No. 640,238. Patented Jan. 2, 1900.

J. A. SVENSON.

STEAM ENGINE.

(Application filed May 6, 1899.)

(No Model.) 2 Sheets—Sheet 1.

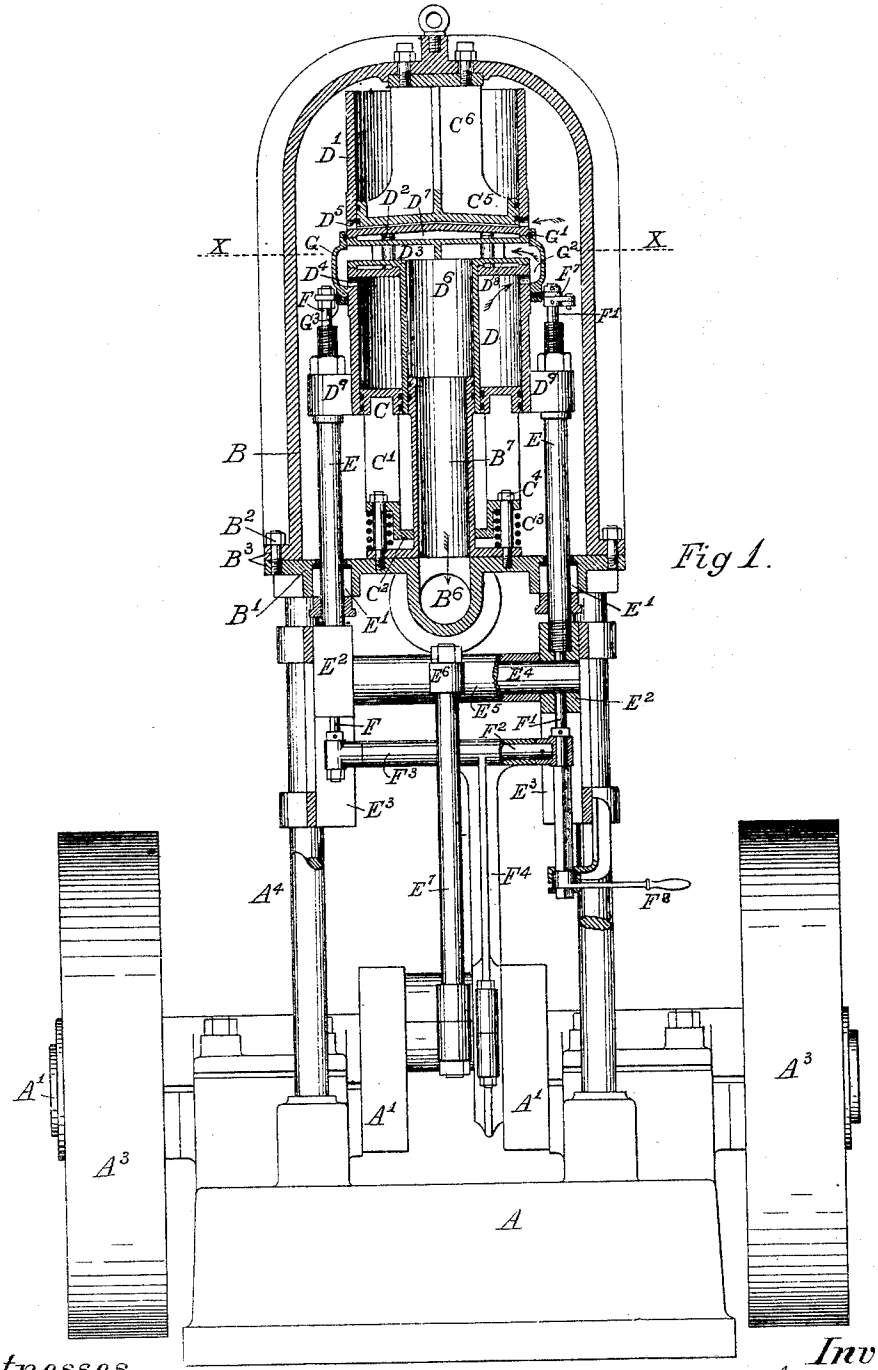


Fig 1.

