

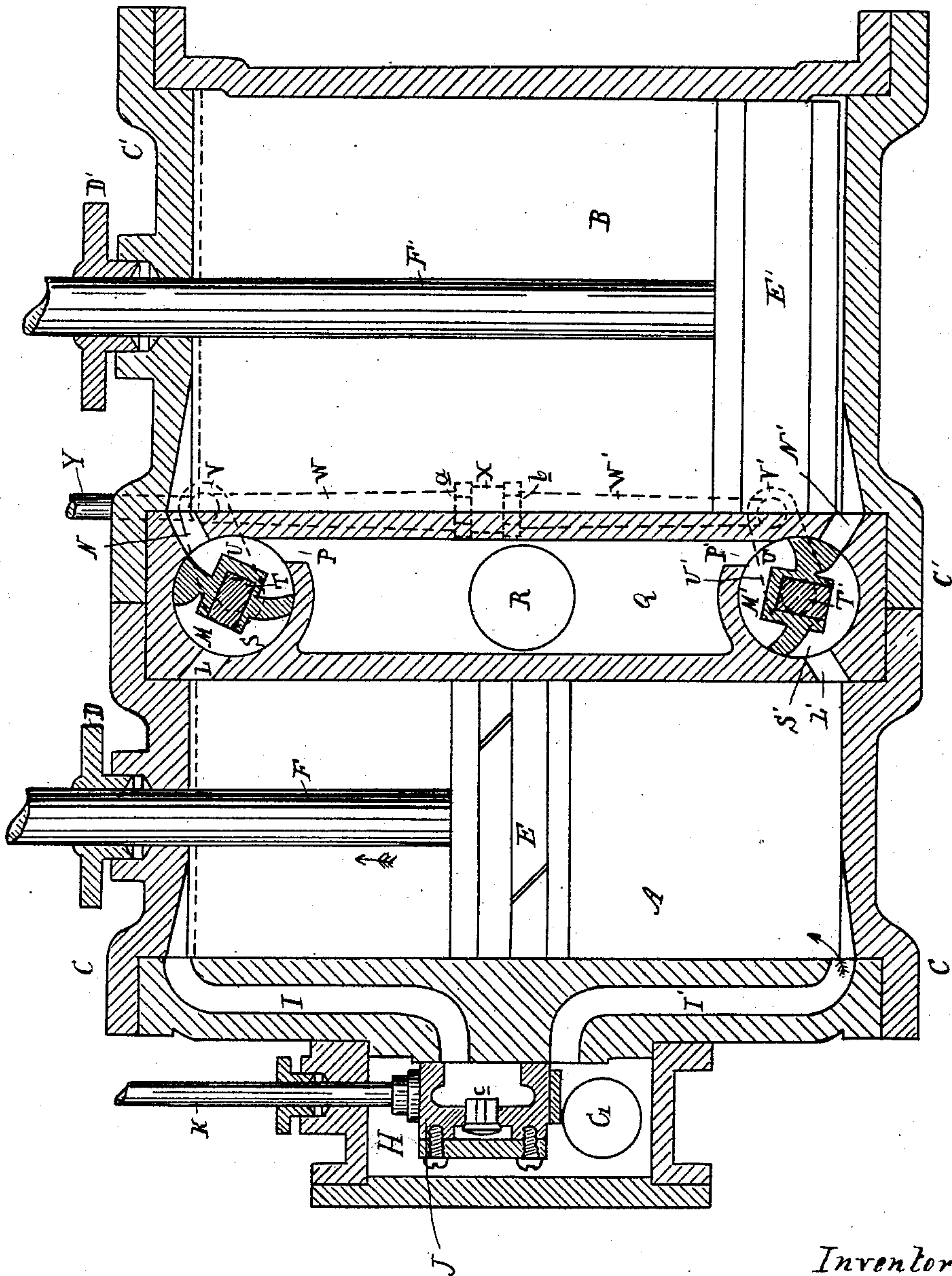
(No Model.)

C. B. TURNER.

STEAM ENGINE.

