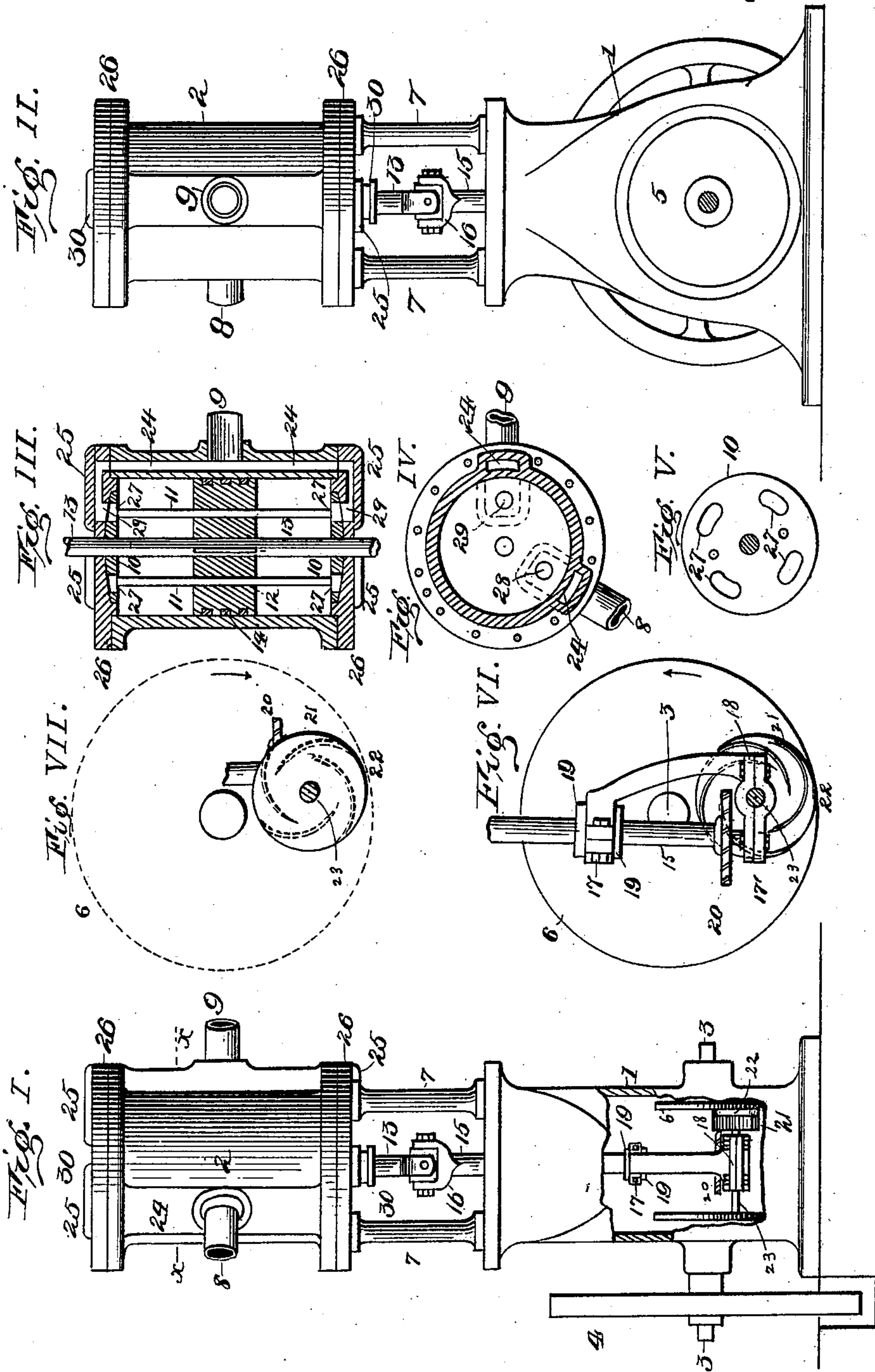


(No Model.)

