(No Model.) 2 Sheets—Sheet 1.

G. WOOD.

STEAM MOTOR.

No. 342,721. Patented May 25, 1886.

Fig. 1.

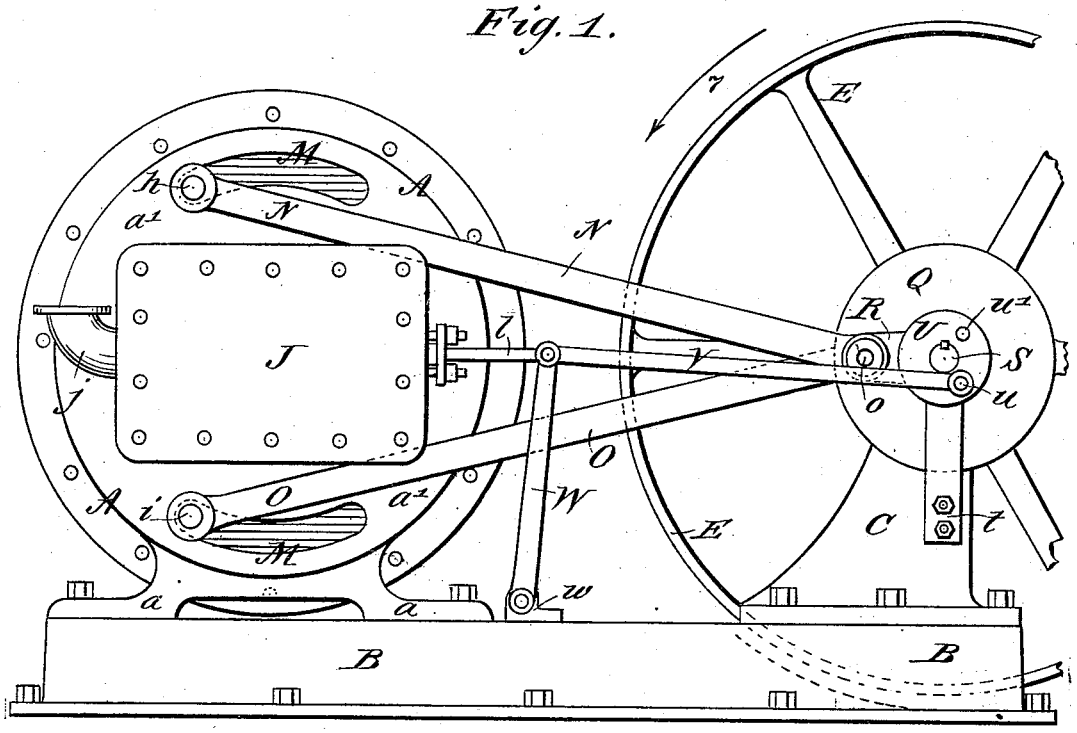
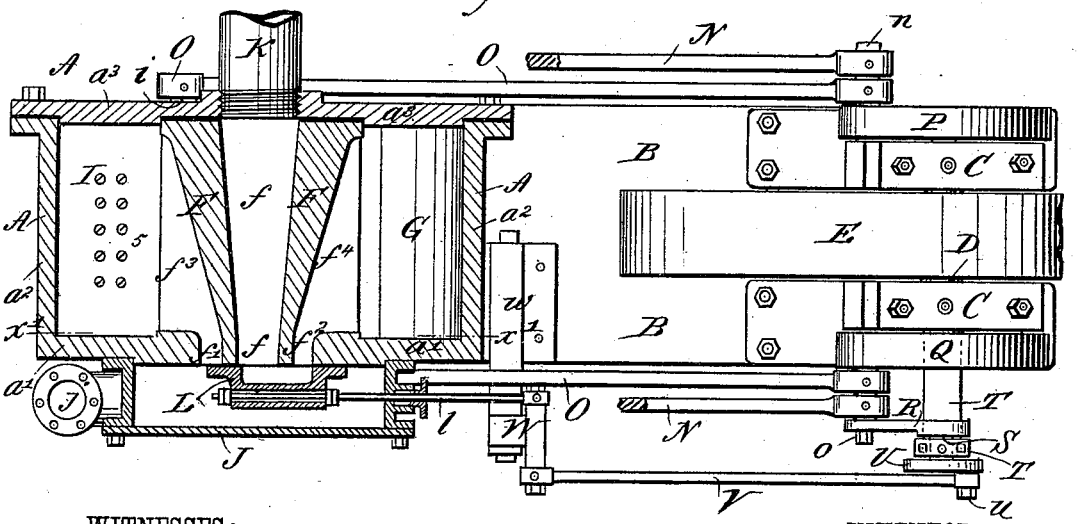


Fig. 2.



