M. B. SMITH.

ENGINE.

APPLICATION FILED JULY 24, 1907.

950,248. Patented Feb. 22, 1910.

2 SHEETS—SHEET 1.

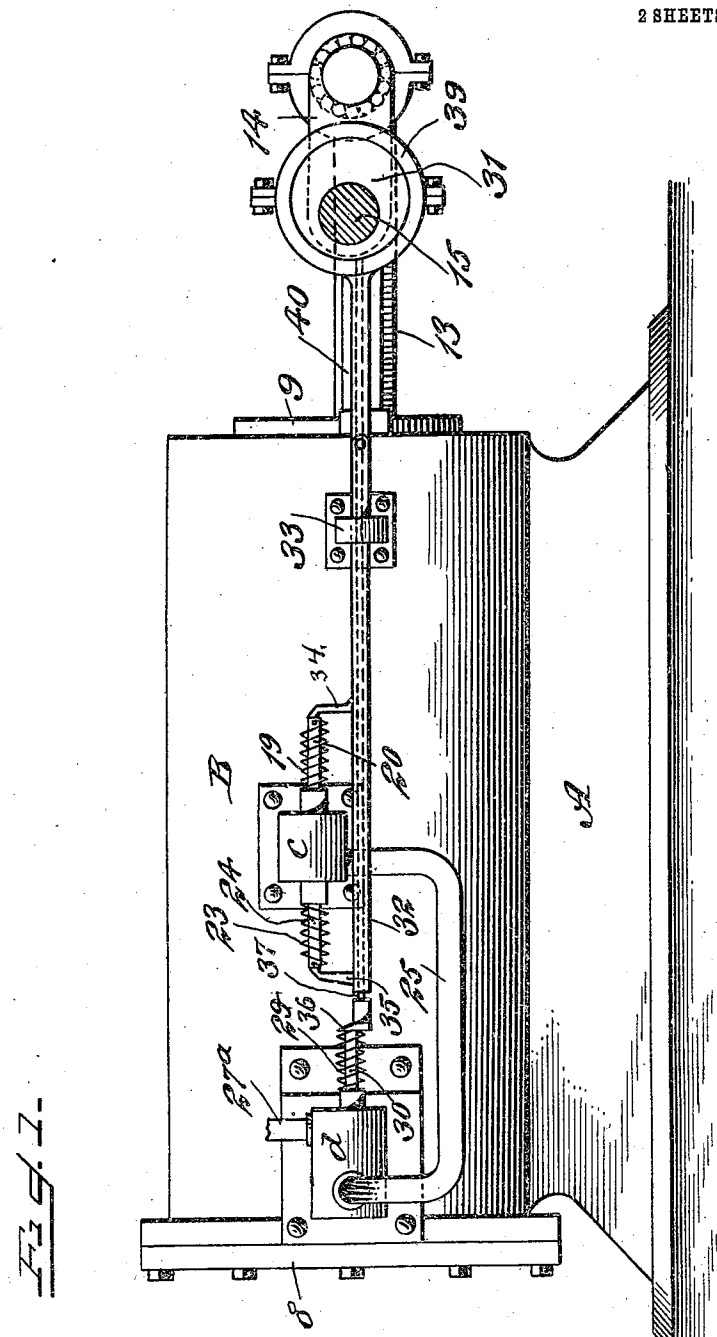

Fig. 1.

