

(No Model.)

3 Sheets—Sheet 1.

G. S. STRONG.

STEAM ENGINE.

No. 304,975.

Patented Sept. 9, 1884.

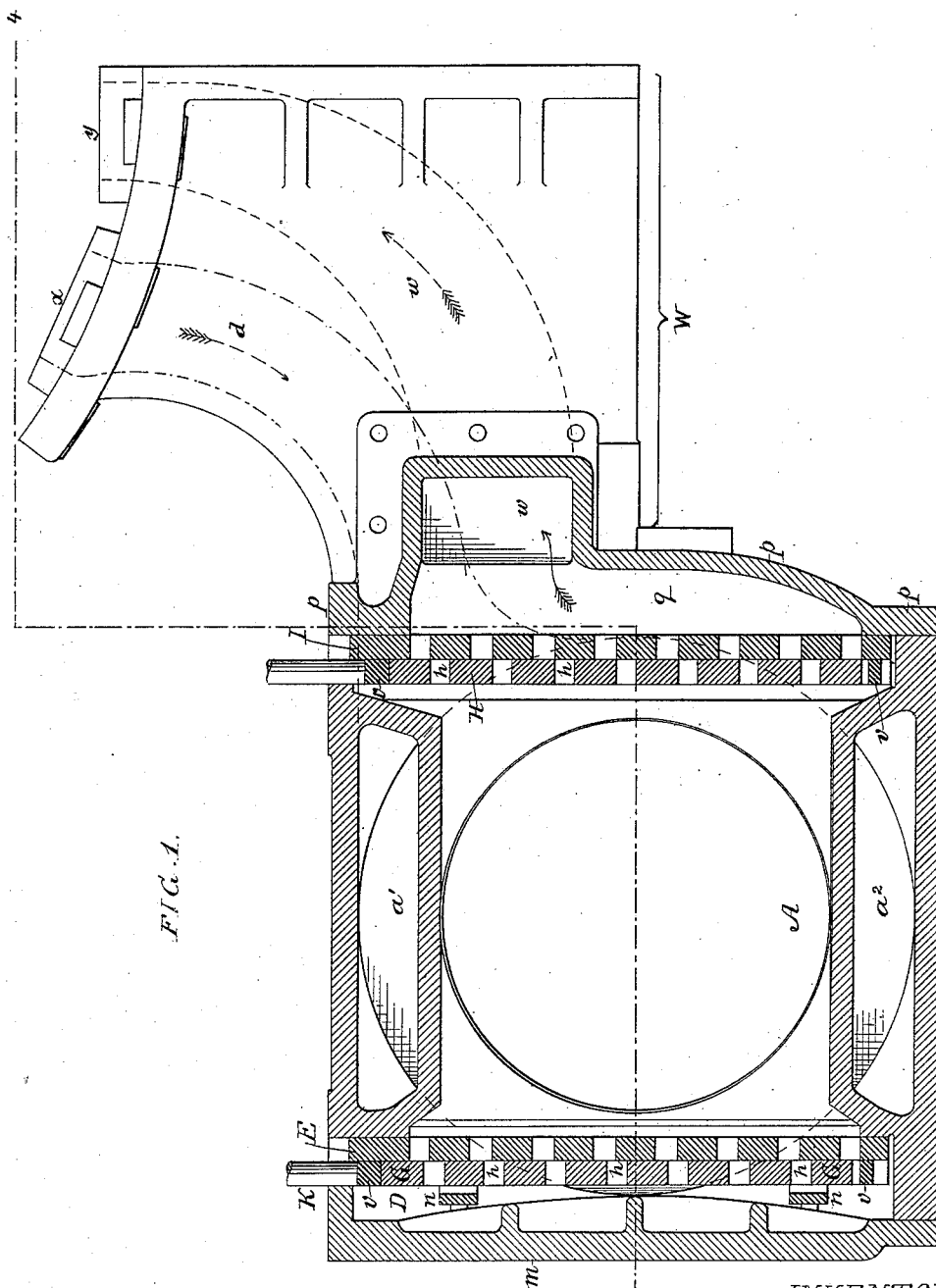


FIG. 1.