WITNESSES:

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E. Sedgwick

INVENTOR:

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ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

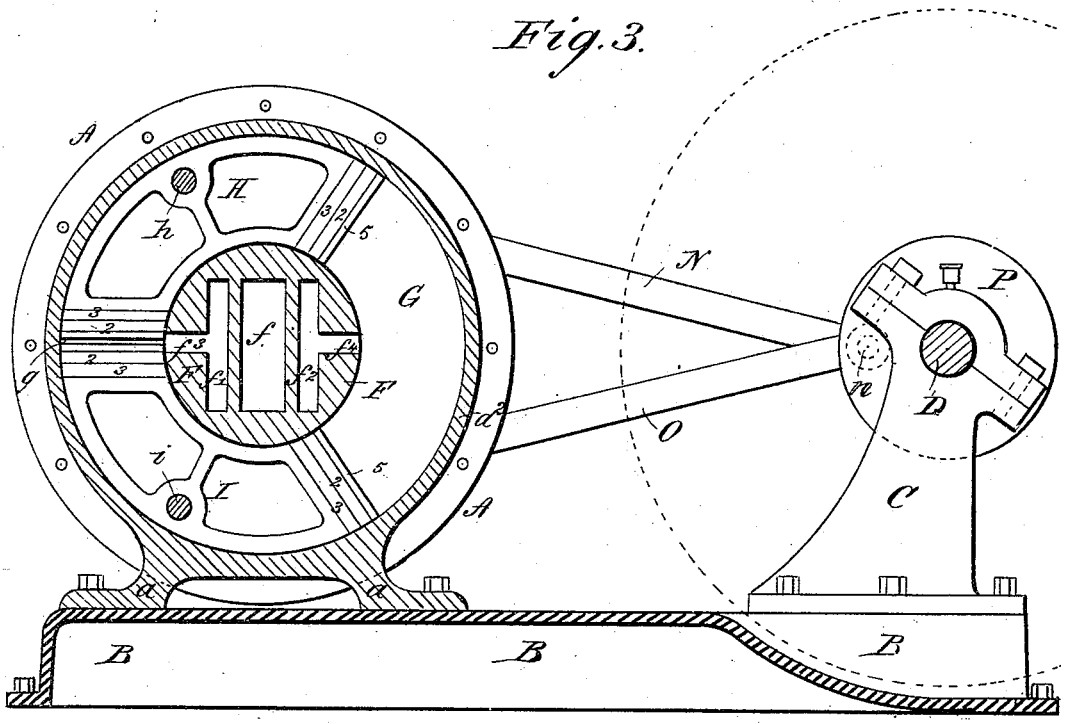


Fig. 4.

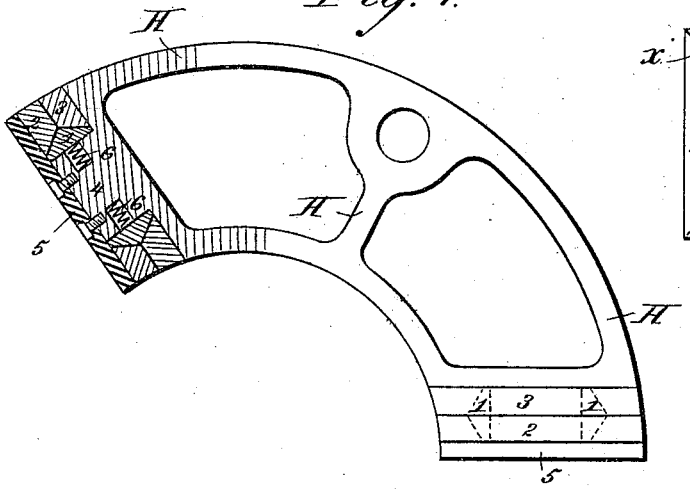
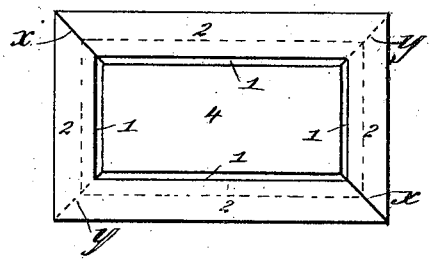


Fig. 5.