Witnesses
R. W. Ashley
R. B. Carmody

Inventor
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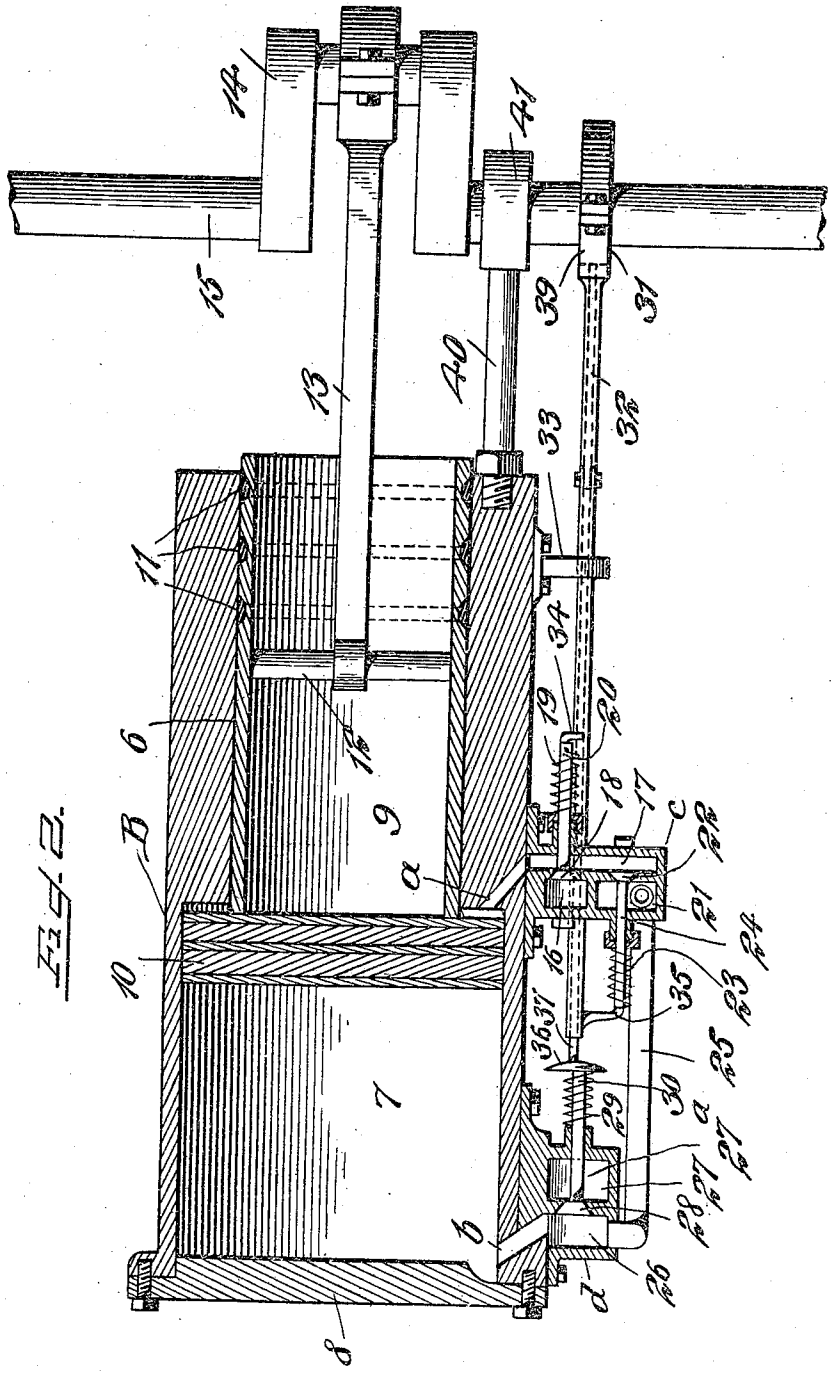

Fig. 2.

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UNITED STATES PATENT OFFICE.

MELVILLE B. SMITH, OF OZONE PARK, NEW YORK.

ENGINE.

950,248. Specification of Letters Patent. Patented Feb. 22, 1910.

Application filed July 24, 1907. Serial No. 385,350.

To all whom it may concern:

Be it known that I, MELVILLE B. SMITH, a citizen of the United States, and a resident of Ozone Park, in the county of Queens and State of New York, have invented certain new and useful Improvements in Engines, of which the following is a specification.

This invention relates to certain novel and useful improvements in steam engines.