WITNESSES:
John M. Clayton.
James F. Tobin.

INVENTOR:
George S. Strong
by his Attys
Howden and Son

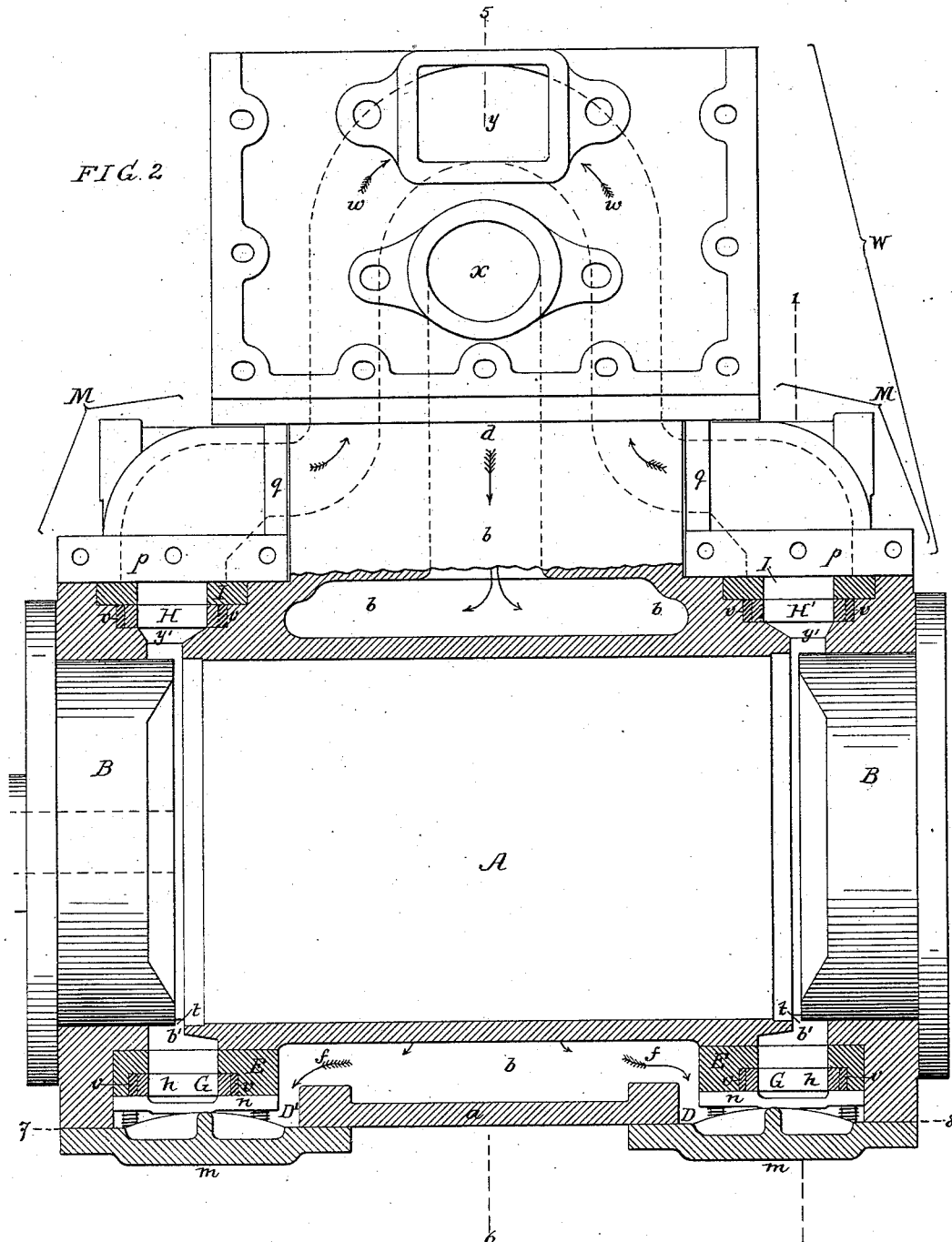
(No Model.)

