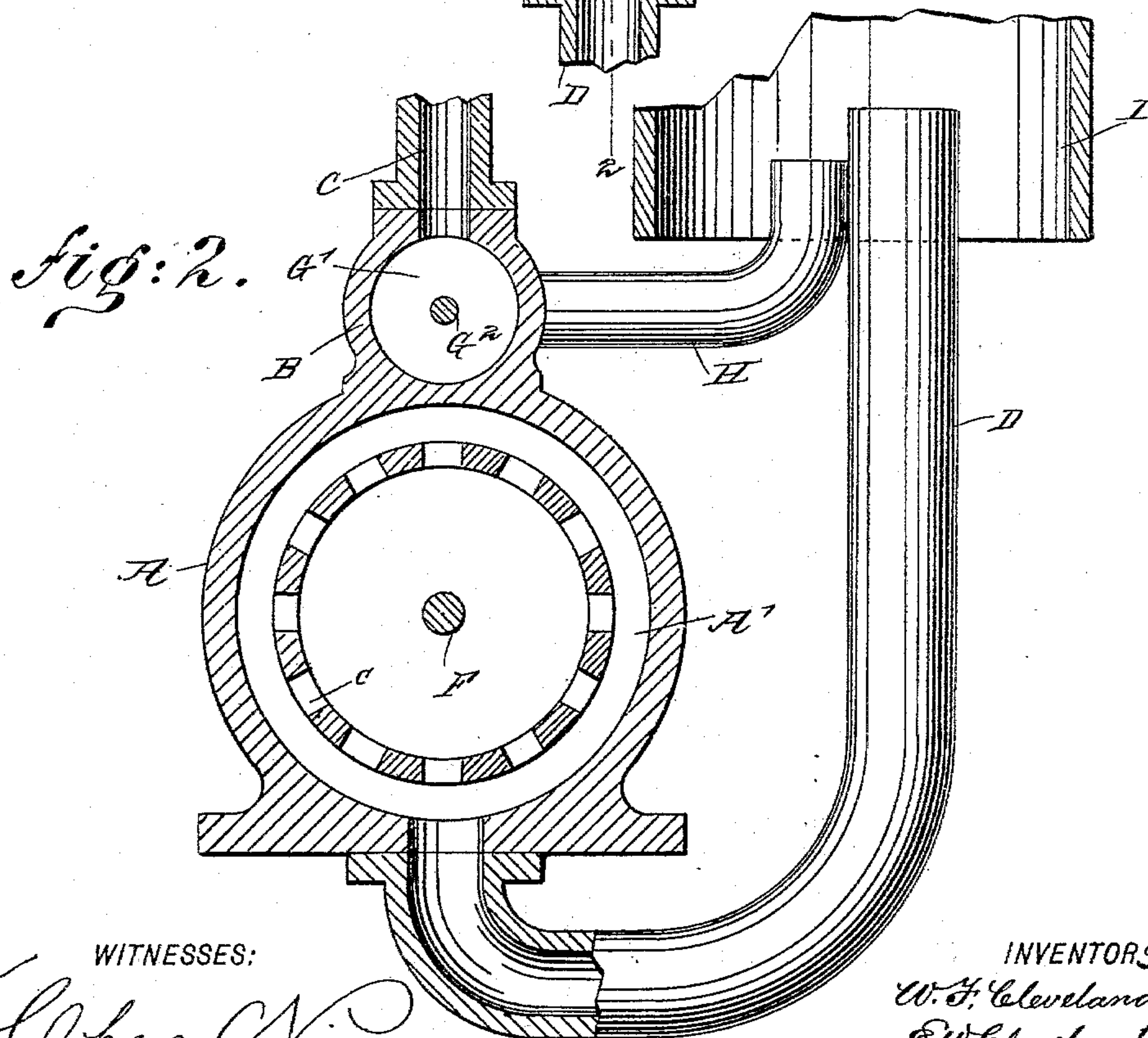
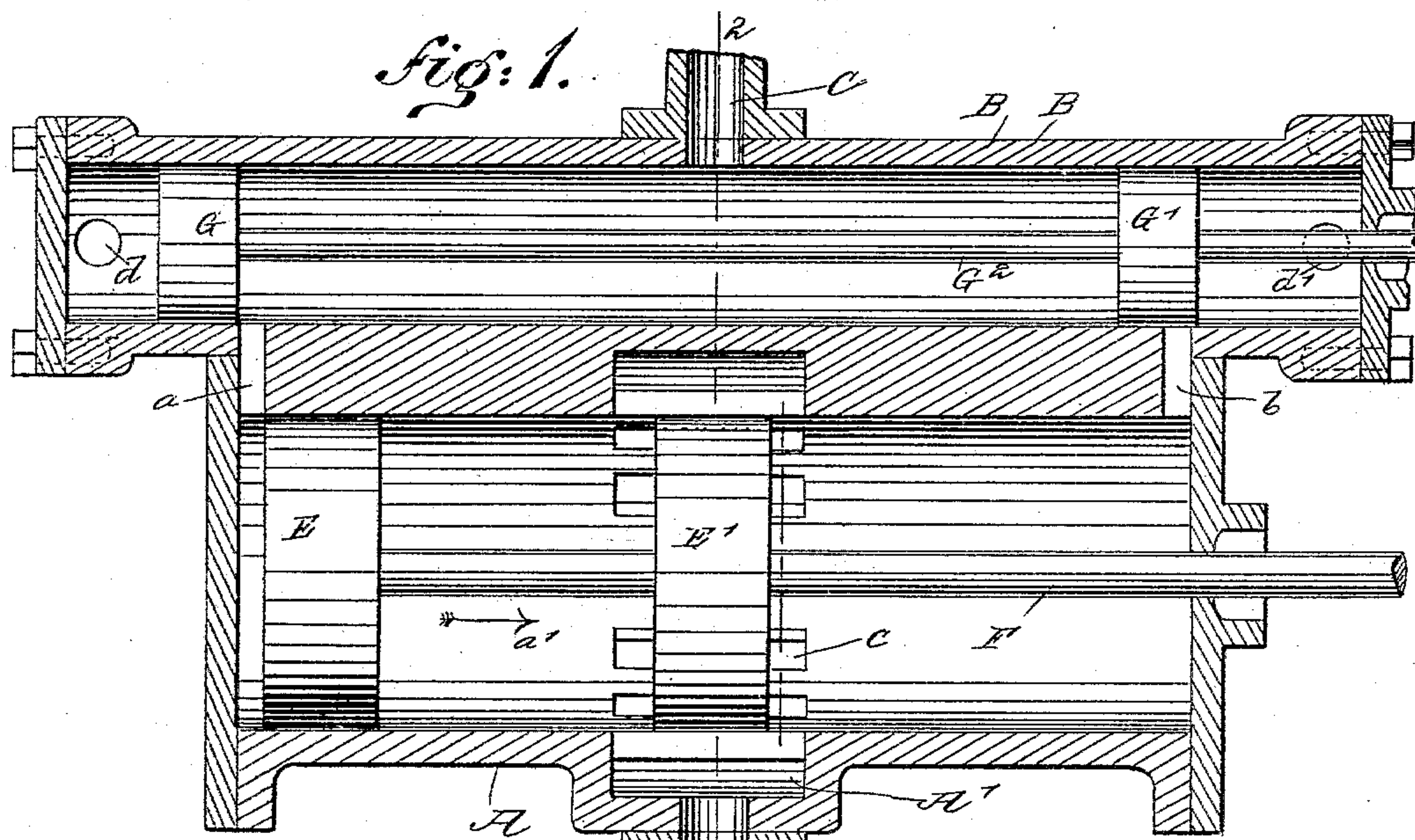