In carrying out the present invention one of the purposes is to provide an engine possessing the desired features of simplicity, durability and strength.

It is further my purpose to so construct the cylinder and certain coöperating parts thereof that they may be employed in connection with other engines.

A further purpose is to provide an engine capable of producing maximum power under a minimum supply of motive fluid.

With the above recited objects and others of a similar nature in view, my invention consists in the construction, combination and arrangement of parts set forth in and falling within the scope of the appended claims.

Referring now to the accompanying drawings, Figure 1 is a view in side elevation of a horizontally arranged steam engine embodying my improvement; Fig. 2 is a longitudinal, sectional plan view of a horizontally arranged steam engine constructed in accordance with my invention.

Before entering into a detail description of the constructed features of the invention, I will briefly relate the theory of operation upon which the invention is based. Turning first to the engine shown in Figs. 1 and 2, which engine is designed to employ steam as a motive power, it is my intention to admit steam through suitable ports, to the crank side of the piston head when in its retracted position, the charge of course operating to push the piston forward to the limit of its stroke. On the retractive or return movement of the piston the charge will be compressed or forced backward and pass out through the port used to admit the charge to the cylinder and escape past the admission channel to a tube or pipe from which it is conducted to the end or head of the cylinder and admitted to the latter at a point near such end or on top of the piston head. The charge then so admitted reacts to force the piston along its retracted or return path. On the next forward stroke of the piston, caused by the admission of a fresh charge, the charge on front of the piston is forced out at the port near the end of the cylinder and through a suitable exhaust to any point of discharge. The valve mechanism for timing and controlling the admission and exhaustion of the charges will be described in detail hereafter. It will thus be noted that I have in a single cylinder embodied the feature of a compound engine.

Referring now to the accompanying drawings in detail, especially to Figs. 1 and 2, wherein I have shown a horizontally disposed engine, the letter A designates the bed plate and B indicates as an entirety the novel form of cylinder employed. This cylinder comprises a relatively narrow section 6 forming the portion nearest the crank shaft of the engine and the relatively enlarged or widened section 7, to which is bolted the head 8 of the cylinder.

The form of piston employed comprises the tubular section 9 sliding or working in the narrow portion of the cylinder, and the enlarged or head member 10 affixed to the inner end of the tubular section 9 and worked in the enlarged section of the cylinder. The form of the piston, therefore, is approximately that of a T and the tubular section is provided with suitable packings 11. A bar 12 extends transversely of the interior of the tubular section 9 of the piston and is fastened thereto, and one end of the piston rod 13, is fastened to said bar, the opposite end of such rod being connected eccentrically at 14 to the crank shaft 15.

In the construction shown I provide two ports leading into the enlarged section of the cylinder, the port *a* being arranged adjacent to the relatively narrow section of the cylinder, so that the charge passing therethrough will work against the portion of the piston head extending beyond the wall of the tubular section 9, while the port *b* is arranged to lead into the cylinder near the head 8 thereof.

The valve mechanism controlling the motive fluid is located in proper position relative to these ports, and at the side of the cylinder. For instance, adjacent to the port *a* I bolt or otherwise secure to the casing a valve housing *c*. This housing is divided into three channels or ports. The port 16 through which the fresh charge is admitted communicates with the channel or port 17, which in turn, leads into the port *a*. A communication between the port 16 and the

channel 17 is controlled by the puppet valve 18 normally held closed by means of the spring 19 surrounding the stem 20 of such valve. The channel 17 further communicates with the port 21 and this communication is also controlled by a puppet valve 22 inversely arranged relative to the valve 18 and also held closed by means of a spring 23 acting upon the stem 24. From the chamber 21 leads the pipe 25 communicating with the chamber 26 of the housing *d* secured to the casing at the port *b*. Within this housing is formed a second or lower chamber 27 communicating with the upper chamber 26, the communication between the two chambers being controlled by the valve 28 normally held closed by means of the spring 29 surrounding the stem 30 of such valve.

