No. 754,744. PATENTED MAR. 15, 1904.

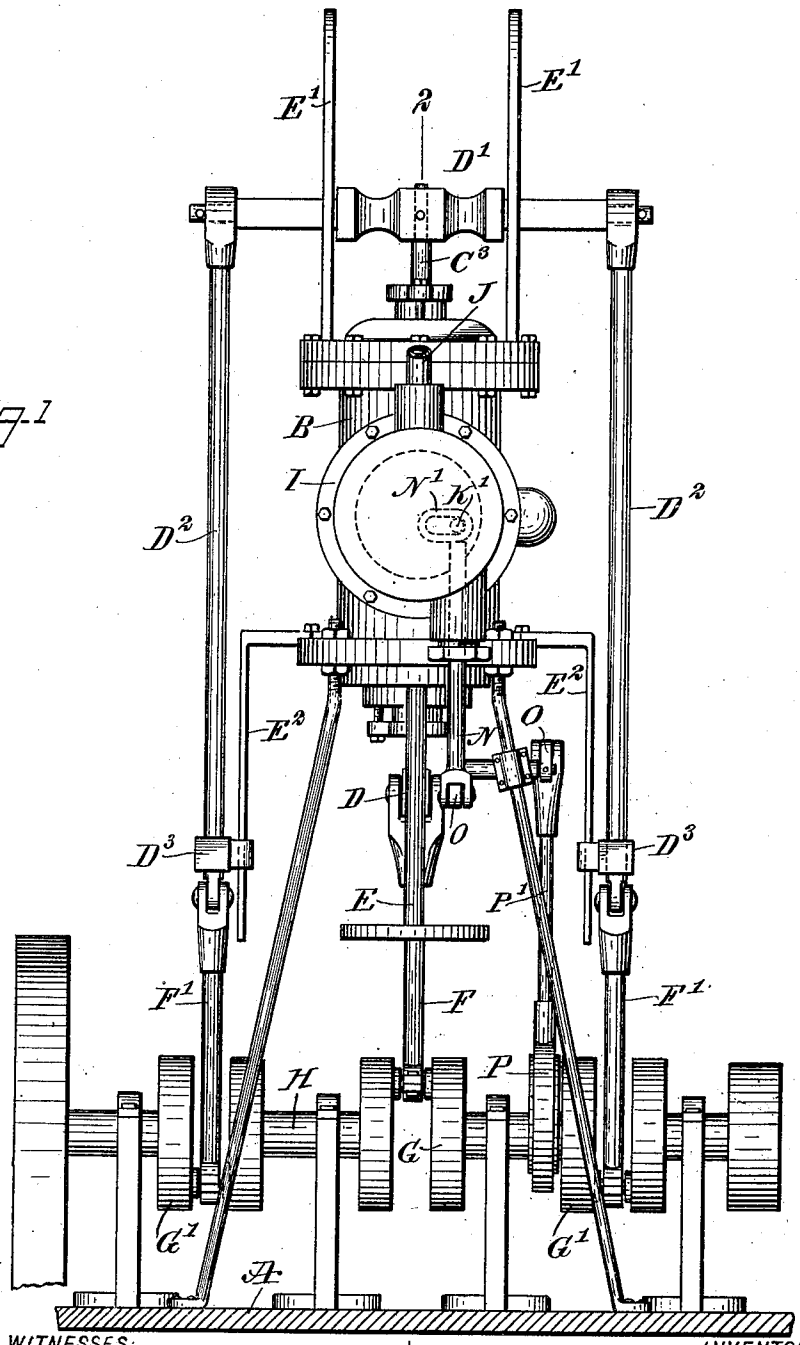
C. F. CHANDLER.

ENGINE.

APPLICATION FILED SEPT. 28, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4

