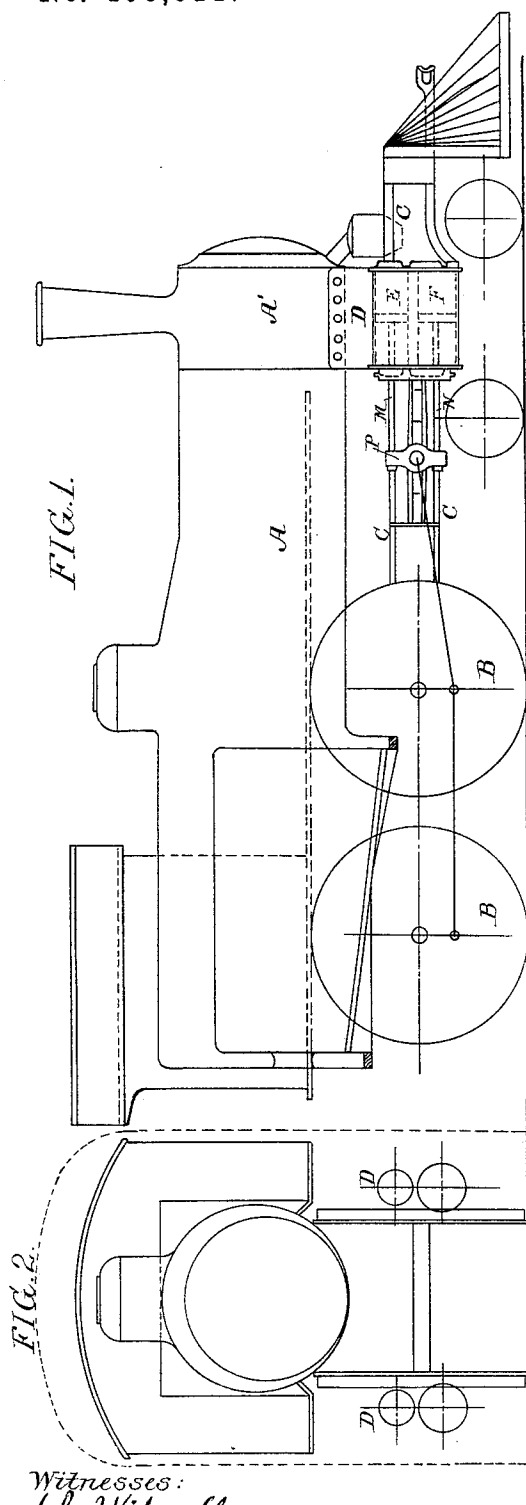


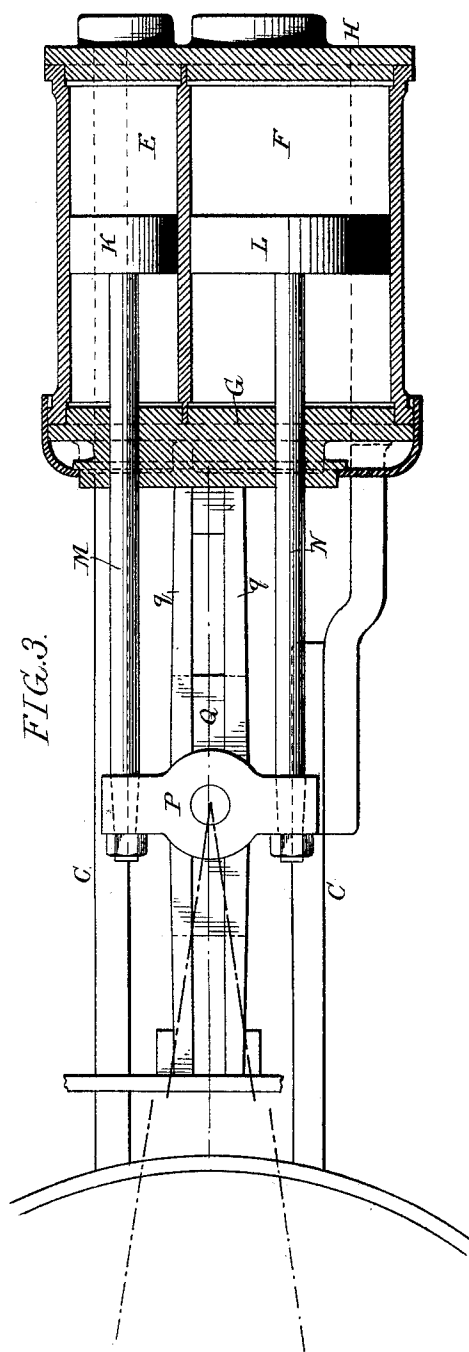
3 Sheets—Sheet 1.