The means for operating the three valves at predetermined times, to permit the proper ingress and egress of the motive fluid to and from the enlarged section of the cylinder, is as follows: Secured to the crank shaft is the hollow eccentric 31 which in turn has fastened thereto the relatively long sleeve or tubular valve rod 32, passing through the guide bearing 33 secured to the side of the engine cylinder. Carried by the sleeve 32 is a small lug 34 adapted to contact with and open the valve 18, when the sleeve is shifted forward by the turning of the crank shaft. A second lug 35 also projects from the sleeve and is designed to contact with the stem 24 of the valve 22 and open the latter on the retractive movement of the sleeve. The valve 28 is opened against the action of its spring by the contact or striking of the head 36 carried by the rod 37, which rod passes down through the tubular sleeve and is operated by the eccentric 31 surrounded by the hollow eccentric 39. 40 indicates a tie rod bolted to the end of the cylinder and terminating in bearings 41 through which the crank shaft passes.

The operation of the engine shown in Figs. 1 and 2 is as follows: As the crank shaft is turned and the sleeve rod 32 thrust forward the projection 34 striking against the stem of the valve 18, opens such valve and permits the fresh charge of steam at high pressure to pass from the port or intake 16 to the channel 17 and from thence to the port *a* to the back of the piston head, and the charge striking against the head forces the latter forward toward the end of the cylinder. On the return stroke of the piston the charge is compressed by the back of the piston head and forced out again through the port *a* into the channel 17 and through the opening controlled by the valve 22 to the chamber 21 and thence to the pipe 25, the valve 18 at this time being closed and the valve 22 open by the lug 35 striking the stem of the valve on the retraction stroke of the sleeve rod. From the pipe 25 the charge passes into the chamber 26 and through the port *b* to the top side of the piston, or the low pressure side thereof where the pressure exerted by such charge tends to force the piston on the back stroke. It will be noted that as the piston reaches the limit of its retracted stroke the valves 28 and 18 are closed while the valve 22 is opened to admit the charge expelled by the down stroke of the piston to admit to the top side of the piston that charge expelled by the return stroke. But as the piston again moves forward toward the end of the cylinder the valve 18 is opened to admit a fresh charge to the under side of the piston, the valve 22 is closed by the force of the spring and the valve 28 is now opened by the head 36 striking the stem so that the charge on front of the piston or in the low pressure portion of the cylinder, will be expelled through the port *b* into the chamber 27 and out through the exhaust opening 27ª. The three valves are of course adjusted so that the opening and closing takes place at predetermined times for the intaking and expelling of the various charges.

While I have herein shown and described one embodiment of my invention, I wish it to be understood that I do not limit myself to the precise details of construction herein set forth, but that modification and variation may be made without departing from the spirit of the invention or the scope of the claims.

What I claim is:

1. An engine comprising a crank shaft and a cylinder, a piston moving therein and provided with a piston head, means for admitting a charge to one side of the piston head, a valve for controlling said admission of a charge, means for conducting the said charge to the opposite side of the piston head, a second valve for controlling the passage of the charge to said opposite side, means for exhausting the charge from said opposite side of the piston head, a third valve for controlling said exhaust, and a connection between the crank shaft and said valves for operating the valves.

2. An engine comprising a crank shaft and a cylinder, a piston moving therein and provided with a piston head, means for admitting a charge to one side of the piston head, a valve for controlling said admission of a charge, means for conducting the said charge to the opposite side of the piston head, a second valve for controlling the passage of the charge to said opposite side, means for exhausting the charge from said opposite side of the piston head, a third valve for controlling said exhaust, and a movable member connected to and operated by the crank shaft for operating said valves.

