and augmenting

the mechanism of the elements which operate the valves, and without obliging the operators of the locomotive-engines, marine, or others which have to travel equally well in both directions to operate other parts than the throttle-valve and the lever or wheel for starting the engine, or for obtaining at will by said lever or wheel graduations of cut-off. The exhaust-valve, being placed at the lower side of the cylinder, will also admit of doing away with blow-off cocks.

It is obvious that the novel arrangements herein described are applicable to engines other than steam-engines—for example, to compressed-air engines or engines operated by any other gas acting by expansion upon a piston.

I claim as my invention—

1. The combination, with the cylinder having a single admission-port of large area and an external steam-passage leading to the under side of the valve, of the inlet slide-valve provided with a channel having a series of apertures in the face of the valve arranged to provide an opening of large area at the beginning of the period of admission, substantially as described.

2. The combination, with the cylinder having the external steam-passage communicating with the under side of the valve, of the slide-valve having the apertures *b b' b''*, arranged substantially as described.

3. The combination, with the grated slide-valve provided with steam-passages, as specified, of the plate *Z*, disposed above said valve and provided with an aperture *X*, substantially as described.

4. The combination, with the steam-valves and exhaust-valves and with controlling and reversing mechanism comprising a reciprocating guide, as *K*, a shifting connection-rod connecting said guide with the link-motion, and a lever, as *P O*, for actuating the steam-valves, said lever being pivotally connected with said guide, of the arm *v t*, carried by said guide and actuating the exhaust-valve stem, whereby all said valves are controlled by a single shifting connection-rod, substantially as described.

5. The cylinder having two inlet and two exhaust ports, the latter being located near the ends of the cylinder, so that the beginning and end of the exhaust are determined by the piston, in combination with inlet and exhaust valves for said ports, substantially as described.

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

EDMOND ROY.

Witnesses:

R. J. PRESTON,
J. O. YONG.