A. HOWARD.
MOTIVE ENGINE.

No. 602,161.

Patented Apr. 12, 1898.



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MOTIVE ENGINE.

SPECIFICATION forming part of Letters Patent No. 602,161, dated April 12, 1898.

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To all whom it may concern:

Be it known that I, AUGUSTUS HOWARD, a subject of the Queen of Great Britain, residing in the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Motive Engines to be Driven by Elastic Fluids; and I hereby declare the following to be a full, clear, and exact description of my invention, such as it will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to reciprocating engines impelled by steam or air or any elastic fluid and to a novel mode of applying and distributing such motor fluid by means of certain constructive features involved in such apparatus.

My improvements consist in placing in the ends of the motive cylinder disks or valves which by the aid of the piston that moves between them are given rotary motion through the piston-rod, thus opening and closing induction and eduction ports in regular and positive succession and within such period or range as is required for economical distribution of the impelling fluid.

It also consists in a device for producing revolution of the piston-rod and thereby rotation of the said valves by means of a spiral-gear wheel mounted on a connecting-rod joined to the piston-rod by a universal joint, said spiral gear being operated by a scroll-toothed gear fixed on the crank of the engine concentric with the crank-pin, so as to turn with the same and thereby actuate said connecting-rod and the piston-rod positively as the crank-shaft revolves.

It also consists in devices accessory to and tributary to these results, as illustrated in the drawings herewith, forming a part of this specification, in which—

Figure I is an elevation of an engine in the plane of its crank-shaft made according to my invention. Fig. II is an elevation of the same engine in a plane at right angles to Fig. I. Fig. III is a vertical section through the cylinder, piston, and valves of the same. Fig. IV is a cross-section on the line xx of Fig. I. Fig. V is a plan view of one of the

valve-plates. Fig. VI is a detail view of the crank disk and pin, scroll-wheel on the latter, spiral gear on connecting-rod, and accessories employed for turning the piston-rod. Fig. VII is a detached view of the crank-pin and scroll-wheel thereon engaging the spiral gear for turning the piston-rod on the opposite side from that shown in Fig. VI.

Similar numerals of reference apply to corresponding parts throughout.

The main frame 1, cylinder 2, crank-shaft 3, and fly-wheel 4 are of the usual form, the main frame or pedestal 1 being inclosed to contain lubricating liquid and provided with a removable plate 5 to give access to the interior and permit the insertion of the crank-disk 6. The cylinder 2 is supported on the struts 7, of which there may be three or more, and is provided with a steam-supply pipe 8 and an escape or exhaust pipe 9, which pipes can be so connected that their function can be transposed and the motion of the engine reversed in this manner.

Referring to Fig. III, 10 10 are valve-disks connected together and rotated by the struts or rods 11, that pass through the piston 12, the latter being keyed to the piston-rod 13 and provided with the usual packing-rings 14. The said piston-rod is coupled to the crank-pin 23 by means of a connecting-rod or pitman 15, which is connected to the piston-rod by a universal joint 16 and extends down through a yoke or bearing 17, rigidly connected with the top or main part 18 of the crank-pin bearing, as shown in Fig. VI. It also has a bearing in the part 18 at 17'. Above and below the bearing 17 are provided strong collars 19, that receive the thrust, and at the lower end of the connecting-rod 15 is fastened a pinion 20, having spirally-formed teeth which are engaged by the scroll-formed teeth of the wheel 22, borne rigidly on the crank-disk 6 in a position concentric with the crank-pin, as shown in Figs. VI and VII.

When in motion, the spirally-toothed gear or pinion 20 on the connecting-rod 15 is carried around the crank-pin 23, being at the same time caused to revolve on its own axis by means of the curved teeth 21 of the scroll

gear or wheel 22, which engage with it. This turns the connecting-rod 15, as the pitch of the threads or teeth 21 may determine, thereby causing the piston-rod 13, piston 12, and disk valves 10 to slowly revolve.

