(No Model.) 2 Sheets—Sheet 1.

W. F. & E. W. CLEVELAND.

STEAM ENGINE.

No. 602,392. Patented Apr. 12, 1898.

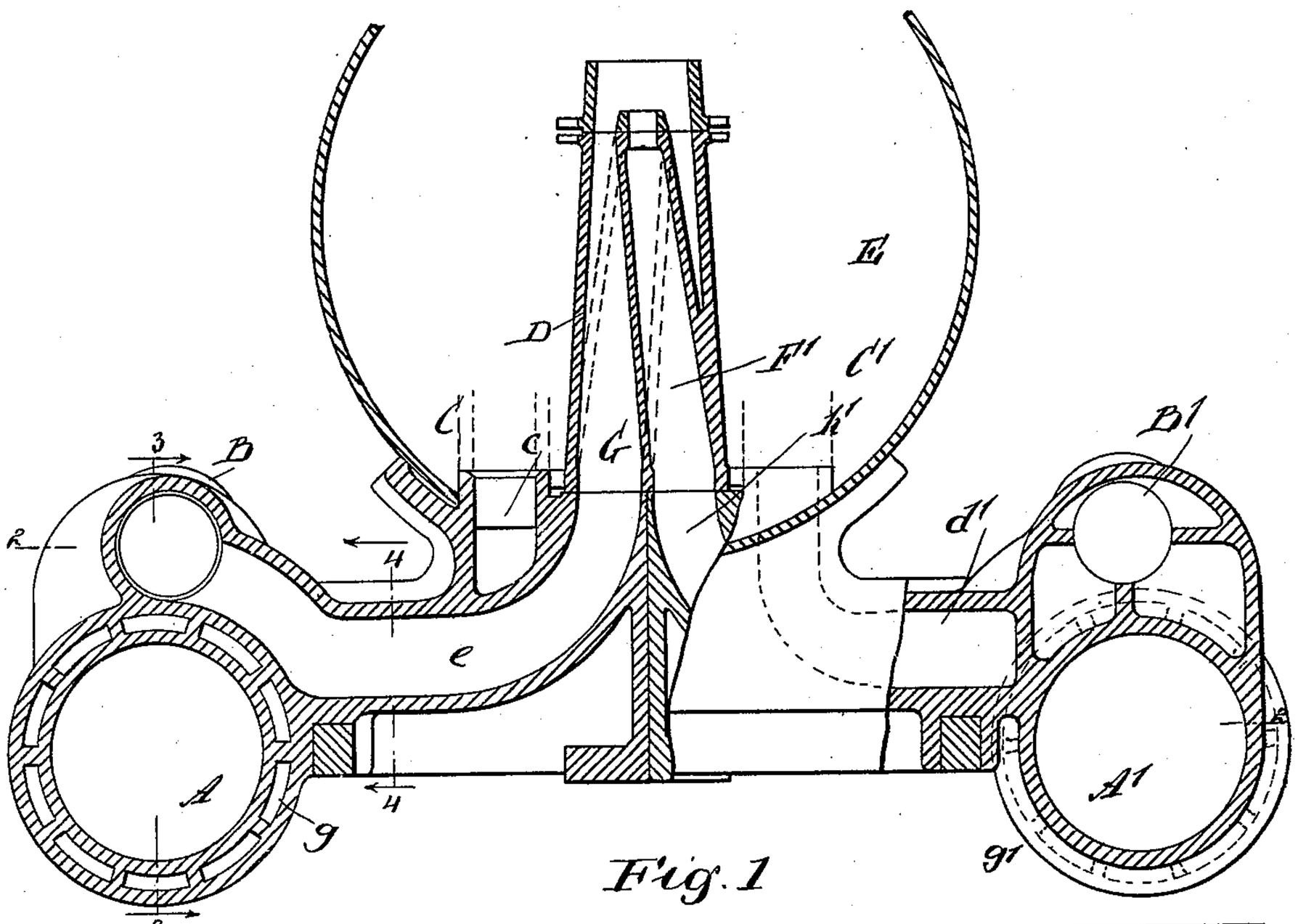

