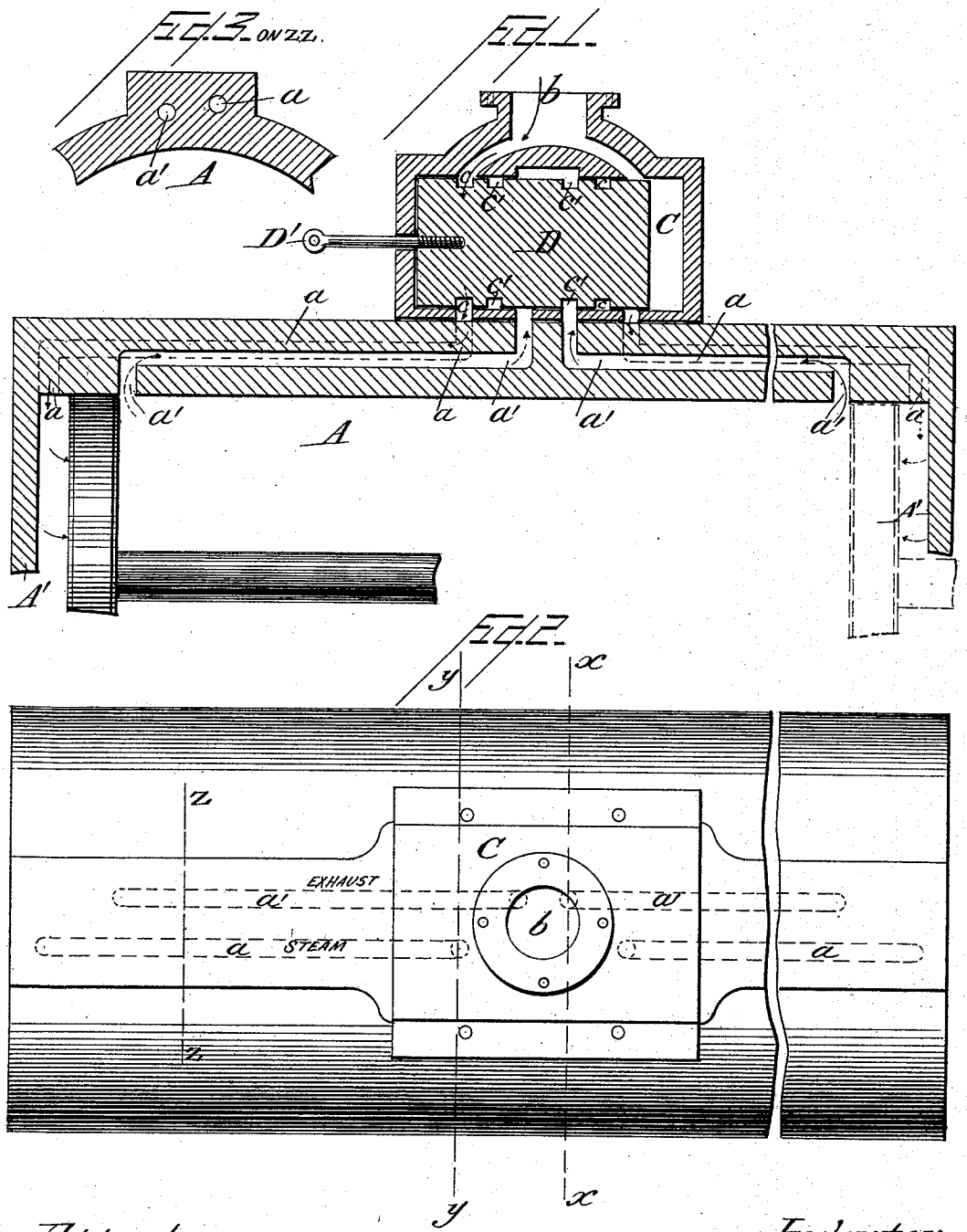
(No Model.) 2 Sheets—Sheet 1.

