

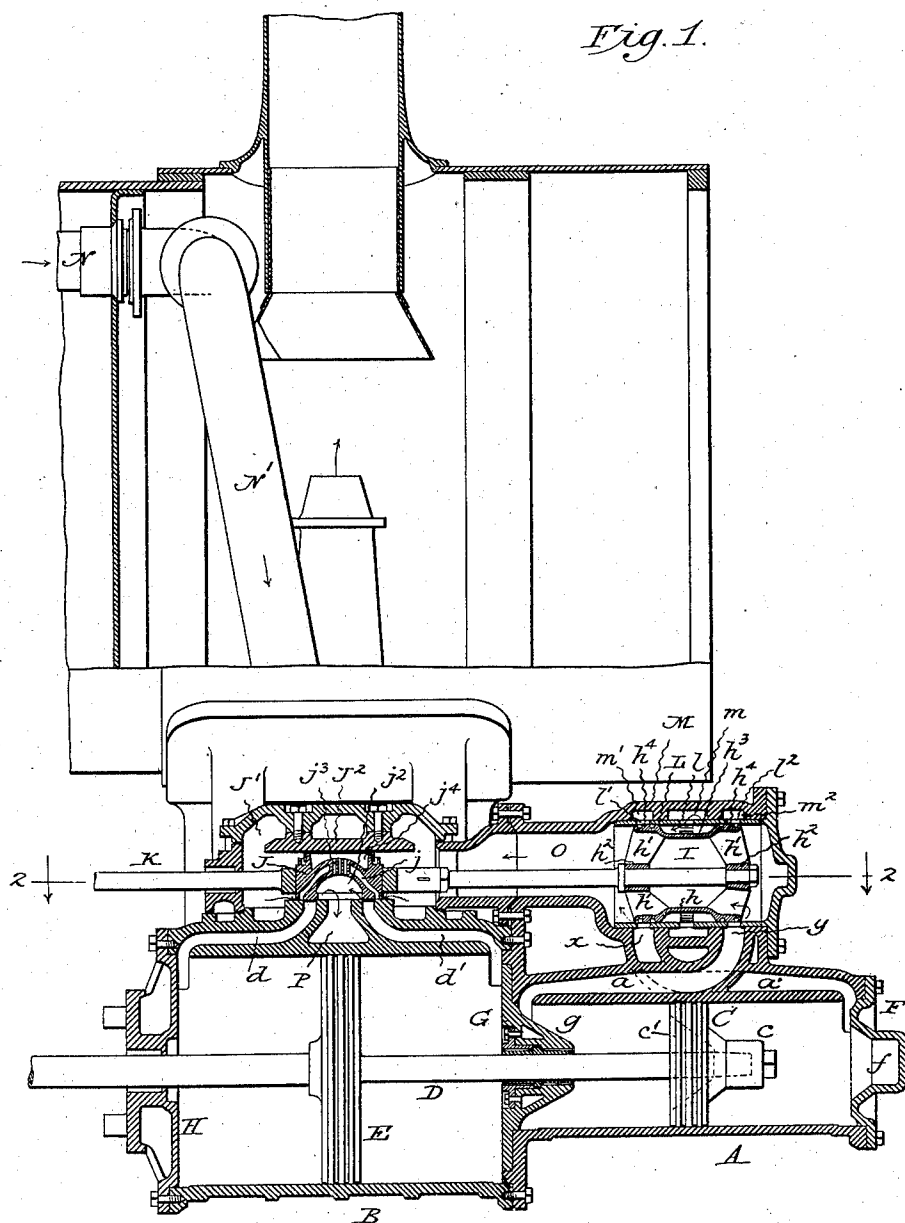
No. 741,838.

PATENTED OCT. 20, 1903.