No. 406,011.

Patented June 25, 1889.



Witnesses:
John Wilson Cbr
William D. Garner.



Inventor:
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Howan & Howan

(No Model.)

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S. M. VAUCLAIN.
COMPOUND LOCOMOTIVE ENGINE.

No. 406,011.

Patented June 25, 1889.

FIG. 4.

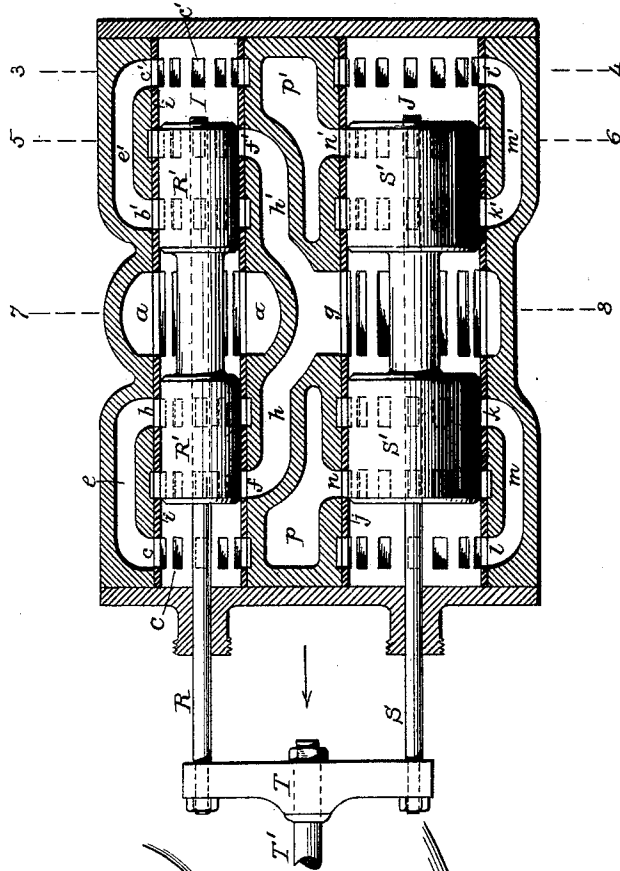
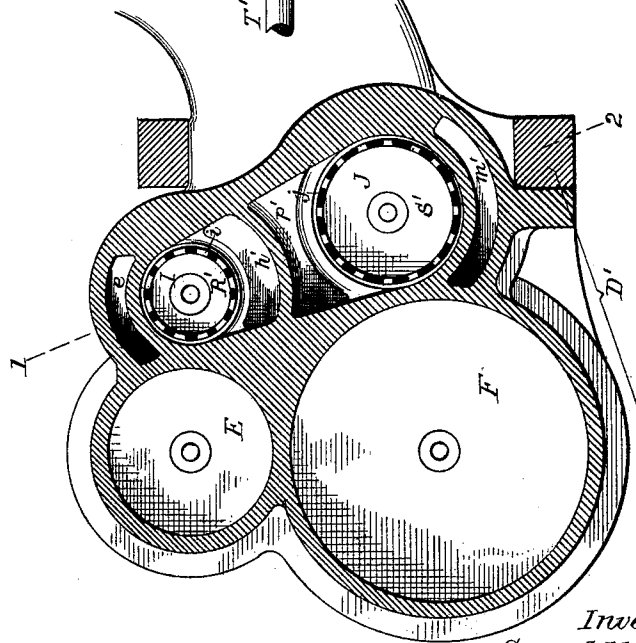


FIG. 6.
8-6



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(No Model.)