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Fig 2

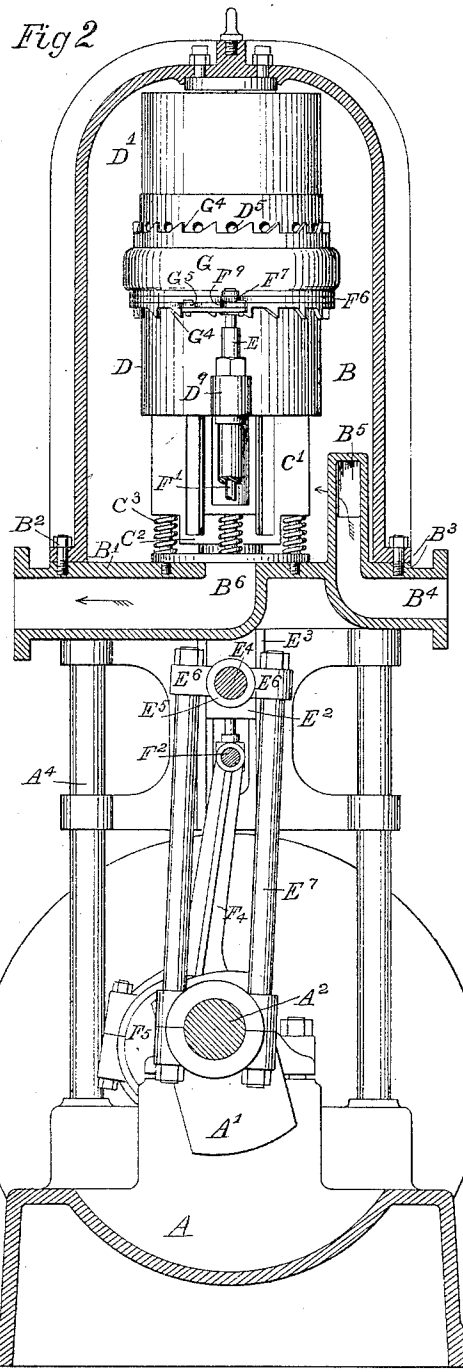


Fig 3

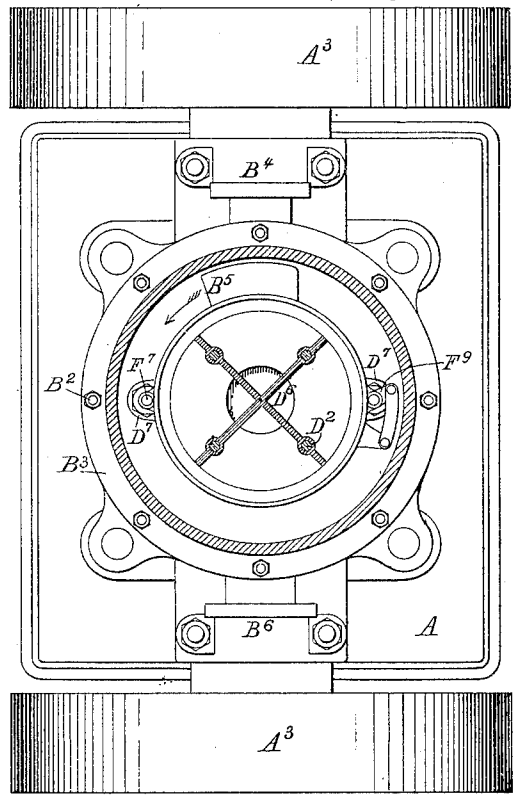
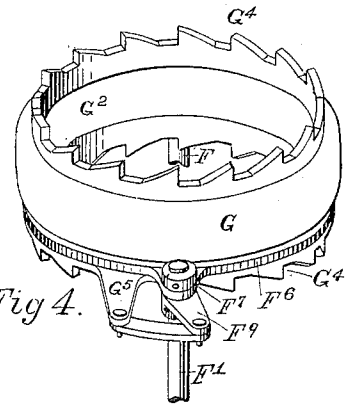


Fig 4.



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JOHN A. SVENSON, OF CHICAGO, ILLINOIS.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 640,238, dated January 2, 1900.