D. BURNS.

STEAM ENGINE.

No. 416,823. Patented Dec. 10, 1889



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(No Model.) 2 Sheets—Sheet 2.

D. BURNS.

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Fig. 4.

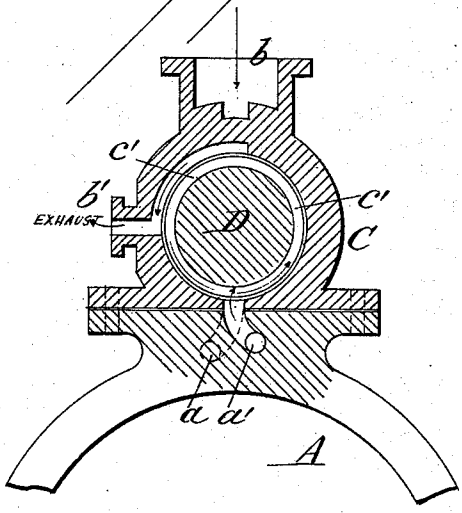
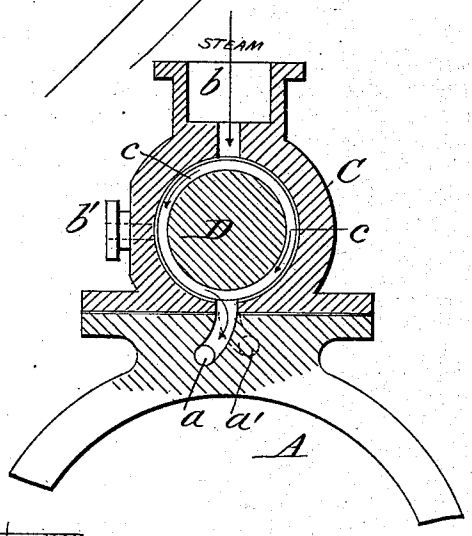


Fig. 5.



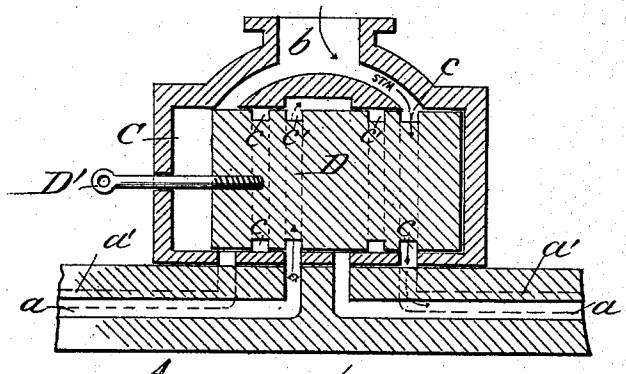


Fig. 6.

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UNITED STATES PATENT OFFICE.

DAVID BURNS, OF MUSKEGON, MICHIGAN.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 416,823, dated December 10, 1889.

Application filed March 20, 1889. Serial No. 304,005. (No model.)

To all whom it may concern:

Be it known that I, DAVID BURNS, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Steam-Engines, of which the following is such a full, clear, and exact description as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which illustrate the construction and arrangement of the different parts.

The general features and purposes of this invention are to furnish a perfect cushion for the piston at both ends of its stroke, which is accomplished by closing the exhaust-port before the piston reaches the end of the cylinder, thus inclosing a portion of the exhaust-steam, which is compressed by the continued movement of the piston. To produce this result, the cylinder is provided with separate and distinct passages for the transmission of live and exhaust steam from its interior to and from the steam-chest, the passages for live steam terminating in the usual manner in close contiguity with the cylinder-heads, while the exhaust-passages open into the interior of the cylinder at a distance of more than the thickness of the piston from said heads. Thus when the piston in its reciprocations reaches said openings they are closed by it and further escape of steam from that end of the cylinder prevented. As the valve which admits steam must be in position to admit live steam instantly upon the piston reaching the end of its stroke, it becomes necessary to close the exhaust-opening at the end receiving steam. This is accomplished by the movement of the valve in the steam-chest, said valve being provided with four separate and distinct ports, the two nearest the middle being for the exhaust—one for each end of the cylinder—and the end ports controlling the admission of live steam. By this construction of valve and the two separate ports and passages for each end of the cylinder the movements of the valve are made to fully control the admission and exit of steam from said cylinder.