WITNESSES:

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UNITED STATES PATENT OFFICE.

GEORGE WOOD, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-MOTOR.

SPECIFICATION forming part of Letters Patent No. 342,721, dated May 25, 1886.

Application filed August 28, 1885. Serial No. 175,587. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WOOD, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and Improved Steam-Engine, of which the following is a full, clear, and exact description.

My invention relates to steam-engines or motors of that class in which curved or segmental oscillating pistons are connected with a crank on the main driving-shaft; and the invention has for its object to provide a more simple, compact, inexpensive, and economical engine than others of this general character.

The invention consists in certain novel features of construction and combination of parts of the engine, all as hereinafter fully set forth.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the engine with the fly-wheel partly broken away. Fig. 2 is a plan view thereof with the cylinder, steam-chest, and valve in horizontal section. Fig. 3 is a side view with the cylinder in vertical section on the line x' x', Fig. 2, and with the bed-plate and driving-shaft also in section. Fig. 4 is an enlarged side view of one of the oscillating pistons, partly in section; and Fig. 5 is an end view of one of the pistons with the outer plate, which holds the packing in place, removed.

The engine-cylinder A has a general circular form, and is bolted through its leg-brackets *a* to the bed-plate B, to the other end of which are bolted the pillow-block bearings C C, in which is journaled the driving-shaft D, to which the fly-wheel or belt-wheel E is fixed.

I show the side a' of the cylinder A cast solidly with and to the outer wall or periphery, a^2, thereof, and to the side a' is cast or fixed centrally the cylindrical block F, which reaches to and is packed at its back end against the removable side plate, a^3, of the cylinder, whereby an annular steam-space, G, is formed between the periphery of the block F and the peripheral wall a^2 of the cylinder, in which space the two curved or segmental pistons H I are fitted to oscillate.

Through the center of the block F is formed the exhaust-port *f*, which opens at one end into the steam-chest J at the side of the cylinder, and opens at the other end into the exhaust-pipe K, through which the steam or other elastic fluid is discharged after being used in the cylinder. In the block F, at opposite sides of the exhaust-port *f*, are formed the ports f' f^2, which open at one end into the steam-chest J, and have lateral offshoots or branches f^3 and f^4, respectively, into the steam-space G of the cylinder.

An ordinary slide-valve, L, fitted over the ports f f' f^2, controls the inlet to the cylinder of steam admitted to the chest J through the supply-pipe *j*, and serves also to exhaust the steam from the cylinder. The means for actuating the valve will be hereinafter described.

The pistons H I have pins *h h i i*, respectively, fixed to their opposite sides, and so as to project through slots, as at M, in the opposite sides of the cylinder; and to these pins *h h i i* are connected the one ends of pairs of rods N N O O, respectively, the other ends of which are connected to wrist-pins *n o*, which are fixed, respectively, in the crank-disks P Q, which are fast on the driving-shaft D.

To the wrist-pin *o* of the crank-disk Q is connected the outer end of an arm, R, which is fixed to a short shaft, S, journaled in a bearing at the top of a bracket-arm, T, which is bolted at *t* to one of the bearings C; or it may be to the engine-bed. To the outer end of the shaft S, which is journaled in alignment with the driving-shaft D, is fixed a crank-disk, U, having a wrist-pin, *u*, to which is connected the one end of a rod, V, the other end of which is connected with a rock-arm, W, which is journaled in a bearing, *w*, fixed to the engine-bed, and to the rock-arm W is connected the stem *l* of the valve L; hence the valve will be actuated from the main driving-shaft as the latter is rotated by the rods N O and the oscillating pistons H I.

The pistons H I are packed at each end by the metal packing-plates 1 2 3, which are fitted in an angular recess around the tongue 4 on the end of the piston, and are held in said recess by a metal plate, 5, which is screwed onto the end of the tongue 4. (See Figs. 4 and 5.) The packing 1 is made in four pieces, one at each side and end of the tongue 4, and behind each piece are fitted springs 6, which rest in sockets in the tongue and press these pack-

ings 1 outward. The packing-plates 2 and 3 are each made of two angular parts extending along one side and end of the tongue 4, and the joints at x and y of the packing 2 and 3, respectively, are at opposite diagonal corners, so that the joints x of the packing 2 will be over the solid angular corners of the packings 3. (See Fig. 5.) The outer faces of the packing-plates 1 are beveled backward from the center both ways, and the inner edges of the packings 2 3 are correspondingly beveled so as to lie against the plates 1 and each other; hence the springs 6 will force the packings 2 3 against the four walls of the steam-space G and pack the pistons H I steam-tight at both ends.