Fig. 1

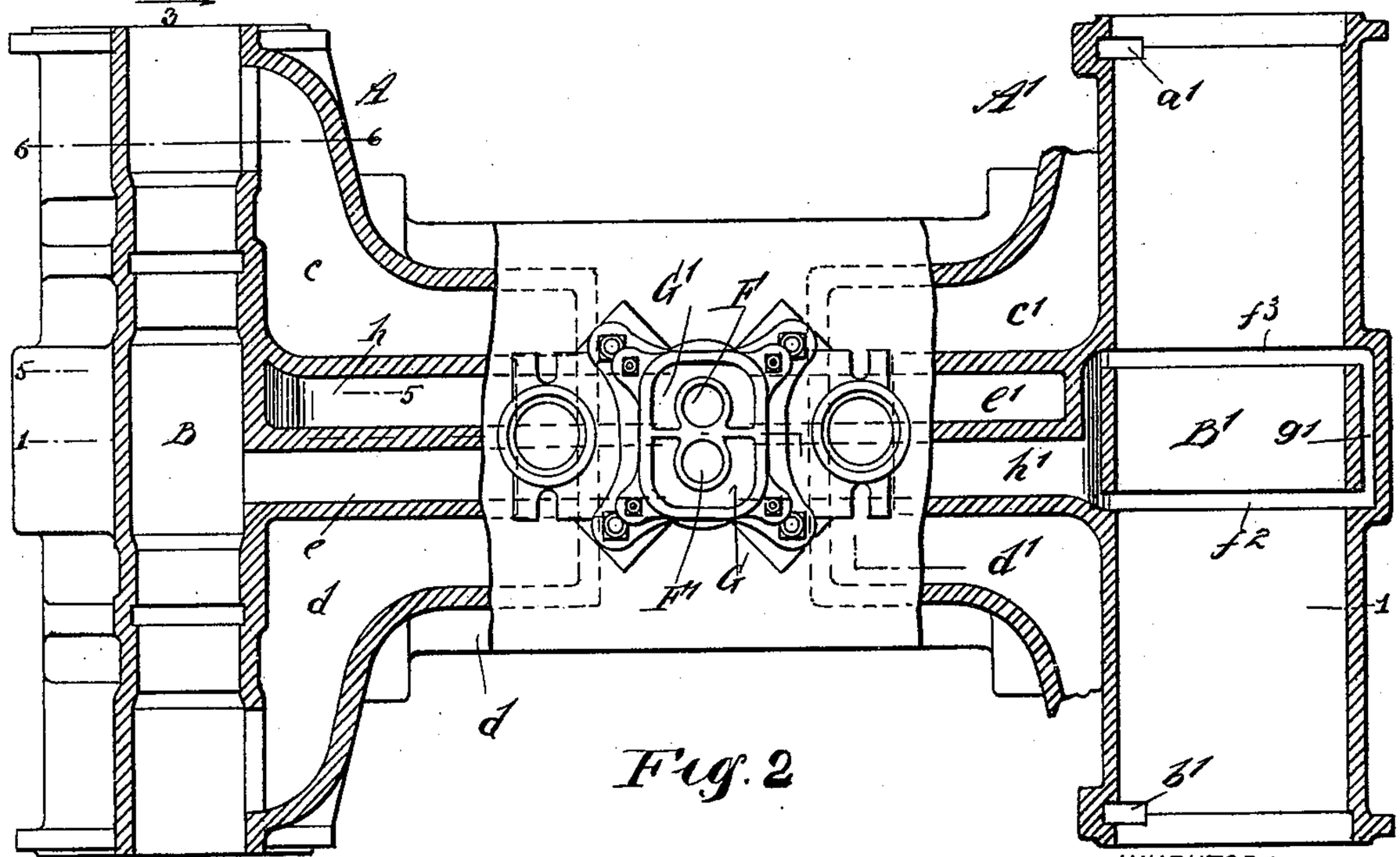

Fig. 2

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(No Model.) 2 Sheets—Sheet 2.