In the drawings, in which similar letters of reference indicate like parts in the different figures, Figure 1 is a side elevation of a cylinder and steam-chest constructed in accordance with my invention. Fig. 2 is a longitudinal section through the cylinder, steam-chest, and valves, showing the relative positions of the different parts and passages in the same. Fig. 3 is a vertical transverse section on line $x\ x$ of Fig. 1. Fig. 4 is a similar section on line $y\ y$, Fig. 1. Fig. 5 is a plan with the position of the several ports and passages indicated by dotted lines; and Fig. 6 is a section of valve and chest, showing the valve in another position.

In the figures, A represents the steam-cylinder, and B the piston which reciprocates within said cylinder.

$a\ a$ represent the passages through the cylinder which conduct live steam from the steam-chest C, and $a'\ a'$ the exhaust-passages, through which the steam makes its exit. As will be observed, these passages run parallel and are formed in the usual way by cores inserted in the mold when the cylinder is cast. As heretofore stated, the live-steam passages $a\ a$ enter the cylinder in close proximity to the heads A′ of the same, the exhaust-passages $a'\ a'$ opening at a certain distance, which distance may be varied as it is desired to give more or less cushioning to the piston, as the greater the distance from the head to the opening the larger will be the amount of steam inclosed between the cylinder-head and piston and consequent resistance to the movement of the same. The valve D, by which the movement of the piston is controlled, is preferably of the cylindrical or piston variety, and is inclosed within the cylindrical chamber of the steam-chest C, which steam-chest is provided with an opening b, through which live steam enters the chest, and with another opening b', through which the exhaust-steam escapes.

The valve D is provided with four encircling grooves, two of which $c\ c$ form the openings or ports through which live steam enters the passages $a\ a$, leading to the cylinder, and the grooves $c'\ c'$ those through which the exhaust-steam escapes to the exit-opening b'. With the exception of these grooves turned in its periphery, the valve is a plain cylinder of equal diameter from end to end, having a

smooth outer surface that fits snugly the bored chamber of the steam-chest from one port or groove to another, but not so tightly as to prevent its ready reciprocation by means of an eccentric and the valve-rod D′.

The operation of the mechanism is plainly illustrated in Fig. 2 of the drawings, in which the piston is shown as having passed the exhaust-opening at one end of the cylinder, and consequently compressing the steam between it and the cylinder-head. The valve is also nearly in position to admit steam to this end for the purpose of reversing the movement of the piston, the exhaust-passage at this end being closed and that at the opposite end of the cylinder opened to allow the escape of steam from before the returning piston.

It will be apparent that the construction of the other portions of the engine may be of any of the many kinds in use, and does not, therefore, need a description in detail; and, further, that the details of construction in the parts above fully described may be varied in many ways without departing from the spirit of my invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent the following:

1. As an improvement in steam-cylinders, the cylinder provided at each end with a separate steam and exhaust port, the steam-port being situated at the extreme end of the cylinder and the exhaust-port at a distance of about the thickness of the portion from it, in combination with a four-ported circular valve adapted to close one of the exhaust-passages and prevent the escape of live steam until the piston shall have reached the end of the stroke, substantially as shown and described.

2. As an improvement in steam-cylinders, the combination of a steam-cylinder provided with two exhaust and two steam passages, all ending at different points in the length of said cylinder, with the cylindrical steam-chest and valve having four encircling grooves or ports moving in said steam-chest, all arranged and operating substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

DAVID BURNS.

Witnesses:
THOMAS HUME,
MARTIN DOWD.