Steam or other aeriform fluid enters through the pipe 8 and passes through a side passage 24 in the cylinder-shell and through a passage 25 in the cylinder-cover 26, where it finds entrance into the cylinder through the ports 28 and valve-openings 27. Similarly the exhaust-pipe 9 communicates with the cylinder by way of passages 24 25 and ports 27 28, as shown in the right half of Fig. III. The course of the steam or other aeriform fluid can be reversed by changing the pipes 8 and 9 from inlet to exhaust and the reverse or by other well-known means of reversal.

In the present drawings the gearing by which the piston 12 and the valve-disks 10 are revolved is shown so arranged as to produce one revolution of the said valve-disks to four revolutions of the crank-shaft 3, and consequently four ports 27 are required in the valve-disks 10, as shown in Fig. V. These ports 27 revolve upon and successively communicate with the ports 28 and 29, Fig. IV, in the cylinder-heads 26, first acting as induction-ports for the inlet-ways 28 and then as release or exhaust ports for the passages 29, or the reverse if the engine is to be driven in the opposite direction.

It will be understood that the point of cut-off, release, lap, and lead can be attained by the disposition and form of the passages or ports 27, 28, and 29, also that relative velocities or rates of revolution of the disks 10 and the number of ports 27 can be more or less, according to gear.

In the case of small engines the diagonal thrust of the connecting-rod 15 can be sustained by the glands 30; but with larger engines a cross-head and the usual ways are employed as guides for the piston-rod.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a motive engine of the class herein described, a cylinder provided with cylinder-heads having inlet and outlet ports therein, rotary distributing disks or valves, and a revoluble piston in said cylinder, connected with and driving said rotary distributing disks or valves by suitable mechanism, substantially as and for the purpose specified.

2. In a motive engine, a piston, a cylinder and heads therefor provided with ports or passages for induction and eduction of the working fluid, and rotary distributing disks or valves provided with ports or passages, said disks being rigidly connected by rods

passing through the piston, substantially as and for the purpose specified.

3. In a motive engine, a cylinder and heads therefor provided with induction and eduction ports and passages, a revoluble piston connected with and operating rotary valve-disks in the ends of the said cylinder, a piston-rod and a connecting-rod with a universal joint between, and means for positively turning the said rods and piston in accordance with the reciprocating movements of the engine, substantially as specified.

4. In a motive engine, a cylinder and heads therefor provided with induction and eduction ports and passages, rotary distributing disks or valves in the opposite heads, connected together and turning in one direction within the cylinder, and a revoluble piston, piston-rod and connecting-rod, the latter attached to the crank-pin bearing and turned positively by suitable mechanism in accordance with the reciprocating movements of the engine, substantially as specified.

5. In a motive engine, a cylinder, revoluble disks or valves in the ends thereof, induction and eduction ports or passages in the cylinder-head and corresponding ports in the revoluble disks or valves, with means for turning the said disks or valves positively and in accordance with the reciprocating movements of the engine, substantially as specified.

6. In a motive engine, a cylinder, and heads therefor provided with induction and eduction ports and passages, a revoluble piston, piston-rod and connecting-rod, turning in one direction, and distributing disks or valves mounted in the heads of the said cylinder, driven positively by gearing connecting them positively with the crank and crank-shaft, through said revoluble piston and rods, so as to move in accordance with the reciprocating movements of the engine, substantially as specified.

7. In a motive engine, having a cylinder, rotary disk valves in the ends thereof, a reciprocating piston, and piston-rod, a means for rotating said rotary valves, consisting of a connecting-rod with universal-joint connection with the piston-rod, bearing on its lower end a spirally-toothed pinion meshing with and impelled by a scroll-toothed gear-wheel borne on the crank-disk concentric with the crank-pin, substantially as specified.

In testimony whereof I have hereunto affixed my signature in the presence of two witnesses.

AUGUSTUS HOWARD.

Witnesses:

EVAN WILLIAMS,
HENRY H. BATES.