W. F. & E. W. CLEVELAND.

STEAM ENGINE.

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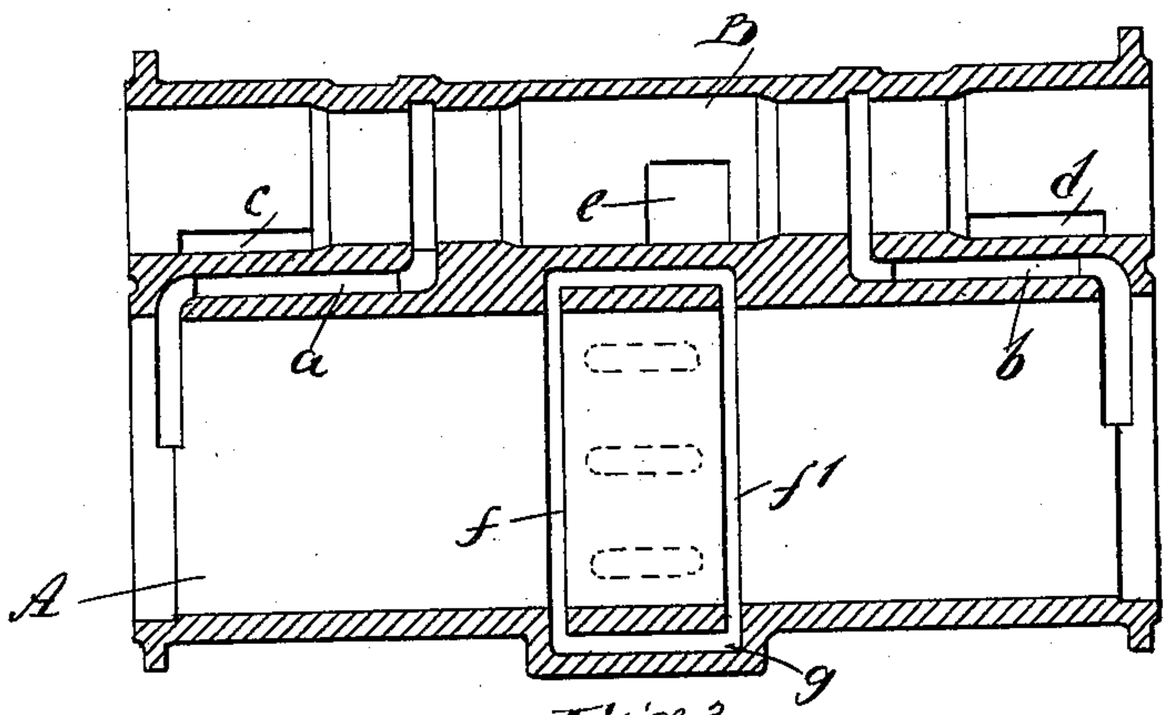