J. E. SAGUE.
COMPOUND STEAM ENGINE.
APPLICATION FILED MAY 16, 1901.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses
A. M. Parkins
R. Ellsworth

Inventor
James E. Sague,
By his Attorneys,
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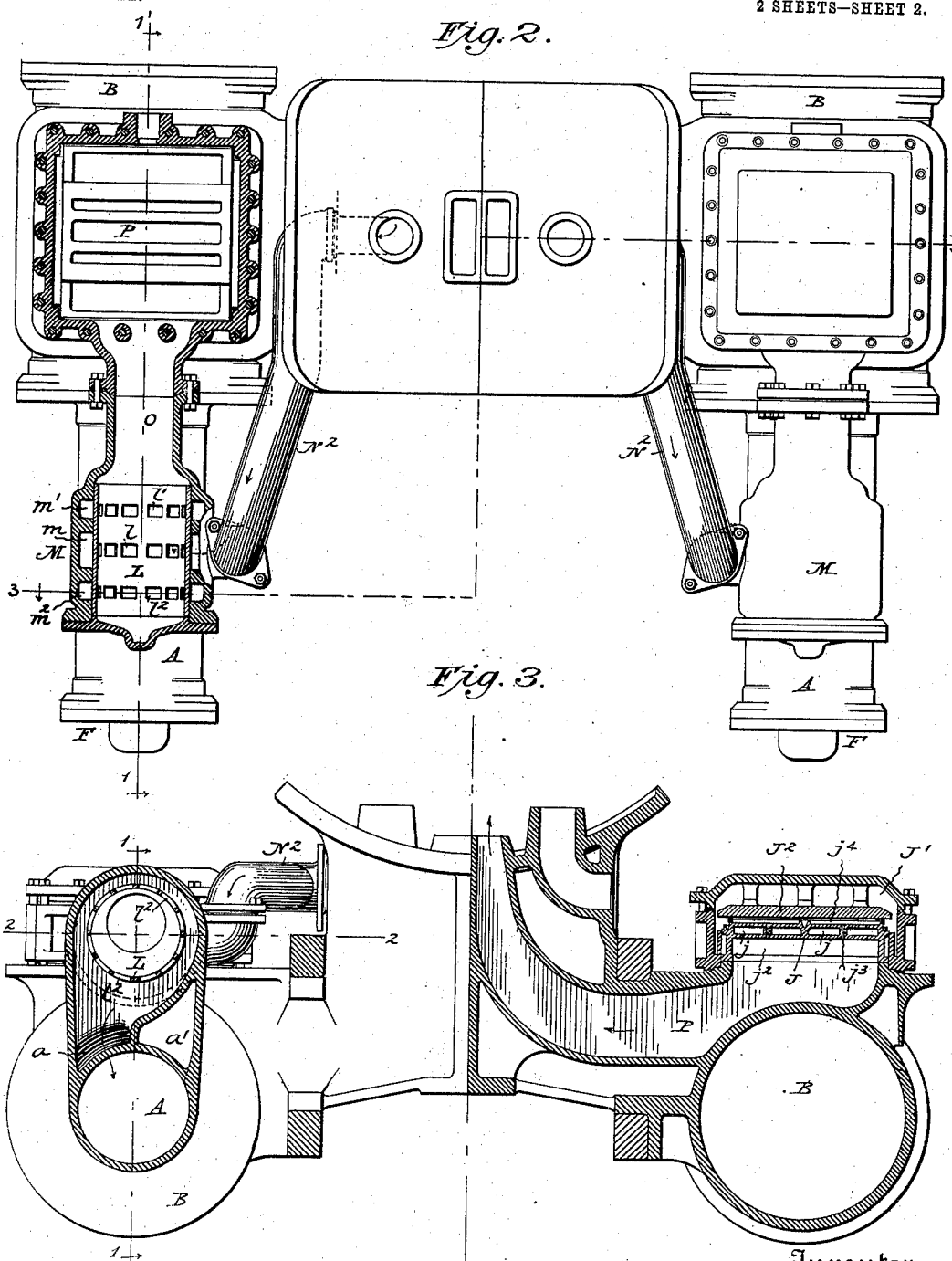
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UNITED STATES PATENT OFFICE.

JAMES E. SAGUE, OF SCHENECTADY, NEW YORK.

COMPOUND STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 741,838, dated October 20, 1903.