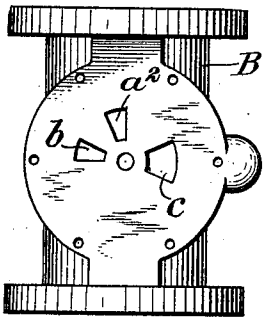


Fig. 2

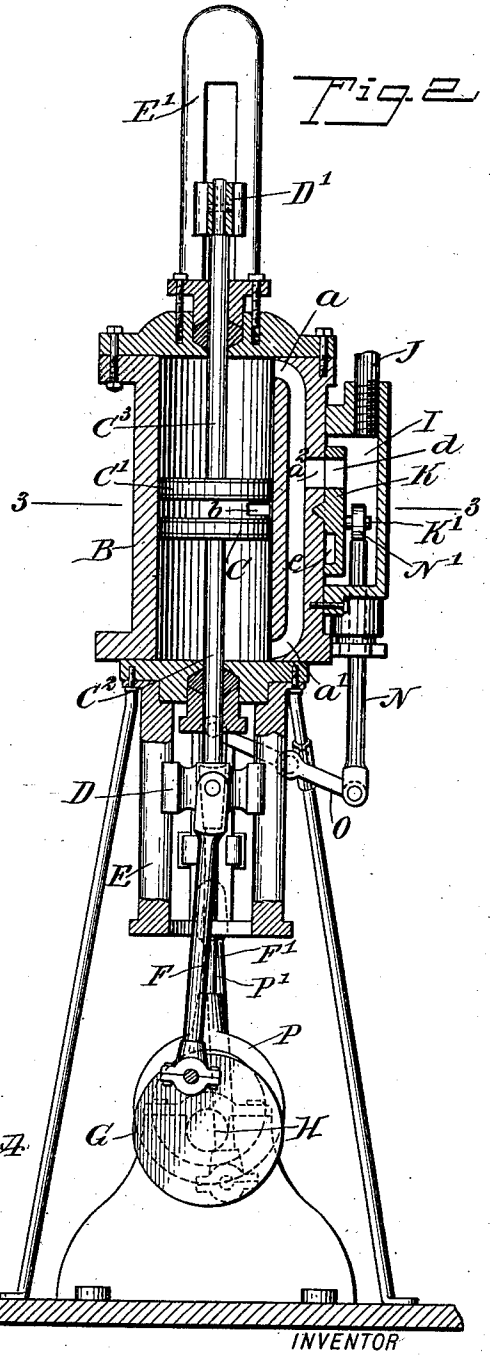


Fig. 5

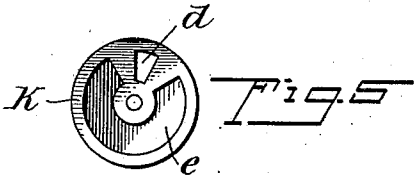
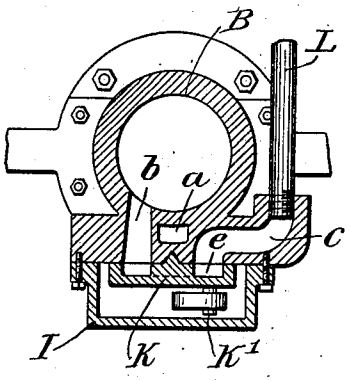


Fig. 3



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No. 754,744. Patented March 15, 1904.

UNITED STATES PATENT OFFICE.

CHARLES F. CHANDLER, OF ORANGE, NEW JERSEY.

ENGINE.

SPECIFICATION forming part of Letters Patent No. 754,744, dated March 15, 1904.

Application filed September 28, 1903. Serial No. 174,887. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. CHANDLER, a subject of the King of Great Britain, and a resident of Orange, in the county of Essex and State of New Jersey, have invented a new and Improved Engine, of which the following is a full, clear, and exact description.

The invention relates to engines in which the motive agent acts simultaneously on two pistons to cause the same to advance toward and to recede from each other.

The object of the invention is to provide a new and improved engine arranged to utilize the motive agent to the fullest advantage.

The invention consists of novel features and parts and combinations of the same, as will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the improvement. Fig. 2 is a transverse section of the same on the line 2 2 of Fig. 1. Fig. 3 is a sectional plan view of the same on the line 3 3 of Fig. 2. Fig. 4 is a face view of the valve-seat, and Fig. 5 is a face view of the valve.

On a suitably-constructed frame A is mounted a vertically-disposed cylinder B, in which reciprocate pistons C and C′, of which the piston C has its piston-rod C^2 connected with a cross-head D, mounted to slide vertically in a guideway E, attached to the lower cylinder-head of the cylinder B. The cross-head D is connected by a pitman F with a crank G on the main shaft H of the engine, and the piston-rod C^3 for the piston C′ is connected with a cross-head D′, mounted to slide vertically in suitable guideways E′, attached to the upper head of the cylinder B.

The cross-head D′ is connected by rods D^2 with slides D^3, mounted to move vertically on guideways E^2, attached to the cylinder B, and the said slides D^3 are connected by pitmen F′ with cranks G′, secured on the main shaft H. The wrist-pins of the cranks G and G′ are disposed diametrically, as plainly indicated in the drawings, so that a continuous rotary motion is given to the main shaft H on the reciprocation of the pistons C and C′ in the cylinder B.

