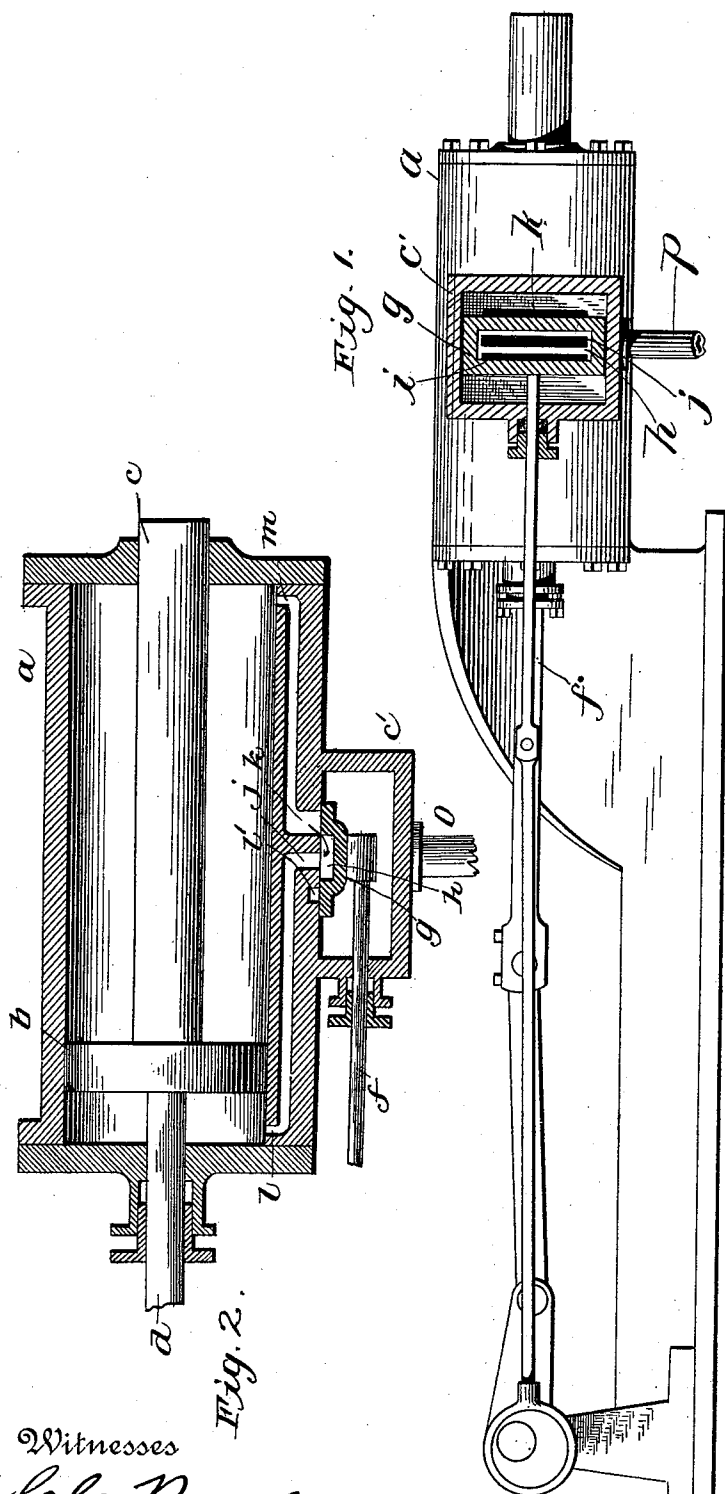


(No Model.)

H. M. McCALL.
STEAM ENGINE.

No. 519,588.

Patented May 8, 1894.



Witnesses
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UNITED STATES PATENT OFFICE.

HARRY M. MCCALL, OF LATROBE, ASSIGNOR OF ELEVEN-TWELFTHS TO
RICHARD G. KENNEDY AND BENJAMIN D. REED, OF PITTSBURG,
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STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 519,588, dated May 8, 1894.

Application filed August 29, 1893. Serial No. 484,280. (No model.)

To all whom it may concern:

Be it known that I, HARRY M. MCCALL, of Latrobe, in the county of Westmoreland and State of Pennsylvania, have invented certain
5 new and useful Improvements in Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and
10 use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to certain improvements in steam engines, and more particularly to improvements in compound or double expansion steam engines.

