(No Model.) 3 Sheets—Sheet 1.

J. B. PITCHFORD.

STEAM ENGINE.

No. 302,636. Patented July 29, 1884.

FIG. 1

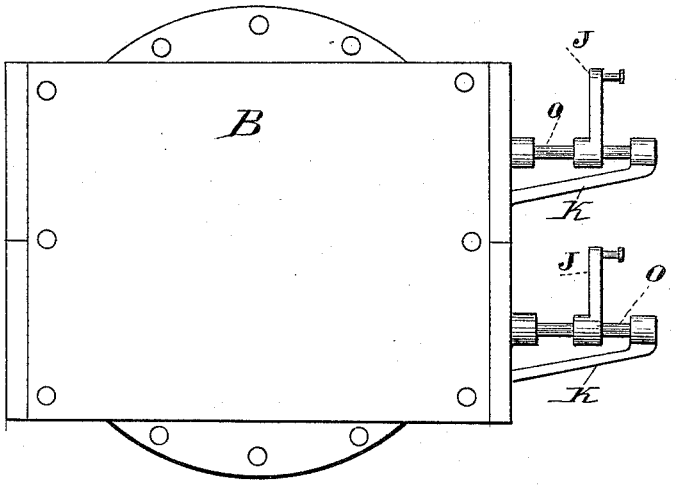
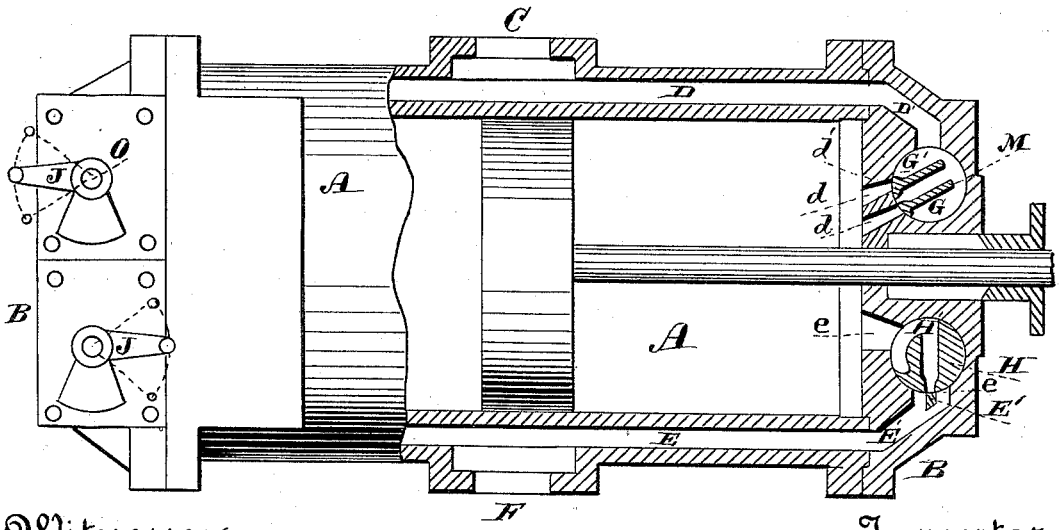


FIG. 2



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STEAM ENGINE.

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FIG. 3.

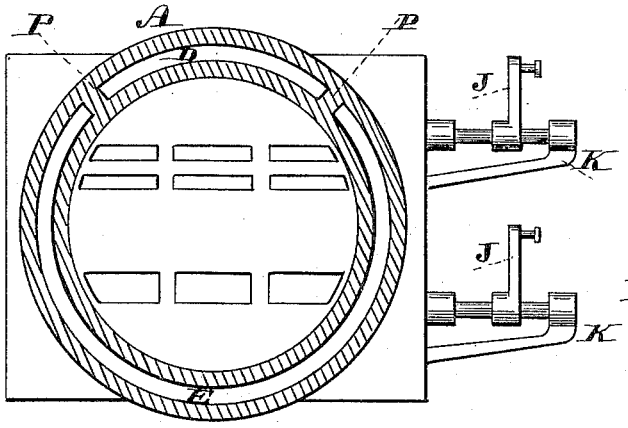


FIG. 5

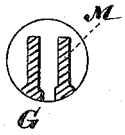


FIG. 8.

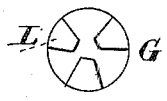


FIG. 9.

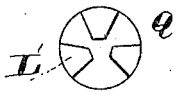


FIG. 6.

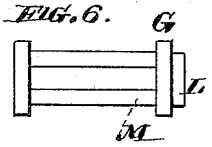


FIG. 7.

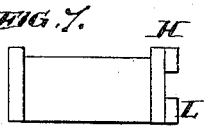


FIG. 10.