Application filed May 6, 1899. Serial No. 715,849. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. SVENSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

The object of my invention is the production of a steam-engine wherein means are provided for diminishing those wastes of steam due to cylinder condensation and to clearance-spaces, wherein the danger caused by the accidental presence of non-vaporized water in the cylinder is avoided, wherein simplicity of mechanical structure is combined with a high degree of efficiency, and wherein moving parts and steam-surfaces are made easily accessible for inspection and repair. In the attainment of these objects I have produced an engine the pistons of which normally are relatively stationary, while the cylinders reciprocate. A steam-receiver incloses said cylinders, and live steam being admitted to all portions of the interior of said receiver entirely surrounds said cylinders. A valve of peculiar construction admits steam from the receiver to the interior of the cylinders, said valve being automatically operated by an eccentric with valve-rod connections and the motion of said cylinders being imparted by the usual connecting-rods to a crank-shaft of ordinary form.

In the accompanying drawings, Figure 1 is a front elevation of this engine, showing the upper portion upon a vertical central section. Fig. 2 is a side elevation of the same, partly in section. Fig. 3 is a horizontal section on dotted line $x\ x$ of Fig. 1, and Fig. 4 is a perspective view of the valve mechanism.

Like letters of reference indicate corresponding parts throughout the several views.

In the construction of a steam-engine embodying the improvements hereinbefore outlined I provide a supporting-bed A, having the usual crank-shaft A′, the crank-pin A^2, and the balance-wheels A^3. Above the bed A and rigidly affixed thereto is provided the supporting-frame A^4, and upon this supporting-frame is mounted the receiver B. This receiver is of cylindrical dome form and is secured to a base B′ by the bolts B^2, passing through annular flanges B^3 on said receiver and said base. The receiver B is removed from the base B′ to give access to the working parts of the engine by merely taking out these bolts B^2, and thus breaking only one steam-joint—that between the receiver B and the base B′. A steam-inlet B^4 extends inward through the base B′ and, turning upward within the walls of the receiver B, is provided at one of its sides with a discharge-opening B^5 for the ingress of the live steam, whereby said steam is given a gyratory motion upon its entrance into the receiver B, which motion is calculated to separate the water particles from the steam, and thus prevent the presence of water in the cylinders. The opening B^5, however, is placed a little distance above the bottom of the receiver to provide a space for the reception of the condensation, should there be any such, and a drain-cock (not shown) may be provided, if necessary, to remove any water which accumulates in such space. An exhaust-port B^6 extends from the center of said base B′ to the outer side thereof, connecting at its inner end with the exhaust-tube B^7, which tube extends upward in the center of the receiver B.

An annular piston C, having the supporting-arms C′ and the annular base-ring C^2, surrounds the exhaust-tube B^7 and has a yielding connection with the base B′ by means of the compression coil-springs C^3, secured by the bolts C^4, upon which said springs are mounted. These springs C^3 are intended to restore the piston C to its normal position, the pressure of the live steam within the receiver B against the under face of said piston being sufficient to hold it in its upper position. Should a blow fall upon the piston C—as, for example, the shock which would be caused by the presence of a considerable quantity of water within the lower cylinder during the operation of the engine—the piston C yields, becoming a relief-valve of a size equal to the full cylinder diameter. The yielding piston C permits the employment of a very small clearance-space between the said piston and the closed end of its cylinder. A second piston C^5 is rigidly mounted in the upper end of the receiver B, upon its integral stem C^6. Under certain conditions it might be desirable to provide this piston with a yielding support similar to that of the piston C, but

for the sake of simplicity a rigid support for the upper piston is here employed.

When it is desirable to remove the receiver B, the piston C^5 need not be disturbed, but may be removed bodily with said receiver.

Two cylinders D and D′, of equal diameter, are provided for the pistons C and C^5, respectively. These cylinders are secured together end to end by the rivets D^2, their adjacent ends being wholly closed and their outer ends open. An exhaust-port D^3 is formed between the closed ends of the cylinders D and D′, and said cylinders are provided with the peripheral radial steam-ports D^4 and D^5, respectively, which ports are for the admission of live steam to the cylinders and also for the escape of the exhaust therefrom. The cylinder D has a central tube D^6, which tube, telescoping with the exhaust-tube B^7, forms a communication between said exhaust-tube B^7 and the exhaust-port D^3. D^7 and D^8 are closed air-spaces designed to prevent the loss of heat by conduction from the interior of the cylinders D and D′, respectively, to the cooler exhaust-port D^3. Said spaces may readily be opened to the admission of live steam should such change be found desirable. By the foregoing arrangement of cylinders and pistons within a chamber filled with live steam it will be seen that the temperature of the steam meeting surfaces is held at a point near to that of the live steam, and consequently that the initial condensation in the cylinders is almost wholly eliminated.