3. An engine comprising a crank shaft and a cylinder, a piston moving therein and pro-

vided with a piston head, means for admitting a charge to one side of the piston head, a valve for controlling said admission of a charge, means for conducting the said charge to the opposite side of the piston head, means for exhausting the charge from said opposite side of the piston head, a valve independent of the first-mentioned valve for controlling said exhaust, a movable member connected to and operated by the crank shaft adapted to contact with and operate one of said valves and a lug carried by said movable member adapted to contact with and operate a second of said valves.

4. An engine comprising a crank shaft and a cylinder, a piston moving therein and provided with a piston head, means for admitting a charge to one side of the piston head, a valve for controlling said admission of a charge, means for conducting the charge to the opposite side of the piston head, a valve for controlling the passage of the charge to said opposite side, means for exhausting the charge from said opposite side of the piston head, a valve for controlling said exhaust, a movable member connected to and operated by the crank shaft, a lug carried by the movable member adapted to contact with said first-mentioned valve, a second lug carried by said movable member adapted to contact with said second-mentioned valve, said movable member being adapted to contact with said third-mentioned valve.

5. In a fluid pressure engine, a cylinder, a reciprocating piston therein, ports at the ends of the cylinders on either side of the piston, a valve casing on the cylinder communicating with one of the ports and having a fluid inlet, a valve controlling the inlet, a valve casing communicating with the other port, a conduit connecting said casing, a valve for controlling the flow of fluid from the first-mentioned casing to the second-mentioned casing, means for opening the first-mentioned valve to admit fluid to the cylinder, and means for opening the second-mentioned valve to permit the steam admitted to pass from one side of the piston through the casings and conduit to the other side of the piston.

6. In a fluid pressure engine, a cylinder, a reciprocating piston therein, ports at the ends of the cylinder on either side of the piston, a valve casing on the cylinder communicating with one of the ports and having a fluid inlet, a valve controlling the inlet, a conduit connecting said casing and port, a valve for controlling the flow of fluid from the first-mentioned casing to said port, means for opening the first-mentioned valve to admit fluid to the cylinder, and means for opening the second-mentioned valve to permit the steam so admitted to pass from one side of the piston through the inlet casing and conduit to the other side of the piston.

7. In a fluid pressure engine, a cylinder, a reciprocating piston therein, ports at the end of the cylinder on either side of the piston, a valve casing on the cylinder communicating with one of the ports and having a fluid inlet, a valve controlling the inlet, a valve casing communicating with the other port and having a valve-controlled exhaust, a conduit connecting said casing, a valve for controlling the flow of fluid from the first-mentioned casing to the second-mentioned casing, means for opening the first-mentioned valve to admit fluid to the cylinder, and means for opening the second mentioned valve to permit the steam so admitted to pass from one side of the piston through the casings and conduit to the other side of the piston.

8. In a fluid pressure engine, a cylinder, a reciprocating piston therein, ports at the ends of the cylinder on either side of the piston, a valve casing on the cylinder communicating with one of the ports and having a fluid inlet, a valve controlling the inlet, a valve casing communicating with the other port and having a valve-controlled exhaust, a conduit connecting said casing, a valve for controlling the flow of fluid from the first-mentioned casing to the second-mentioned casing, means for simultaneously opening the inlet in the first-mentioned casing and said exhaust, and means for opening the conduit-controlling valve to permit the steam admitted to one side of the piston to pass through the casings and conduit to the other side of the piston.

9. In a fluid pressure engine, a cylinder, a reciprocating piston therein, ports at the end of the cylinder on either side of the piston, a valve casing on the cylinder communicating with one of the ports and having a fluid inlet, an automatically closing valve controlling the inlet, a valve casing communicating with the other port, a conduit connecting said casing, an automatically closing valve for controlling the flow of fluid from the first-mentioned casing to the second casing, a spring closed exhaust valve in the second casing, and a reciprocating member moving in one direction to automatically open the inlet and exhaust valves, and in the other direction to open the conduit-controlling valve.

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

MELVILLE B. SMITH.

Witnesses:

R. B. CAVANAGH,

JAMES M. [illegible]