No. 327,417.

Patented Sept. 29, 1885.



Attest:
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UNITED STATES PATENT OFFICE.

CHESTER B. TURNER, OF DETROIT, MICHIGAN, ASSIGNOR TO HENRY C. HODGES, CHARLES C. HODGES, CLARENCE B. HODGES, AND CHARLES H. HODGES, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 327,417, dated September 29, 1885.

Application filed June 4, 1885. (No model.)

To all whom it may concern:

Be it known that I, CHESTER B. TURNER, of Detroit, in the county of Wayne and State of Michigan, have invented new and useful
5 Improvements in Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing, which form a part of this specification.

10 This invention relates to certain new and useful improvements in the construction of steam-engines of the double or compound type.

The novelty consists in the peculiar combination and the construction and arrangement of parts, hereinafter more fully described and claimed.

In the accompanying drawing, A represents what may be termed the "direct-pressure cylinder," and B the other cylinder, which
20 may be termed the "expansion-cylinder." These cylinders are of equal length, but the latter is of nearly or quite double the interior area of the former, and each is provided with heads C C', stuffing-boxes D D', pistons E E',
25 and piston-rods F F', of any of the known and approved constructions.

H is a steam-chest, having an inlet steam-port, G, and ports I and I' lead from this steam-chest, the former into one end of the
30 cylinder A and the latter into the opposite end of the same.

J is a slide-valve connected with an eccentric-rod, K, by means of which, in its reciprocation, it will alternately close and disclose
35 the ports I and I'.

Ports L and L' lead from the cylinder A, one at either end thereof, to the valve-chambers M and M', from which other ports, N and N', lead to the ends of the cylinder B, and
40 ports P and P' lead to the chamber Q, which is located between the valve-chambers M and M', and in the dividing-wall between the two cylinders A and B, and which has an exhaust-port, R, leading to the outer atmosphere.

45 The valve-chambers M and M' are circular in form, and are provided with rotating wing-valves S and S', pivotally supported in their respective chambers, as shown, upon shafts T and T', suitably journaled in the walls of their

respective chambers. Each of these shafts T 50 and T' has cranks U and U' secured to its respective and projecting ends, which are provided with crank-pins V and V', respectively, such crank-pins being secured to the connecting-rod, which is formed of two parts, W and 55 W', which are connected together by means of an adjusting-nut, X, which has a right and left interior thread to engage with exterior threads, a and b, upon the two parts of the connecting-rod. This rod is secured to the end 60 of an eccentric-rod, Y, connecting with an eccentric upon the main shaft, which is not shown. The valves S and S' are so set that in the reciprocation of the rod which operates them they will alternately close or disclose the 65 ports N and N' and P and P', as more fully described in the description of the operation.

It will be observed in the drawings that the piston in the cylinder A is at half-stroke, with steam entering the port I', while in the cylinder B the piston is at the end of its stroke, 70 with the ports N and P open to allow the steam in such cylinder, upon the commencement of the return-stroke of its piston, to pass to the exhaust. As the piston E in the cylinder A 75 progresses in the direction of the arrow from the position shown, the valve in the steam-chest gradually closes the port I', and the valve in the valve-chamber M' discloses the port N', so that the steam in the cylinder A, which is 80 actuating the piston under the boiler-pressure, will pass to the cylinder B, and start its piston E' in its travel. By the time the piston E has reached the end of its stroke in the direction indicated by the arrow, the port I' has 85 been closed and the port I disclosed, and now the steam which has driven the piston E to the end of its stroke is passing to the cylinder B, and compelling, by expansion, the piston thereof to complete its stroke, this piston 90 being at half-stroke when the piston in the other cylinder is at the end of the stroke. Thus it will be seen that the steam may be worked by direct pressure in both cylinders simultaneously while both pistons are travel- 95 ing in the same direction. When the parts are in the position shown in the drawings, with the piston in the cylinder A advancing in the

direction of the arrow, there is no opportunity for the steam to pass through the valve-chamber M to the other cylinder, or to the exhaust; hence it is compressed between the cylinder A and its head. Now, when this compression is sufficient to overcome the boiler-pressure upon the valve in the steam-chest, this compressed steam will pass through the port I, and raising the check-valve c in the slide-valve in the steam-chest, discharge such steam in the steam-chest, where it will pass with the live steam through the port I' and not be lost.