Fig. 3

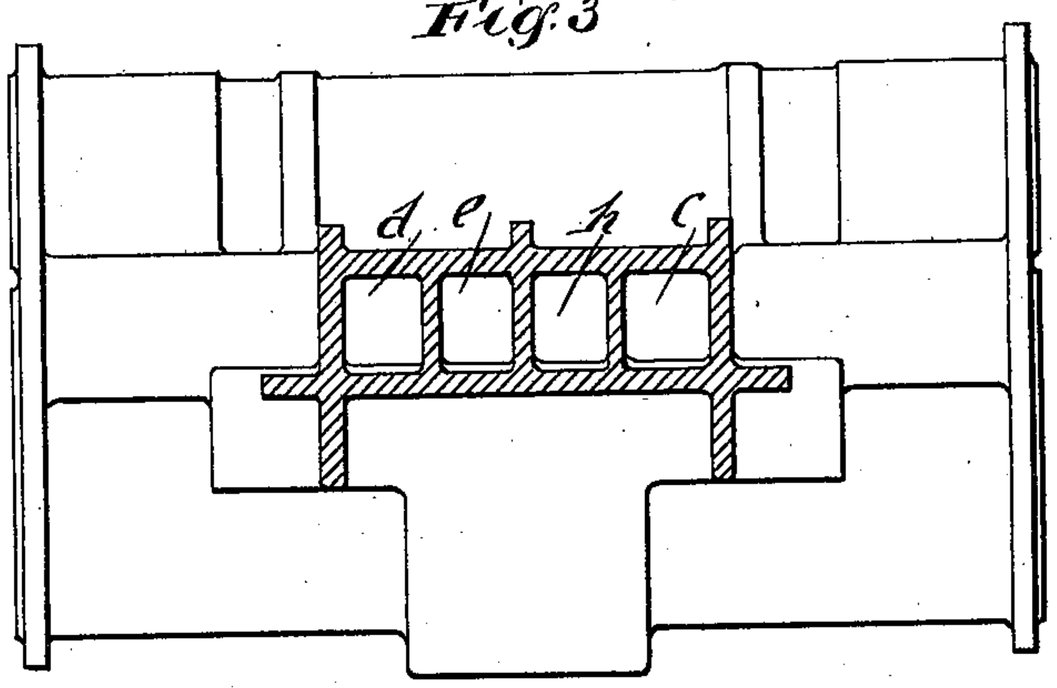

Fig. 4

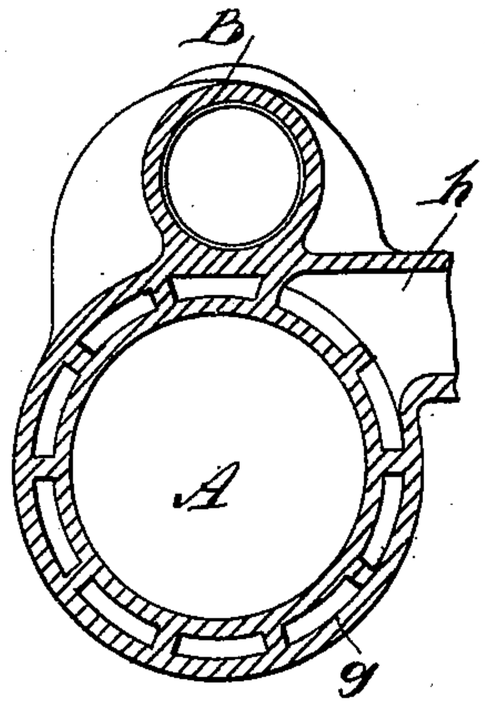

Fig. 5

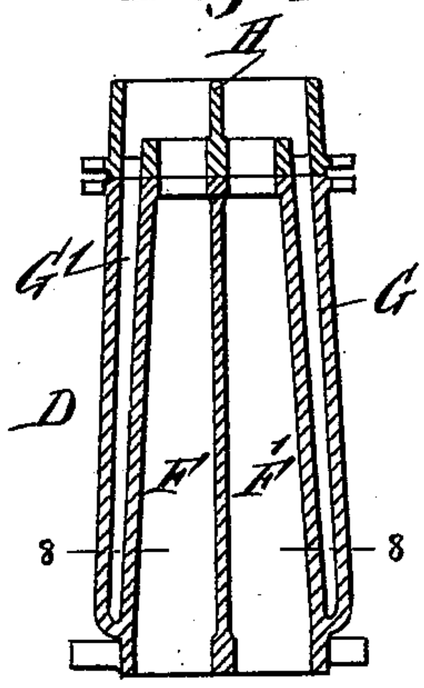

Fig. 7

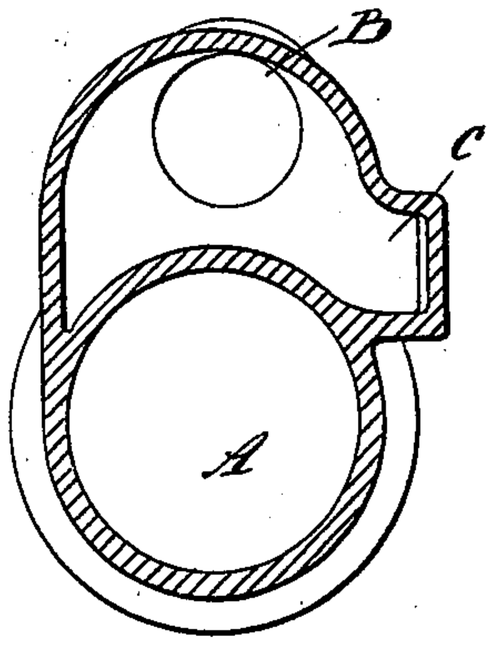

Fig. 6

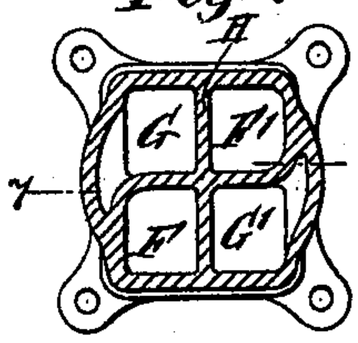

Fig. 8

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UNITED STATES PATENT OFFICE.

WILLIAM FITCH CLEVELAND AND EUGENE WYMAN CLEVELAND, OF ROUNTHWAITE, CANADA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 602,392, dated April 12, 1898.

Application filed July 22, 1897. Serial No. 645,568. (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, Dominion of Canada, have invented new and useful Improvements in Steam-Engines, of which the following is a full, clear, and exact description.

The invention relates to steam-engines, such as shown and described in Letters Patent of the United States No. 551,263, granted to us on December 10, 1895.

The object of the present invention is to provide certain new and useful improvements in steam-engines, more particularly a locomotive or tandem engine, and whereby a greater or a lesser vacuum is produced in the exhaust ends of the cylinder by an induction or suction action of the main or piston exhaust of one engine upon the valve or auxiliary exhaust of the other engine.

The invention consists principally of two cylinders provided with main or piston exhausts and auxiliary or valve exhausts arranged in such a manner that the main exhaust of one engine-cylinder produces a suction on the auxiliary exhaust of the other cylinder.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then 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 all the figures.