(No Model.)

W. F. & E. W. CLEVELAND.
STEAM ENGINE.

No. 551,262.

Patented Dec. 10, 1895.



WITNESSES:

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UNITED STATES PATENT OFFICE.

WILLIAM FITCH CLEVELAND AND EUGENE WYMAN CLEVELAND, OF
ROUNTHWAITE, ASSIGNORS OF ONE-THIRD TO ANCUS MARTIUS
PETERSON, OF BRANDON, CANADA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 551,262, dated December 10, 1895.

Application filed July 3, 1895. Serial No. 554,899. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM FITCH CLEVELAND and EUGENE WYMAN CLEVELAND, subjects of the Queen of Great Britain, residing at Rounthwaite, in the Province of Manitoba and Dominion of Canada, have invented a new and Improved Steam-Engine, of which the following is a full, clear, and exact description.

10 The object of the invention is to provide a new and improved steam-engine which is simple and durable in construction, very effective in operation, arranged to utilize the motive agent to the fullest advantage, and to
15 reduce back pressure in the cylinder to a minimum.

The invention consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then
20 pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in both the figures.
25

Figure 1 is a sectional side elevation of the improvement, and Fig. 2 is a transverse section of the same on the line 2 2 of Fig. 1.

The improved steam-engine is provided
30 with a cylinder A, having at its ends the inlet-ports *a* and *b* opening into a steam-chest B, preferably made cylindrical, and provided at or near its middle with a steam-supply pipe C, connected with a boiler or other source
35 of steam-supply. At or near the middle of the cylinder A are arranged the main exhaust-ports *c*, opening into an annular chamber A', formed in the cylinder A, the said chamber being connected with an exhaust-pipe D.

40 In the cylinder A are arranged to slide the two pistons E and E', placed a suitable distance apart, and secured on a piston-rod F, connected in the usual manner with the main driving-shaft of the engine. In the steam-
45 chest B is arranged a piston-valve, formed with two pistons G and G', placed a suitable distance apart, and secured on a valve-stem G², connected at its outer end by a suitable mechanism with the main driving-shaft of
50 the engine, so as to impart an intermittent

reciprocating motion to the said piston-valve, to cause the pistons G and G' to properly open and close the ports *a* and *b*.