I have illustrated but a single figure, but that, with the following description of the operation, will make the invention apparent. In the figure the piston E is shown to have made one-half its upstroke, and the piston E' to have completed its downward stroke. The valve-eccentrics are so arranged as to quickly open the port N' between the two cylinders A B at about this point of the operation, but the feed-valve J does not close the port I' until the piston E has about completed its stroke, so that as the piston E passes from the point shown in the drawing, it has behind it, in cylinder A, the steam from the chest at approximate boiler-pressure, as also has piston E', the port N' being open. The port I' closes and the port I discloses when the piston E has finished its stroke; but the port N' is not closed so quickly, and allows steam from the lower part of the cylinder A, upon a large part of the first half of the downward stroke of the piston E, to pass from said cylinder to cylinder B, behind piston E', to make that piston complete its stroke. The port I' is closed slightly before either the piston E has made one-half its downward stroke or the piston E' has completed its upstroke, and the expansion of the steam in B finishes the stroke of piston E', where the reduced pressure in cylinder A makes a cushion, any surplus passing back to steam-chest, as described. Thus the first of the stroke of piston E' and nearly the whole stroke of piston E in either direction are made by steam at nearly boiler-pressure passing from A to B after piston E has made one-half its stroke, and continuing to thus pass until said piston has returned to that position, the cylinder A for the first half of the stroke of piston E exhausting into cylinder B.

A cut-off may be arranged that will cut off the steam at any desired point in the stroke of the piston in the cylinder A, so that the engine can be compounded, working live steam in the smaller and steam by expansion in the larger cylinder, if desired.

I do not desire in this application to claim the check-valve in a slide-valve, as I propose to make that specific feature the subject-matter of another application.

I am aware of Patent No. 321,325, granted to I. A. Turner June 30, 1885. My invention is designed as an improvement upon the construction therein set forth.

I am aware of the patent to Massey, No. 252,485, and make no claim to the construction shown therein as forming part of my invention.

What I claim as my invention is—

1. In a steam-engine, the combination, with two cylinders, as A B, arranged side by side, and having valve-chambers and connecting-ports near each end, of valves, as M M', arranged and operated automatically to admit steam from one cylinder to the other after the piston in the first has made a part of its stroke, as set forth.

2. In a steam-engine, the combination, with two cylinders, as A B, arranged side by side, with an exhaust-chamber between and having connecting-ports, as L N P L' N' P', of valves M M', arranged between the cylinders, near each end, and operated automatically to open the passage to the exhaust-chamber, and between the two cylinders alternately, as set forth.

3. In a steam-engine, the combination, with two cylinders of different areas, arranged side by side, and having connecting-channels near each end, of an exhaust-chamber arranged between the two cylinders, and having connections with the connecting-channels between the cylinders and valves arranged to control such passages, as set forth.

4. A double engine constructed substantially as described, and having an exhaust-chamber located between the two cylinders, in combination with valve-chambers located in each end of such exhaust-chamber, valves located in such valve-chambers, such valves being connected together by means of an adjustable connecting-rod operated by an eccentric upon the main shaft, substantially as and for the purposes described.

5. A steam-engine having two cylinders of different areas side by side, with heads, pistons, piston-heads, and stuffing-boxes, in combination with a steam-chest, H, having an inlet-port, G, and a slide-valve, ports I I' L L' N N' P P', valve-chambers M M', located at either end of the exhaust-chamber Q, and in the division-wall between such two cylinders, valves S, connected with the adjustable connecting-rod formed of the two parts W W', adjustably secured together by the nut X, the parts being constructed, arranged, and operating, substantially as and for the purpose described.

CHESTER B. TURNER.

Witnesses:

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