By having the piston C′ connected with the main shaft H in the manner described it is evident that a direct transmission of the power exerted against the piston C′ is obtained without undue friction, and hence the motive agent is utilized to the fullest advantage.

The cylinder B is provided with admission-ports *a*, *a′*, and *b* and an exhaust-port *c*, and the said admission-ports *a* and *a′* open into the ends of the cylinder and lead to a port a^2, opening into a steam-chest I, attached to the cylinder B. The other admission-port *b* leads from the steam-chest I to the middle of the cylinder B to direct the motive agent between the pistons C and C′, so as to force the same apart.

The steam-chest I is provided with a steam-inlet pipe J, connected with a boiler or other suitable source of motive-agent supply, and in the said steam-chest I is mounted to oscillate a valve K for controlling the ports a^2, *b*, and *c*, and for this purpose the said valve K is provided with a port *d* and a cavity *e*, as plainly indicated in Fig. 5. The cavity *e* serves to alternately connect the ports a^2 and *b* with the exhaust-port *c*, while the port *d* serves to connect the interior of the steam-chest I alternately with the ports a^2 and *b* to bring the motive agent into the cylinder B. When the port *d* registers with the port a^2, as shown in Fig. 2, then the motive agent passes from the steam-chest I by way of the registering ports *d* and a^2 into the ports *a* and *a′* to conduct the motive agent to the ends of the cylinder B to move the pistons C and C′ toward each other, and during this time the port *b* is connected by the cavity *e* with the exhaust-port *c* to allow the exhaust motive agent between the said pistons to pass out into an exhaust-pipe L. When the valve K is shifted, then the port a^2 is connected by the cavity *e* with the exhaust-port *c*, and the port *d* then connects with the admission-port *b*, and hence the motive agent passes from the steam-chest I by the registering ports *d* and *b* into the middle of the cylinder B to push the pistons C and C′ apart. The exhaust-steam in the ends of the

cylinder B now passes by way of the ports a, a', and a^2 and cavity e into the exhaust-port c and to the exhaust-pipe L.

In order to oscillate the valve K in unison with the movements of the pistons C and C', the following device is provided: On the valve K is secured a crank-pin K', extending into a transversely-elongated slot in the head N' of a valve-stem N, extending through a suitable stuffing-box to the outside of the steam-chest I. The outer end of the valve-stem N is connected with one end of a lever O, fulcrumed on the frame A and connected at its other end with the eccentric-rod P' of an eccentric P, secured on the main shaft H, so that when the latter is rotated the eccentric P imparts a rocking motion to the lever O, which in turn by the stem N imparts an oscillating motion to the valve K, so as to bring the ports in proper registry with each other, as above explained.

From the foregoing it will be seen that the engine is very simple and durable in construction and is not liable to easily get out of order, and the motive agent employed is utilized to the fullest advantage, as both pistons are acted on simultaneously, both on the outward as well as on the inward stroke.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an engine, the combination with a cylinder having an exhaust-port, and cylinder-admission ports, of which one leads to the middle of the cylinder and the other to the ends of the cylinder, pistons moving toward and from each other in the said cylinder, a main shaft, a steam-chest on the said cylinder, a rock-valve in the said steam-chest, having a port and a cavity for connecting the interior of the steam-chest with the admission-ports and the latter with the exhaust-port, means for rocking the valve on the said main shaft, cross-heads connected with the piston-rods of the said pistons, guides for the cross-heads, and a pitman for connecting one of the cross-heads with the crank on the main shaft, of slides connected by rods with the other cross-head and mounted to move on guideways attached to the cylinder, and pitmen connecting the said slides with cranks on the said main shaft, as set forth.

2. In an engine, the combination with a vertically-disposed cylinder provided with ports, the steam-chest, the valve for controlling said ports, the pistons arranged to move toward and from each other in the said cylinder, the upper and lower cross-heads mounted to slide vertically on guideways attached to the cylinder-heads, and connected with the piston-rods of the said pistons, and a pitman for connecting the lower cross-head with a crank on the main shaft, of vertical guideways having their upper ends extending inward and connected with the lower part of the cylinder, rods connected with the upper cross-head and provided with slides at their lower ends mounted to move vertically on the last-mentioned guideways, and pitmen connecting the lower ends of said rods with cranks on the main shaft, as set forth.

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

CHARLES F. CHANDLER.

Witnesses:
CLARENCE O. WOODRUFF,
NETTIE B. CRANE.