3 Sheets—Sheet 3.

S. M. VAUCLAIN.
COMPOUND LOCOMOTIVE ENGINE.

No. 406,011.

Patented June 25, 1889.

FIG. 5.
3-4

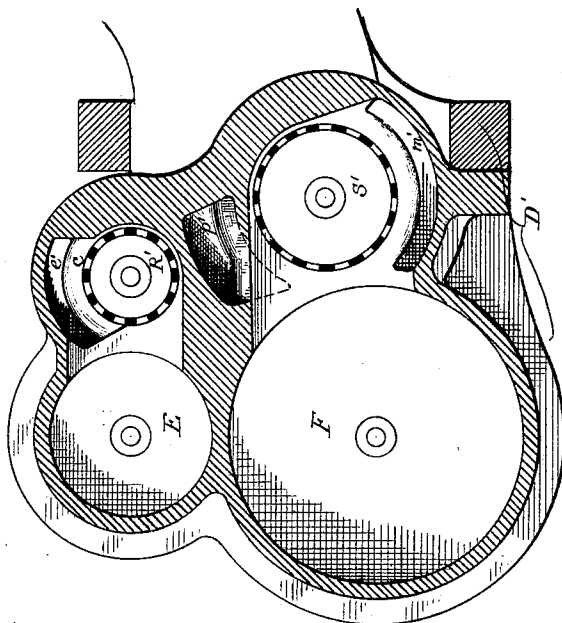
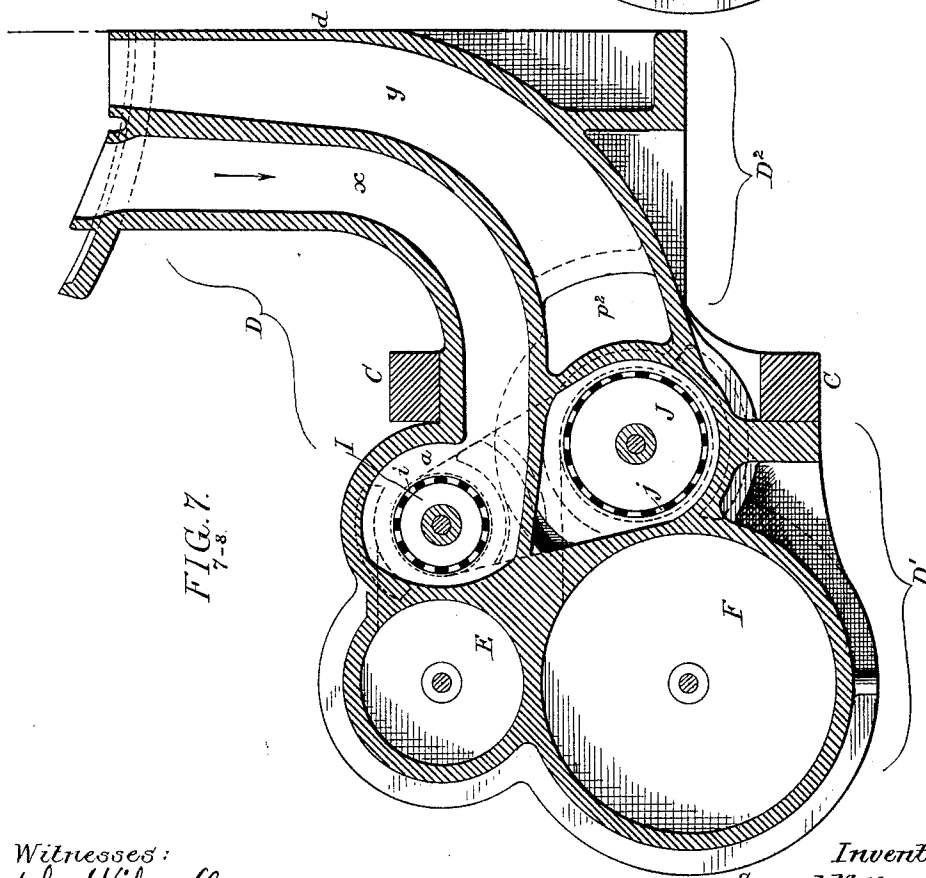


FIG. 7.
7-8



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UNITED STATES PATENT OFFICE.