3 Sheets—Sheet 2.

G. S. STRONG.
STEAM ENGINE.

No. 304,975.

Patented Sept. 9, 1884.



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(No Model.)

3 Sheets—Sheet 3.

G. S. STRONG.

STEAM ENGINE.

No. 304,975.

Patented Sept. 9, 1884.

FIG. 3.

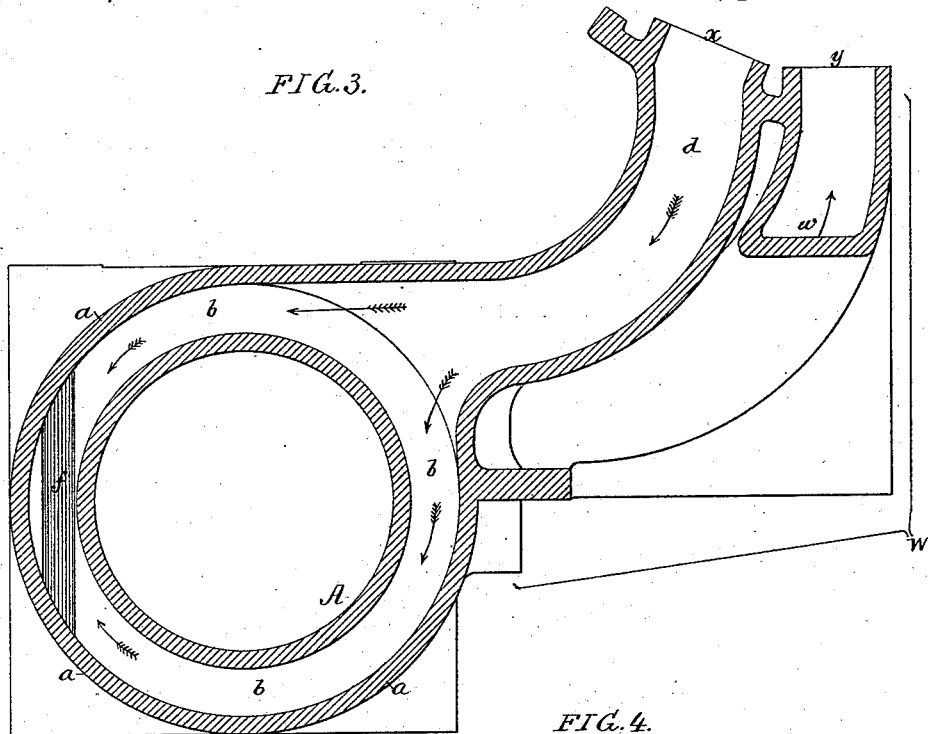
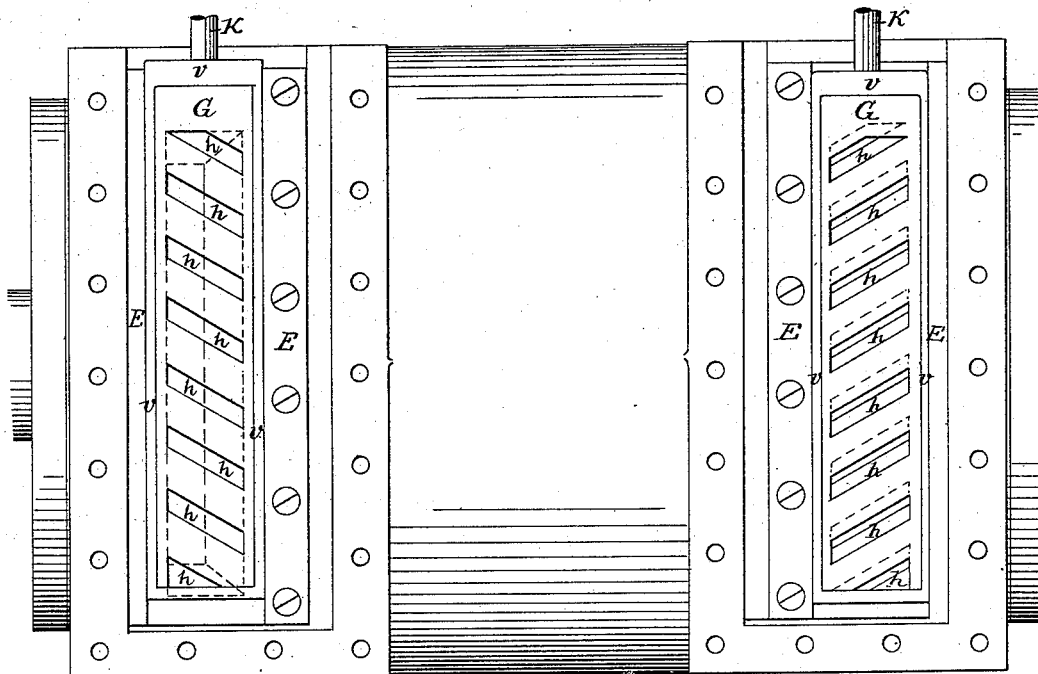