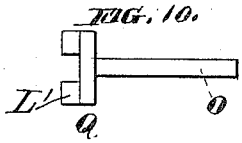
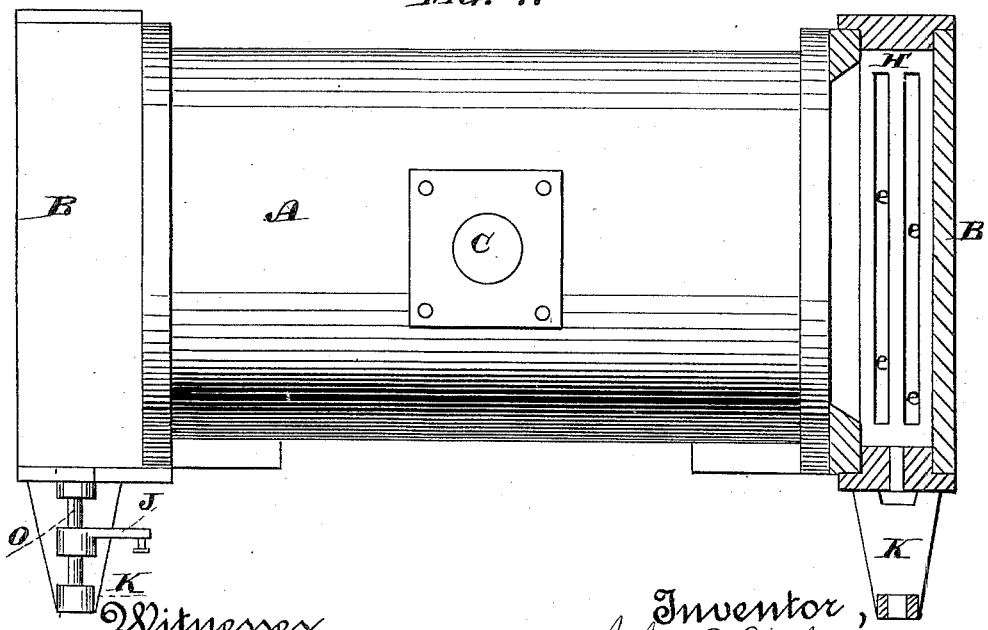


FIG. 4.



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STEAM ENGINE.

No. 302,636. Patented July 29, 1884.

FIG. 11.

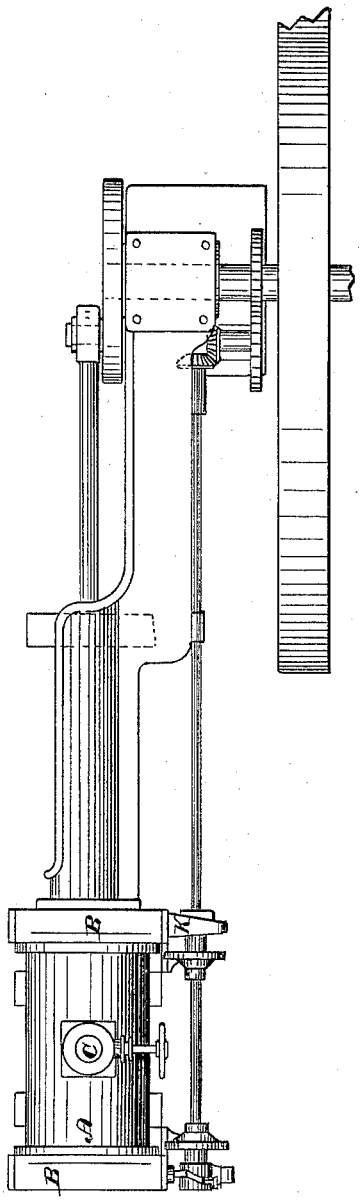
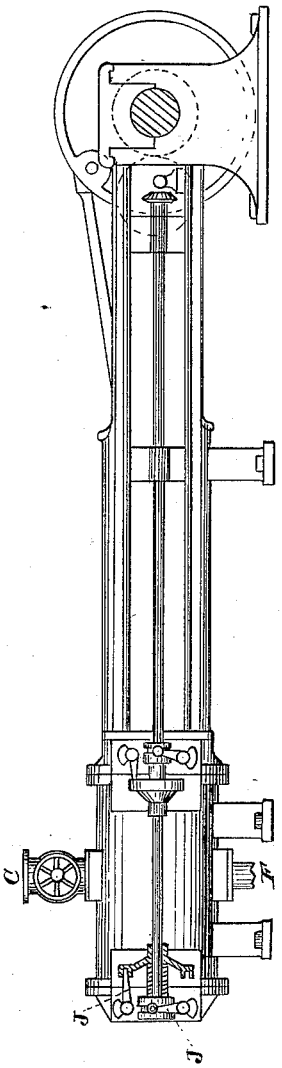


FIG. 12.



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UNITED STATES PATENT OFFICE.