Application filed May 16, 1901. Serial No. 60,520. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. SAGUE, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Compound Steam-Engines, of which the following is a specification.

My present invention relates to compound engines especially adapted for locomotives in which the cylinders are arranged "tandem" or one directly in front of the other.

The object of my invention is to improve the construction and increase the efficiency of the valve mechanism for governing the admission and exhaust of the high and low pressure steam.

In carrying out my invention I arrange the high-pressure cylinders close to the low-pressure cylinders and immediately in front of them, the two pistons being secured to the same piston-rod. The valve for the high-pressure cylinder is arranged in line with the valve for the low-pressure cylinder and is secured to the same valve-rod. Steam enters the valve-chest of the high-pressure cylinder in such manner as to deliver to a centrally-arranged annular groove in a valve which governs the two ports of the high-pressure cylinder. The valve is hollow, and the exhaust-steam from the two ends of the high-pressure cylinder is delivered past the edges of the valve at its opposite ends. The valve of each low-pressure cylinder is a balanced slide-valve having a central exhaust-cavity, and it is preferably arranged for a double admission of steam on the principle of the "Allen" valve. The front end of each high-pressure cylinder is provided with a removable head, which has a recess in it, into which may project the end of the piston-rod. The piston of the high-pressure cylinder is preferably made conical and hollow and is removably secured to the piston-rod. The piston of the low-pressure cylinder is also removably secured to the piston-rod, and between the two cylinders is interposed a partition which is formed with a conical projection which may extend

into the conical recess in the piston of the high-pressure cylinder on the back stroke of the latter. The rear end of each low-pressure cylinder is closed by a head which may be readily removed when desired. The arrangement is such that when the pistons of the high-pressure cylinders are moved to their greatest extent forward the heads of the high-pressure cylinders may be removed and the keys which attach the pistons to the front ends of the piston-rods may be readily withdrawn. The pistons of the low-pressure cylinders may be entirely withdrawn from these cylinders after the pistons of the high-pressure cylinders are detached and after the heads at the rear ends of the low-pressure cylinders are removed.

In the accompanying drawings I have shown my improvements as applied to a compound locomotive-engine.

Figure 1 shows a vertical section on the line 1 1 of Figs. 2 and 3. Fig. 2 shows a transverse section on the line 2 2 of Figs. 1 and 3. Fig. 3 shows a cross-section on the line 3 3 of Fig. 2.

I would here state that while my improvements are especially designed for use in connection with compound locomotive-engines they may be employed in connection with other engines. The subject-matter deemed novel will be set forth in the claims.

The high-pressure cylinder A on each side of the locomotive is arranged directly in front of and in line with a low-pressure cylinder B. Each high-pressure piston C is attached to the end of a piston-rod D in such manner that it may be readily removed therefrom. The piston E of the low-pressure cylinder is also preferably removably secured to the rod D; but this is not essential, as the pistons E may be withdrawn from the low-pressure cylinders without being detached from the rods.

The front head F of each high-pressure cylinder is formed with a recess *f*, into which the end *c* of the piston C may extend when the piston is moved forward to its greatest extent. The piston C is preferably provided with a conical recess *c'*, adapted to fit over the conical projection *g* on the partition G,

which is interposed between the high and low pressure cylinders, this partition forming the front head of the low-pressure cylinder and the back head of the high-pressure cylinder. The back head H of each low-pressure cylinder is detachable, as indicated.

The valve-chests of the high and low pressure cylinders may be of any suitable construction adapted to contain the valves and to permit them to properly operate. As shown, with particular reference to Fig. 1, the valve I for the high-pressure cylinder and the valve J for the low-pressure cylinder are secured to the same valve-rod K, which is straight, and the valves are in line with each other, being directly connected. The valve I is hollow, the cylindrical shell h being imperforate and held around the valve-rod by means of ribs h' radiating from hubs h^2 . The shell h is provided with an annular groove or recess h^3 on its periphery, and the annular surfaces h^4 on the opposite sides of this groove or recess are provided with packing-rings, as indicated. The valve I slides in a cylindrical bushing L, which is formed with an annular series of perforations l , registering with the annular groove h^3 , and with annular series of perforations l' on opposite sides of the central series l . This bushing is held firmly in place in the casing M, and this casing is formed with a chamber m , communicating with the perforations l , and with chambers m' m^2 , communicating with the perforations l' .