FIG. 4.



WITNESSES:

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UNITED STATES PATENT OFFICE.

GEORGE S. STRONG, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
JOHN T. MORRIS, TRUSTEE, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 304,975, dated September 9, 1884.

Application filed February 4, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. STRONG, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Steam-Engines, of which the following is a specification.

My invention consists of certain improvements, fully described hereinafter, in the cylinders, valves, steam and exhaust ports and passages of steam-engines, and especially of such engines as appertain to locomotives, the main objects of my improvements being, first, to prevent friction in the operation of the valves; second, to arrange the seats of the steam-valves near to the bore of the cylinder, thereby diminishing the clearance and obviating loss of steam; third, to maintain the cylinder at a uniform temperature and prevent loss of heat by radiation; fourth, to make the passage for conveying the steam to the valve-chamber direct and free from abrupt turns; and, fifth, to so arrange the structure comprising the cylinder, its passages, and the extension of the said cylinder, when applied to locomotives, that it can be economically made.

In the accompanying drawings, Figure 1, Sheet 1, is a vertical section (on the line 1 2, Fig. 2) of the steam-cylinder and its adjuncts, made according to my invention; Fig. 2, Sheet 2, a sectional plan on the line 3 4, Fig. 1; Fig. 3, Sheet 3, a vertical section on the line 5 6, Fig. 2; and Fig. 4, a view on the line 7 8, Fig. 2, the valve-chest covers being removed.

Around the cylinder A and cast therewith is a jacket, a, the annular space b between which and the said cylinder constitutes a steam chamber or passage, communicating in one direction with a steam-passage, d, in the extension W of the cylinder, the said extension being such that one of the branches of the usual breeches-pipe can be secured to it and made to communicate with the said passage d. The cylindrical jacket is restricted to the central portion of the cylinder, as shown in Figs. 2 and 4, a portion of the said cylinder at and near each end of the same being quadrangular, as shown in Fig. 1, each quadrangular portion being chambered above and below at a' and a'', and the chambers communicating with the annular passage b within the jacket. This passage, as shown in Fig. 2, communi-

cates through short passages f f with two valve-chambers, D D', situated on one side of the cylinder, one near each end of the same, within the limits of the said quadrangular parts. In each of these chambers is secured a plate, E, forming a seat for a gridiron-valve, G, the openings h in the latter being preferably inclined, as shown in Fig. 4, and corresponding with similar openings in the seat-plate E. When the valve at either end of the cylinder is open, the steam will be admitted to the cylinder through a port, b', the outlet t of this port into the cylinder being contracted, as shown in Fig. 2, but being in height the same as the internal diameter of the cylinder, and hence presenting an extended area for the passage of steam into the said cylinder. The distance between the valve and the outlet t is so short that the space within the port, generally known to engineers as "clearance," is very limited, and hence much of the loss of steam due to long passages between the valve and cylinder is obviated, this being one of the objects of my invention. Each of the chambers D D' is provided with a removable cover, m, and against the valve bear two cross-bars, n, backed by springs, so that if water should gain access to the cylinder the valve will yield to a limited extent and permit the water to escape. This device, however, forms no part of my invention.