Figure 1 is a cross-section of the improvement on the line 1 1 of Fig. 2. Fig. 2 is a plan view of the same with parts in section on the line 2 2 in Fig. 1. Fig. 3 is a sectional side elevation of one of the cylinders on the line 3 3 of Fig. 1. Fig. 4 is a like view of the same on the line 4 4 of Fig. 1. Fig. 5 is a cross-section of one of the cylinders on the line 5 5 of Fig. 2. Fig. 6 is a like view of the same on the line 6 6 of Fig. 2. Fig. 7 is a sectional side elevation of the blast-pipe on the line 7 7 of Fig. 8, and Fig. 8 is a sectional plan view of the same on the line 8 8 of Fig. 7.

The locomotive-engines are provided with the cylinders A and A′, each having the cylinder-ports *a b* and *a′ b′*, respectively, for the admission of the live steam and the discharge of part of the exhaust-steam, the said ports leading to the steam-chests B and B′, formed or attached to the cylinders A and A′, respectively.

Into the ends of the steam-chests B and B′ open the live-steam ports *c d* and *c′ d′*, respectively, of which the ports *c d* are connected with the steam-supply pipe C and the other ports *c′ d′* are connected with a steam-supply pipe C′, the said pipes being arranged on opposite sides of the blast-pipe D, located in the smoke-box E of the boiler. (See Fig. 1.)