Live steam passes through the pipe N into the branch pipes N', which lead to opposite sides of the locomotive, and then down the pipes N' and along the pipes N² to the chambers m , before referred to. The passages a a' , which lead to the opposite ends of the high-pressure cylinder, cross each other, as shown, so that steam entering at x will pass to the front end of the cylinder, while steam entering at y will pass to the rear end of the cylinder. The live steam which enters the passage m passes through the perforations l into the annular groove or chamber h^3 , and thence it passes into either the chamber l' or the chamber l^2 and thence into either the passage a or the passage a' . The exhaust-steam passes out through the passages a a' into the receiver-space O.

The exhaust-steam from the high-pressure cylinder which passes out through the passage a' passes through the hollow valve I in the manner indicated by the arrow and into the receiver-space O.

The low-pressure valve J is in this instance a slide-valve. Steam from the receiver-space O passes into the chamber J', surrounding the valve, and may pass the edges of the valve in the manner indicated by the arrows when the valve has moved to the proper extent. The valve, as shown, is formed with a passage or passages j , which provide for a double

admission of steam, the valve-seat being correspondingly formed. As this feature of the valve is old and well known, it need not be further described. The valve slides between the valve-seat and a plate J², arranged over it. The cavity j^2 of the valve communicates by means of passages j^3 with a chamber j^4 above the valve beneath the guide-plate J², by which means the exhaust-steam may pass from the valve-cavity to the chamber j^4 , and thus the downward pressure on the valve will counterbalance the upward pressure, so that the valve may be balanced in all directions.

Steam is admitted to the passages d d' , leading to opposite ends of the low-pressure cylinder past the edges of the valve in the manner indicated by the arrows. Exhaust-steam passes from the passages d d' into the cavity of the valve and out through an exhaust-opening P.

In operation live steam passes from the live-steam pipes to the chambers m and thence to the grooves h^3 of the valves I. Referring to Fig. 1, when the valve I moves forward high-pressure steam passes from the chamber m into the passage a' and acts upon the left-hand end of the piston C. At the same time steam passes from the front of the high-pressure cylinder through the passage a and out into the receiver-space O. From the receiver-space O the steam passes to the left-hand end of the slide-valve J and enters through the passage d and acts upon the left-hand end of the piston E. At this time the low-pressure steam passes through the passage d' into the cavity of the valve and thence out through the exhaust-passage P. It will be observed that there is a direct connection between the high-pressure valve and the low-pressure valve, that both valves are extremely simple in construction, and they are light and easy running, producing a minimum amount of strain upon the valve-gear.

I claim as my invention—

1. The combination of a high-pressure cylinder, a low-pressure cylinder, pistons for the two cylinders connected to the same rod, a valve for the high-pressure cylinder having a single central peripheral steam-admission recess and a hollow interior open at opposite ends, a valve for the low-pressure cylinder connected directly to the valve-rod of the high-pressure valve, a receiver-space between the two valves, passages leading to the opposite ends of the low-pressure cylinder, a central exhaust for the low-pressure cylinder, and crossed passages for the admission and exhaust of steam for the high-pressure cylinder.

2. The combination of the high and low pressure cylinders, a balance slide-valve for the low-pressure cylinder having an exhaust-cavity and admitting steam to the low-pressure cylinder at its opposite edges, a valve for the high-pressure cylinder directly con-

5 nected to the slide-valve of the low-pressure cylinder, and consisting of a shell having a single central peripheral recess for live steam and a hollow interior open at opposite ends, and crossed passages for the high-pressure cylinder governed by said high-pressure valve.

In testimony whereof I have hereunto subscribed my name.

JAMES E. SAGUE.

Witnesses:

GEO. S. CLARE,

E. E. YELVERTON.