H H are the two gridiron exhaust-valves situated on that side of the cylinder opposite the steam-valves, each exhaust-valve being contained within a recess in the quadrangular portion of the cylinder between the bottom of the said recess and a seat-plate, I, which has openings preferably inclined and corresponding with those of the valve.

The passage for the steam from the inlet x to the annular passage b within the jacket is shown in Fig. 3 and by dotted lines in Fig. 2, where are also shown by dotted lines the exhaust-passages w w, which terminate at the outlet y, communicating with the usual draft-pipe of the locomotive.

The cylinder and its jacket are preferably cast in one piece with the extension W, containing the steam-passage d and the greater portion of the two exhaust-passages w w, but near each end of the cylinder is an elbow-cast-

ing, M, one portion, *p*, of each of said castings being secured to the cylinder and forming the cover for the seat-plate I of the valve, and also a chamber, *g*, Fig. 1, for receiving the exhaust-steam, and the portion *q* of each casting M being secured to one side of the extension W, the chamber *g* of each casting forming a continuation (indicated by dotted lines in Fig. 1) of one of the exhaust-passages. These elbow-castings M M' thus form removable covers for the exhaust-valve seats, and at the same time afford simple mediums for completing the communications between the cylinder through the exhaust-valve ports and exhaust-passages in the extension W of the cylinder, and also tend to simplicity in making the casting composed of the cylinder, its jacket, and extension W.

The ports *y* of the exhaust-valve are substantially of the same character as the ports *b* of the steam-valves.

It will be seen that the steam takes a nearly direct circuit first from the passage *d* to the jacket, thence directly into the cylinder, and after it has performed its duty therein returning in nearly the same course and in the condition of exhaust-steam to the outlet *y* of the exhaust-passages, the object of this arrangement being to avoid as far as possible all abrupt and tortuous passages.

The cylinder is of course clothed with non-conducting material and the usual lagging, so as to prevent the loss of heat by radiation, the constant presence of live steam in the jacket and chambers *a'* and *a''* possessing the advantage of maintaining the cylinder at the desired temperature.

Each valve, both steam and exhaust, has a spindle, K, of which a yoke, *v*, adapted to the valve, forms a part.

It has not been deemed necessary to illustrate or describe valve-operating mechanism,

as different kinds of valve-gear may be used; but I would refer to the mechanism described in an application filed by me January 19, 1884, Serial No. 118,026, as that which I prefer for reciprocating the valves.

A peculiar feature of the valves when compared with those usually employed on locomotive-engines is that, instead of the ordinary single valve placed on one side or on the top of the cylinder and operating generally in a horizontal plane, there are two sets of valves operating in vertical planes.

It should be stated that this system of valves may be adopted in connection with steam-engines other than those appertaining to locomotives.

I claim as my invention—

1. The combination of a cylinder provided with two steam-valves on one side and a jacket surrounding the cylinder and communicating with the chambers of the said valves and two exhaust-valves on the opposite side of the cylinder, with an extension, W, on the same, the said extension containing a steam-passage communicating with the jacket, and passages for the exhaust-steam, all substantially as specified.

2. The combination of a cylinder for locomotive-engines and an extension, W, of the said cylinder, the said extension containing exhaust-passages with elbow-castings M, forming exhaust-valve chambers and communicating with the exhaust-passages in the extension of the cylinder, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEO. S. STRONG.

Witnesses:

JOHN E. PARKER,
HARRY SMITH.