The object of the invention is to provide an improved compound double expansion steam
20 engine exceedingly cheap, simple and durable in construction, very quick, rapid and sure in action, extremely economical in the consumption of steam, and wherein a single cylinder and piston are employed.

The invention consists in certain novel features in construction and in combination of parts more fully described hereinafter and particularly pointed out in the claim.

Referring to the accompanying drawings:
30 Figure 1, is a side elevation of the improved engine, the steam chest and slide valve being shown in section. Fig. 2, is an enlarged view of the cylinder in horizontal section, the steam chest and slide valve being shown in
35 section, the slide valve being shown in a position it assumes when moving forward and just about to cut off the supply of steam from the rear of the cylinder to the front thereof and to open the front of the cylinder to the
40 exhaust.

a indicates a suitably mounted cylinder.

b indicates the piston in said cylinder provided with the forwardly extending piston rod *d*, and the trunk *c*, extending rearwardly
45 through the rear of the cylinder.

c' indicates the steam chest, preferably, centrally located on the side of the cylinder, and provided with a steam inlet pipe *o*, and a suitable valve seat for the slide valve *g*,
50 operated by the valve rod *f*, by any suitable

connections. This valve seat is provided with three parallel ports *k, j, i*, controlled by said slide valve. The port *k*, is connected by a duct with the port *m*, discharging into the rear end of the cylinder at the high pressure
55 side of the piston. The central port *j*, receives the exhaust from the high pressure end of the cylinder and discharges the same into a duct discharging through port *l*, into the front or low pressure end of the cylinder
60 to throw the piston back to the high pressure end of the cylinder. The port *i*, is the exhaust port and receives the exhaust from the low pressure end of the cylinder through port *j*, and discharging the exhaust through pipe *p*,
65 which conveys it to any point desired. The slide valve is provided with the recess or duct *h*, in its inner face arranged to register with said ports and to place them in communication in the proper order. The ports are all
70 preferably of the same length, and the ports *j*, and *i*, are preferably of the same width, but the port *k*, is of approximately twice the width of either one of the other two ports; and the duct *h*, in the valve is of such width
75 that when the valve is at its limit of rearward movement and starts forward the rear vertical edge of the valve will gradually open the port *k*, see Fig. 1, and permit live steam from the steam chest to flow into the high
80 pressure end of the cylinder and force the piston forward. While the valve is permitting the live steam to flow into the high pressure end of the cylinder the duct *h*, is located over the ports *j, i*, so that the steam from the
85 low pressure end of the cylinder is exhausting through ports *l, j, i*, and the duct *h*, of the valve. When the valve has exposed one half of the port *k*, to the steam chest, the valve starts on the return stroke and as it
90 gradually closes the port *k*, to the steam chest the opposite edge of said port *k*, is being gradually open to the duct *h*, of the valve permitting the steam to exhaust from the live steam end of the cylinder through port
95 *m*, and the inner half of port *k*, duct *h*, and ports *j, l*, into the low pressure end of the cylinder, and at the same time the valve breaks communication between port *j*, and the final exhaust port. When the valve has
100

exposed one half of its width to the duct *h*, it starts on the forward stroke. By reason of this peculiar construction and arrangement it will be observed that the steam is quickly transferred from the high pressure to the low pressure end of the cylinder and that it only has to travel the length of the cylinder so that there is a minimum amount of waste and the engine is operated with great economy of steam and great power is developed, and the engine is exceedingly quick in action, and but three ports and a single slide valve are employed to accomplish the result desired. It should also be observed that the stroke of the valve will be very short even in a very large engine, and that the exhaust through the passage in the slide valve forces the same out so that the friction of the valve on its seat is reduced to a minimum. Furthermore the weight of the valve is comparatively low, therefore the force consumed in operating the valve is reduced to a minimum.

This is a saving of great importance in operating engines.

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

The cylinder of a compound engine having its valve seat provided at the live steam end with a high pressure port larger in area than the low pressure port, in combination with a slide valve arranged to partially extend over said large port when taking live steam and to close the port to live steam while the steam is passing through it from the high pressure to the low pressure end of the cylinder, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

H. M. McCALL.

Witnesses:

HERBERT E. PECK,
LEO J. LALLY.