The operation of the engine is as follows: The proportionate size of the cylinder A, pistons H I, connecting-rods N O, and the crank-disks P n Q o is such that when the wrist-pins n o stand at their extreme positions forward and back of the driving-shaft D the opposing ends of the pistons H I will be separated a little, as shown at g in Fig. 3, to allow the steam to enter from either port, f' or f^2, between the pistons at this extreme of their oscillatory movement, and expand to separate the pistons, and force them to the other extreme of their oscillation, at which point they will be separated sufficiently to receive between their other then adjacent ends, the steam entering from the opposite inlet-port, and the pistons will thereby be driven back again to their first position, and during this time the driving-shaft D will have been turned one complete revolution by the connecting-rods N O.

In Fig. 2 the valve L stands so as to admit steam at the left hand between the pistons H I through the port $f' f^3$, and at the same time to exhaust the steam from space G at the opposite ends of the pistons through the ports $f^4 f^2 f$, and at the other extreme of the strokes the steam will enter through the ports $f^2 f^4$ and exhaust through the ports $f^3 f' f$, as will readily be understood.

The valve may have any desired "lap" and "lead" to regulate the expansive working of the steam to any extent, and to "cushion" the approaching ends of the piston, whereby maximum economy of the steam and smoothness of working will be assured.

When the valve-operating rod V is connected to the wrist-pin u on the crank-disk U, the driving-shaft D and band-wheel E will be rotated in direction of the arrow 7 in Fig. 1, and when the rod V is connected to the pin at u' on the disk U the shaft and wheel D E will be rotated in the opposite direction.

It is obvious that as the steam enters the steam-space G, between the opposite ends of the pistons, the steam expands against yielding and movable surfaces; consequently all or nearly all of the force of the steam is applied directly to useful work in turning the driving-shaft. Other advantages of my engine are its great compactness, stability, and lightness for large powers, and there is no heavy overhead work difficult of access or adjustment.

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

1. A steam-engine constructed with a cylinder having an annular steam-space, two pistons fitted to oscillate therein, supply and exhaust ports in the cylinder, and one valve controlling all the ports, substantially as specified, whereby the steam is admitted alternately between opposite contiguous ends of the two pistons to separate them at each extreme of their oscillation, and the steam is exhausted from behind the pistons, and rods connecting the two pistons directly to a crank on the driving-shaft, substantially as herein set forth.

2. A steam-engine constructed with a cylinder having an annular steam-space between a central cylindrical block, F, and the walls of the cylinder, two pistons fitted to oscillate in the cylinder, steam and exhaust ports f', f^3, f^2, f^4, and f in the block F, a valve controlling said ports to supply and exhaust the steam, which is admitted to expand alternately between opposite contiguous ends of the two pistons, to separate them at each extreme of their oscillation, and connecting-rods, as at N O, from the pistons to a crank on the driving-shaft, substantially as herein set forth.

3. In a steam-engine, the combination, with the cylinder having an annular steam-space, two pistons fitted to oscillate therein, supply and exhaust ports, and a valve controlling them, substantially as specified, to admit and exhaust the steam alternately from between opposite ends of the two pistons, and rods at N O, connecting the pistons to a crank, Q, on the driving-shaft D, of a shaft, S, journaled in line with the driving-shaft, a crank-arm, R, on said shaft and connected with the wrist-pin o, to which the rods N O are attached, a crank, U, on shaft S, and a rod, V, connected with the crank U and to the stem of the valve, substantially as herein set forth.

4. In an engine, the segmental oscillating piston C, constructed with end tongues, 4, and packings thereat comprising plates 1, having double inclined outer faces, plates 2 3, fitted together and to the inclined faces of plates 1, cover-plate 5, confining the packing-plates, and springs 6, forcing the plates out-ward, substantially as herein set forth.

GEORGE WOOD.

Witnesses:
WILLIAM HACKER,
JOHN M. GREENE.