The cylinder D by the lugs D^9, formed on diametrically opposite points of its periphery, provides means for the attachment of the cylinder-rods E, whereby the motion of the cylinders is transmitted to the crank-shaft A′. These cylinder-rods E are of tubular form. They extend through packing-boxes E′ in the base B′ and have a rigid connection with the lugs D^9. At their lower ends they are connected with the cross-head E^2, which cross-head is free to move vertically upon the guides E^3. A wrist-pin E^4 connects the two parts of the cross-head E^2 and is surrounded by a sleeve E^5, having the two oppositely-extending lugs E^6. A two-part connecting-rod E^7 extends downward from the lugs E^6 to the usual connection with the crank-pin A^2.

Valve-rods F and F′ extend through the tubular cylinder-rods E, forming a steam-tight joint therein. The lower ends of these rods are connected by the pin F^2, which pin is surrounded by the sleeve F^3, integral with the eccentric-rod F^4, the lower end of which rod F^4 movably embraces the eccentric F^5, fixed upon the crank-pin A^2. The upper ends of the valve-rods F and F′ support a ring F^6, which ring is provided with two opposite perforated ears F^7. The rod F extends through one of said ears F^7 and has a rigid connection therewith, while the rod F′, extending through the other one of said ears F^7, has a rotatable bearing in said ear. This last-mentioned valve-rod has a hand-lever F^8 at its lower end, by means of which lever the said valve-rod F′ may be oscillated within the tubular cylinder-rods E. This hand-lever F^8 is free to turn in its supporting-bracket, but is prevented from vertical movement. The lower end of the valve-rod F′ is squared and is free to reciprocate vertically in the hub of the hand-lever F^8, which hub is formed to receive the rectangular portion of said valve-rod. An arm F^9 is rigidly secured to said valve-rod F′ near the upper end of said rod. Said hand-lever F^8 and the arm F^9 are instrumental in providing a variable cut-off for the steam-valve, which variable cut-off will be hereinafter described.

A valve-ring G surrounds the cylinders D and D′ and is free to slide thereon. This ring has the usual steam-packing G′ and is provided with an annular exhaust-channel G^2, communicating with said exhaust-port. The width of the valve-ring G is such with regard to the exhaust-port D^3 and the distance between the steam-ports D^4 and D^5 that its reciprocatory movement opens one set of steam-ports for the admission of live steam and opens the other set of steam-ports to the exhaust-channel G^2 in the usual manner. It will be noticed that the eccentric for communicating motion to the valve-ring G is mounted on the crank-pin A^2 instead of upon the crank-shaft, as ordinarily; but when it is remembered that the valve-ring G travels mainly with the cylinders D and D′, having but a slight movement relative thereto, the reason for such connection will be seen.

The circumferential groove G^3 is provided in the lower part of the valve-ring G for the reception of the ring F^6, upon which ring F^6 said valve-ring G has an oscillatory movement.

By the connections hereinbefore described—to wit, the eccentric on the crank-pin A^2 and the valve-rods—the valve-ring G is moved longitudinally with the cylinders D and D′ to admit live steam alternately into said cylinders through the ports D^4 and D^5, respectively. With reference to Fig. 1 it will be seen that the parts are there represented in position for the steam to enter the ports D^5 from the interior of the receiver B. Steam entering thus will drive the cylinder D downward, actuating the crank-shaft A′ through the cylinder-rods E and the connecting-rods E^7. The eccentric connection with said crank-shaft will cause the valve-ring G to close the ports D^5 at the proper moment and will also move the escape-channel G^2 into coincidence with said ports D^5 when the cylinder reaches the lowest point of its stroke. This movement of the valve-ring G will also open the ports D^4, permitting live steam to enter the cylinder D at the beginning of the upward stroke. The exhaust-steam escaping through the ports D^4 and D^5 alternately finds its way from the channel G^2 in the valve-ring G into the exhaust-port D^3 and is discharged through the tubular central portion of the

cylinder D, the exhaust-tube B^7, and the exhaust-port B^6.