JOHN B. PITCHFORD, OF SAN FRANCISCO, CALIFORNIA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 302,636, dated July 29, 1884.

Application filed March 21, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN B. PITCHFORD, of the city and county of San Francisco, State of California, have invented an Improved Steam-Engine; and I hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to certain improvements in steam-engines, which are more especially applicable to that class having independent rotary steam and exhaust valves; and it consists of certain improvements in the rotary valves and the ports by which the steam is admitted to the cylinder and exhausted therefrom; of a means for driving said valves, and of certain improvements in the cylinder and the cylinder-heads within which the valves operate, and the steam and exhaust passages, all of which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is an end elevation of the cylinder-heads showing the valve-chamber covers and brackets. Fig. 2 is a longitudinal view of the steam-cylinder, (part section,) showing one head in elevation and one in section with valves inside. Fig. 3 is a transverse section of the steam-cylinder with view of ports in head, as seen from the inside. Fig. 4 is a longitudinal plan of cylinder with a sectional view of one head through the exhaust-valve chamber. Fig. 5 is a transverse section of valve. Fig. 6 is a plan of valve. Fig. 7 is an elevation of valve. Fig. 8 is an end view of valve, showing clutches. Fig. 9 is an end view of clutches on valve-spindle; Fig. 10, elevation of valve-spindle. Fig. 11 is a plan view of an engine, showing one method of driving the valves. Fig. 12 is a longitudinal elevation of an engine designed with rotary valves.

A is the cylinder of my engine, which is cast with a double shell, so as to provide a passage, D, leading from the steam-inlet pipe C to the chambers within the heads in which the steam-valves are fitted, and a passage, E, around the lower portion of the cylinder leading from the exhaust-valve chambers to the exhaust-discharge pipe at F. The steam and exhaust passages are separated by partitions or diaphragms P, and as the steam and exhaust passages entirely surround the cylinder, the steam passing through them serves to keep the cylinder hot, and assists to prevent radiation. By this construction I form large straight passages, and avoid the use of small crooked cores in molding cylinders, which often cause flaws and the loss of a casting. The amount of machine-work upon the cylinder is also reduced, since the valve seats and passages are formed entirely in the detachable cylinder-head.

The steam-valves G and exhaust H are fitted into chambers G′ and H′, respectively, which are formed transversely across the heads B of the cylinder, as shown. These valve-chambers are connected with the main steam and exhaust passages D and E, by short passages D′ E′, formed in the heads, so as to correspond with the main passages when the heads are bolted on. From the steam-valve chambers narrow passages *d d* lead directly into the cylinder, and wider passages *e* lead into the exhaust-valve chambers. Narrow passages E′ lead from the exhaust-valve chambers to the passages E. All these passages are made as long transversely of the cylinder-heads as the diameter of the cylinder will allow, to provide a free passage for the steam.

In order to reduce the amount of motion necessary for a full opening and closing of the ports, instead of one wide port I form two or more narrow ones, *d e*, the united area of which will give the necessary size for the steam-passages. The valves G and H have bars M, extending longitudinally between the disks which form the ends. There are as many of these bars as there are ports, and they are of such a width, and are separated by such spaces in each, as to close and open the ports simultaneously and have the proper amount of lap and lead. The valve-chambers are bored out and the faces of the bars M turned to correspond and so that they may seat properly. The end disks, G and H, from which the valves are driven, have projections L, with corresponding depressions between them, into which similarly-shaped projections, L′, fit. These projections are formed upon the faces of disks Q, which are fixed to the stems O, and they thus form clutches which drive the valves, but at the same time allow them sufficient movement to seat themselves properly over

the ports. The stems O extend out through the steam-chest covers as shown, and their outer ends are supported by brackets K, which are cast with or bolted to the steam-chest covers, as shown.

J are the valve-stem levers or rocker-arms by which power is communicated to rotate the valves. By thus forming the cylinder-heads with the valve-chambers and short ports within them, the distance from the valves to the cylinder is materially reduced. By the ports being formed in the heads, if a casting should be spoiled it is of much less consequence than the loss of a cylinder. On account of the straight large passages, it is not likely to occur.

In large engines the amount of machine-work upon the cylinder is a matter of considerable expense; but in my engine the most of this work is done upon the heads, which, being comparatively small, are more easily handled, and from their shape are more easily adapted to machines which will do the required work.

If a valve becomes deranged or needs repairs, it may be easily removed without disturbing the remainder of the machinery, as it can be disengaged from the clutch device L.

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

In a steam-engine, the cylinder having a double shell and detachable heads, the double inlet-passages *d d*, and the double valve G, adapted to close and open, both passages and valves being situated in the detachable cylinder-head.

In witness whereof I have hereunto set my hand.

J. B. PITCHFORD.

Witnesses:
S. H. NOURSE,
J. H. BLOOD.