From the middle of the steam-chests B and B′ lead the piston or exhaust ports *e* and *e′*, respectively, leading to nozzles G and G′, respectively, formed within the blast-pipe D. At or near the middle of the cylinders A and A′ are arranged the annular main or piston exhaust ports *f f′* and f^2 f^3, respectively, of which the ports *f f′* of the cylinder A open into an annular chamber *g* and the ports f^2 f^3 of the other cylinder A′ open into an annular chamber *g′*, arranged on the said cylinder A′. The chambers *g g′* connect with channels *h h′*, respectively, opening into the nozzles F F′, respectively, formed in the blast-pipe D, but arranged in such a manner relative to the nozzles G G′ that the nozzle F′ is surrounded by the nozzle G and the nozzle F is surrounded by the nozzle G′, a partition H extending between the two sets of nozzles F G′ and F′ G, so as to completely separate the same. (See Fig. 7.)

Now it will be seen that the main or piston exhaust from the cylinder A in passing through the nozzle F creates a suction in the nozzle G′, through which passes the auxiliary or valve exhaust from the valve-exhaust chest B′ of the cylinder A′, and the main or piston exhaust from the cylinder A′ passes through the nozzle F′ to create a suction in the nozzle G, through which passes the auxiliary or valve exhaust from the exhaust-chest B of the cylinder A, it being understood that the piston-exhaust of one cylinder takes place

simultaneously with the valve-exhaust of the other cylinder.

By reference to Figs. 1 and 7 it will be seen that the main-exhaust nozzles F F′ have their upper ends somewhat below the upper ends of the surrounding auxiliary-exhaust nozzles G′ G, so that the main-exhaust steam from the cylinders creates considerable suction in the valve-exhaust chests B′ B to relieve the engine of all back pressure.

The annular ports *f f′*, as distinguished from the cylinder-ports *a b*, have a greater area opening into the exhaust in the same piston travel, so as to provide for a more instantaneous and complete release of the steam, and therefore the interval of time between the opening of the main exhaust and the opening of the valve-exhaust may be reduced, and a consequent reduction of the compression follows. This arrangement also results that by the more instantaneous exhaust the steam is converted into dry steam as distinguished from saturated steam, and thus the cooling effect of the water on the cylinder-walls, as well as all other forms of condensation, are avoided. The larger exhaust area, with prompter action and without dividing the steam, increases the velocity of the latter, or it is less retarded and heavier draft is produced.

The cylinders A A′ are provided with two pistons, and a double valve is arranged in each of the steam-chests B and B′, and the said pistons and valves operate in substantially the same manner as described in detail in the patent above referred to, so that further description of this part of the engine is not deemed necessary.

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

1. An engine having two cylinders provided with main or piston exhausts, and auxiliary or valve exhausts, arranged in such a manner that the main exhaust of one cylinder produces a suction on the auxiliary exhaust of the other cylinder, substantially as shown and described.

2. A steam-engine, comprising two cylinders provided with main or piston exhausts, a valve-chest for the said cylinders and having auxiliary or valve exhausts arranged relative to the said main or piston exhausts, so that the main exhaust of one cylinder produces a suction on the auxiliary exhaust of the exhaust-chest of the other cylinder, substantially as shown and described.

3. A steam-engine provided with two cylinders having main or piston exhausts, steam-chests for the said cylinders, and provided with auxiliary or valve exhausts, and a blast-pipe having a set of nozzles for the said main or piston exhausts, and a set of nozzles for the said auxiliary or valve exhausts, the nozzles being arranged in such a manner that the nozzle for the main exhaust of one cylinder is within the nozzle for the auxiliary exhaust of the other cylinder, substantially as shown and described.

4. A steam-engine provided with two cylinders having main or piston exhausts, steam-chests for the said cylinders, and provided with auxiliary or valve exhausts, a blast-pipe having a set of nozzles for the said main or piston exhausts, and a set of nozzles for the said auxiliary or valve exhausts, the nozzles being arranged in such a manner that the nozzle for the main exhaust of one cylinder is within the nozzle for the auxiliary exhaust of the other cylinder, and a partition for dividing the nozzle for the main exhaust of one cylinder and the nozzle for the auxiliary exhaust of the other cylinder from the corresponding set of nozzles on the opposite side of the partition, substantially as shown and described.

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EUGENE WYMAN CLEVELAND.

Witnesses:
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Mrs. FRANK SUTTON.