To provide for a variable cut-off, the valve-ring G is formed with the serrations G^4, which may be turned more or less into coincidence with the ports D^4 and D^5, so that said ports will be more or less quickly closed by the reciprocation of the valve-ring, accordingly as it is desirable to cut off the live steam earlier or later in the stroke.

To turn the valve-ring G, a pivotal link connection is made between the arm F^9 near the upper end of the valve-rod F and a lug G^5 on the valve-ring, whereby a slight oscillatory movement of said valve-rod will correspondingly oscillate the valve-ring G upon its supporting-ring F^6. The hand-lever F^8 is provided for oscillating the valve-rod F, and thus changing the time of cut-off in the stroke; but, while I have shown a hand-lever for this purpose, it is clear that in practice a connection may be made between the valve-ring G and some form of governor for automatically actuating said valve.

I have here particularly described my invention in its application to the vertical type of steam-engines; but it should be understood that the invention may readily be adapted to the horizontal type as well.

I claim as my invention—

1. In a steam-engine, in combination, a relatively-stationary piston, a reciprocatory cylinder for the piston, having steam-ports in said cylinder, and means for opening and closing said steam-ports for the admission of live steam to said cylinder.

2. In a steam-engine, in combination, a steam-receiver, a piston mounted in said steam-receiver, a reciprocatory cylinder for said piston, having steam-ports in said cylinder, and means for opening and closing said steam-ports.

3. In a steam-engine, in combination, a steam-receiver, a piston mounted in said steam-receiver, a reciprocatory cylinder for said piston, having steam-ports in said cylinder, means for opening and closing said steam-ports, a crank-shaft, and a connection between the cylinder and the crank-shaft.

4. In a steam-engine, in combination, a steam-receiver, a piston capable of a yielding motion mounted in said steam-receiver, a reciprocatory cylinder for said piston, having steam-ports in said cylinder, means for opening and closing said steam-ports, a crank-shaft, and a connection between the cylinder and the crank-shaft.

5. In a steam-engine, in combination, a steam-receiver, two pistons in said receiver, a reciprocatory cylinder for each of said pistons, having steam-ports in said cylinders, means for opening and closing said steam-ports, a crank-shaft, and a connection between the cylinders and the crank-shaft.

6. In a steam-engine, in combination, a steam-receiver, two pistons in said receiver, a reciprocatory cylinder for each of said pistons, which said cylinders are secured together and have an exhaust-port between their adjacent walls, also having steam-ports in each of said cylinders, means for opening and closing said steam-ports, a crank-shaft, and a connection between the cylinders and the crank-shaft.

7. In a steam-engine, in combination, a steam-receiver, a piston rigidly secured within said receiver, a piston having a yielding support within said receiver, two cylinders for said pistons, rigidly secured together, having an exhaust-port between their adjacent ends and being provided with steam-ports in each of said cylinders, means for opening and closing said steam-ports, a crank-shaft, and a connection between the cylinders and the crank-shaft.

8. In a steam-engine, in combination, a steam-receiver, a piston rigidly mounted within said receiver, a piston having a yielding support within said receiver, two cylinders closed at their adjacent ends and rigidly secured together, having an exhaust-port between them, also having steam-ports for each of said cylinders, means for opening and closing said steam-ports, a crank-shaft, a connecting-rod, a wrist-pin, a cross-head, and a cylinder-rod.

9. In a steam-engine, in combination, a steam-receiver, a piston rigidly mounted in one end of said receiver, an annular piston having a yielding connection with the opposite end of said receiver, two cylinders closed at their adjacent ends and rigidly secured together, having an exhaust-port between them and being provided with peripheral steam-ports, means for opening and closing said steam-ports, an exhaust-tube extending through the cylinder surrounding the annular piston, a crank-shaft, a connecting-rod, a cross-head, and cylinder-rods.