In the ends of the steam-chest B are arranged auxiliary ports *d d'*, adapted to ex-
55 haust part of the steam from the ends of the cylinder A, as hereinafter more fully described.

When the several parts are in the position shown in Fig. 1, the motive agent passes
60 through the supply-pipe C into the steam-chest B, between the pistons G and G' of the piston-valve, and passes through the open port *a* into the left-hand end of the cylinder A to exert its pressure against the outer face
65 of the piston E to force the latter to the right in the direction of the arrow *a'*. As both pistons E and E' are on the same piston-rod F, they move simultaneously.

When the piston E leaves the left-hand
70 end of the cylinder A, then the piston-valve in the steam-chest B shifts to the left, so that the piston G' uncovers the port *b* and the exhaust-steam in the right-hand end of the cylinder A can pass through the port *b* into the
75 right-hand end of the steam-chest B and out through the port *d'* into the exhaust-pipe H, also connected with the other exhaust-port *d*. When the piston E moves upon the ex-
80 haust-ports *c* at the time the other piston E' is near the end of its stroke, then the piston-valve in the steam-chest B shifts to the right, so that the piston G' uncovers the port *b* and the other piston G closes or moves over the
85 port *a*. By a further movement to the right the piston E will pass onto the ports *c*—that is, into a position similar to the piston E' previous to the movement and as shown in Fig. 1, so that the steam in the left-hand end of
90 the cylinder A can pass through the ports *c*, the annular chamber A' and exhaust-pipe D to the outside. The exhaust-steam also passes into the space between the two pistons E and E', so that the pressure on the opposite faces of the said pistons is equal.
95

When the pistons E and E' are on the return stroke—that is, travel in the inverse direction of the arrow *a'*—then the piston during the first part of its movement passes
100 from the ports *c* and at that time the piston-

valve in the steam-chest B again shifts to the right, so that the piston G opens the port *a* to connect the left-hand end of the cylinder A with the left-hand end of the steam-chest B and with the exhaust-port *d*. Thus it will be seen that by the arrangement described a main exhaust takes place through the ports *c* and exhaust-pipe D, and an auxiliary exhaust takes place through the ports *a*, *d* and *b* and *d'*, respectively.

The exhaust-pipes D and H extend into the chimney or stack I of a locomotive, as indicated in Fig. 2, with the upper end of the exhaust-pipe D a short distance above the upper end of the pipe H, so that the exhaust-steam passing first through the pipe D into the chimney or stack I causes a suction over the pipe H to remove atmospheric pressure therefrom and insure a ready exhaust of the steam through the pipe H and the respective end of the steam-chest B, as previously explained. By this arrangement the pressure against the piston E and E' by the exhaust in either end of the cylinder is greatly reduced, and consequently very little, if any, back pressure exists in the engine. It will further be seen that by the main exhaust through the ports *c* the pressure in the cylinder by the exhaust is reduced to atmospheric pressure, and consequently the exhaust-steam passing through the ports *d* *d'* into the pipe H can readily pass into a condenser and be condensed therein without danger of back pressure. Furthermore, the arrangement permits of utilizing the exhaust-steam through the ports *c* for use in a second cylinder, to produce a compound engine, it being understood that this exhaust will not affect the workings of the pistons E E' by the expansion of steam in the second cylinder, as the pressure on both adjacent faces of the pistons E E' is equalized, as previously explained.

It will further be seen that the piston-valve in the steam-chest B is perfectly balanced as

the live steam passes on the adjacent faces of the pistons G and G' at all times.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. A steam engine comprising a cylinder provided at its ends with inlet ports also forming supplementary exhaust ports, the said cylinder being provided at or near its middle with a series of circumferentially arranged longitudinal slots or openings constituting the main exhaust, a double piston fitted to move in the said cylinder, each of the pistons when moving into an innermost position passing partly over the said main exhaust establishing communication between the end of the cylinder and the middle of the cylinder between the pistons, a steam chest into which open the said inlet ports, and provided at its ends with supplementary exhaust ports, and a piston valve fitted to slide in the steam chest and adapted to connect the said inlet ports of the cylinder alternately with the steam inlet and with the said supplementary exhaust ports in the ends of the steam chest substantially as shown and described.

2. A steam engine provided with a main exhaust pipe and a supplementary exhaust pipe for successively carrying the exhaust of the cylinder of the engine, the ends of the exhaust pipes being arranged alongside each other, the upper end of the main exhaust pipe extending above the upper end of the supplementary exhaust pipe, whereby the exhaust steam passing through the main exhaust pipe will create a suction over the supplementary exhaust pipe, substantially as shown and described.

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Witnesses:

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