10. In a steam-engine, in combination, a steam-receiver, a piston rigidly mounted within said receiver at one end thereof, an annular piston having a yielding connection with the opposite end of said receiver, a cylinder for the first-mentioned piston, a cylinder for the last-mentioned piston, which latter cylinder has a central opening therein, an exhaust-tube telescoping within the said opening, means for securing said cylinders together at their closed ends, said cylinders being provided with an exhaust-port between them and having a series of peripheral steam-ports for each cylinder, means for opening and closing said steam-ports, a crank-shaft, a connecting-rod, a cross-head, and a cylinder-rod.

11. In a steam-engine, in combination, a steam-receiver, a piston rigidly secured within said receiver to one end thereof, a cylinder closed at one of its ends for said piston and having a series of peripheral steam-ports in its walls, an annular piston opposite the first-mentioned piston, having a yielding connection with said receiver, a cylinder for said annular piston having a central opening and

a series of peripheral steam-ports near its closed end, an exhaust-tube telescoping in the central opening in the last-mentioned cylinder, means for securing the two said cylinders together at their closed ends to allow an exhaust-port between them, means for opening and closing the steam-ports in said cylinders, a crank-shaft, a connecting-rod, a cross-head, and two cylinder-rods extending between the cross-head and the last-mentioned cylinder.

12. In a steam-engine, in combination, two pistons, reciprocatory cylinders therefor, which cylinders are provided with peripheral steam-ports, a valve-ring surrounding said cylinders, and means for reciprocating said ring relative to said cylinders for opening and closing said steam-ports.

13. In a steam-engine, in combination, two pistons, reciprocatory cylinders therefor, which cylinders are provided with peripheral steam-ports, a valve-ring surrounding said cylinders, which ring is serrated at its outer edges, means for reciprocating said ring relative to said cylinders for opening and closing said steam-ports, and means for turning said ring to place said serrations more or less in coincidence with the steam-ports.

14. In a steam-engine, in combination, two pistons, reciprocatory cylinders therefor, which cylinders are provided with peripheral steam-ports, valve-rods, a supporting-ring mounted on said rods, a valve-ring having a bearing in said supporting-ring, which valve-ring is serrated at its upper and lower edges, an arm fixed on one of said valve-rods, a lug on the valve-ring, a link between said arm and said lug, and means for turning said valve-rod.

15. In a steam-engine, in combination, a steam-receiver, two pistons in said receiver, a reciprocatory cylinder for each of said pistons, having steam-ports in said cylinders, a crank-shaft, a connection between the cylinders and the crank-shaft, two valve-rods having a connection with the crank-shaft, a supporting-ring on the valve-rods, and a valve-ring surrounding the cylinders and mounted on said supporting-ring.

16. In a steam-engine, in combination, a steam-receiver, a steam-inlet pipe provided at its side with an opening for admitting steam to said receiver, whereby the incoming steam is given a gyratory motion within said receiver, a piston mounted in said steam-receiver, a reciprocatory cylinder for said piston, having steam-ports in said cylinder, and means for opening and closing said steam-ports.

17. In a steam-engine, in combination, a steam-receiver, a piston rigidly mounted in one end of said receiver, an annular piston for the opposite end of said receiver, which latter piston has an annular supporting-ring, coil-springs under said ring, bolts extending through openings in said ring and securing said annular piston in position in said steam-receiver, two cylinders closed at their adjacent ends, and rigidly secured together, having an exhaust-port between them and being provided with peripheral steam-ports, means for opening and closing said steam-ports, a crank-shaft, a connecting-rod, a cross-head, and cylinder-rods.

18. In a steam-engine, in combination, a steam-receiver, two pistons in said receiver, a reciprocatory cylinder for each of said pistons, which cylinders are secured together and have an exhaust-port between their adjacent walls, also having steam-ports in each of said cylinders, means for opening and closing said steam-ports, a crank-shaft, a cross-head, cylinder-rods, and a bifurcated connecting-rod extending between the cross-head and the crank-shaft.

19. In a steam-engine, in combination, a steam-receiver, two pistons in said receiver, a reciprocatory cylinder for each of said pistons, which said cylinders are secured together and have an exhaust-port between their adjacent walls, also having non-conducting spaces between said exhaust-port and the cylinder ends, and being provided with steam-ports in each of said cylinders, means for opening and closing said steam-ports, a crank-shaft, and a connection between the cylinders and the crank-shaft.

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