SAMUEL M. VAUCLAIN, OF PHILADELPHIA, PENNSYLVANIA.

COMPOUND LOCOMOTIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 406,011, dated June 25, 1889.

Application filed February 21, 1889. Serial No. 300,672. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL M. VAUCLAIN, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Compound Locomotive-Engines, of which the following is a specification.

The object of my invention is to construct a compound locomotive-engine in which both the high and low pressure cylinders are on the same side of the locomotive, side by side, and connected to a common cross-head, so that an equal amount of power is delivered to each side of the engine, a further object being to so construct the parts that a locomotive of the single-acting American type can be readily altered into a compound locomotive. These objects I attain in the manner hereinafter described, reference being had to the accompanying drawings, in which—

Figure 1 is a diagram side view of a locomotive, showing my improvements. Fig. 2 is a transverse section of the locomotive shown in Fig. 1. Fig. 3 is a longitudinal section of the cylinder, showing part of the running-gear of the engine. Fig. 4 is a longitudinal section through the valve mechanism on the line 1 2, Fig. 6. Fig. 5 is a transverse section on the line 3 4, Fig. 4. Fig. 6 is a transverse section on the line 5 6, Fig. 4; and Fig. 7 is a transverse section on the line 7 8, Fig. 4.

A is the body of the locomotive; B B, the driving-wheels; D, the cylinder-casting, and C are the longitudinal frames of the engine. In Fig. 7 I have shown a full casting D, and it will be understood that a duplicate of this cylinder-casting abuts the portion *d* of the casting D, the two castings extending across the locomotive. The portion D' of the casting extends beyond the side frames of the locomotive, while the portion D² is on the inside of the locomotive-frames and extends into the smoke-box A' in the usual manner. This extension D² contains inlet-passage *x* and exhaust-passage *y*, which communicate in the usual manner, one with the steam-dome and the other with the exhaust-pipe. The parts are identical in form with the parts of the type of locomotive now in common use and known as the "American" locomotive, and I can therefore readily remove the two high-pressure cylinders of a locomotive of

this type and substitute therefor a casting of my improved compound cylinders without any alterations.

I will now describe the detailed construction of my improved compound engine.

E is the high-pressure and F the low-pressure cylinder. In the drawings I have shown the high-pressure cylinder situated directly above the low-pressure cylinder and duplex heads G and H for the ends of the cylinders, although it will be understood that instead of arranging them as shown the high-pressure cylinder may be placed below the low-pressure cylinder, or one may be slightly in advance of the other, without departing from my invention, the cylinders in all cases being what I term "side by side."

At the inner side of the high-pressure cylinder E in the present instance is the high-pressure valve-chest I in the form of a cylinder, and at the inner side of the low-pressure cylinder F is the low-pressure valve-chest J, also in the form of a cylinder. The valve-chest I has a bushing *i*, which is slotted at the different ports, as shown clearly in Fig. 4, for the admission of steam to or the escape of steam from the valve-chest. The chest J also has a bushing *j* of the same general character as the bushing *i* of the chest I.

K is the piston of the high-pressure cylinder, and L is the piston of the low-pressure cylinder, M and N being the piston-rods of the two cylinders, which are connected to a common cross-head P, as shown in Fig. 3, this cross-head being secured to a slide Q, adapted to guideways *q q* on the frame of the engine, and pivoted to the cross-head P is the main connecting-rod common to locomotives of this class, as shown by a line in Fig. 1, this rod being connected to the crank of the first driving-wheel B of the locomotive. It will therefore be seen that the pistons K and L of both the high and low pressure cylinders are connected together and move in unison, so that steam is simultaneously taken at the corresponding ends of both cylinders, the exhaust from either end of the high-pressure cylinder being directed to the opposite end of the low-pressure cylinder and the exhaust from the latter to the smoke box or stack.

I prefer to construct the valve mechanism in the manner which I will now proceed to de-

scribe, reference being had particularly to Figs. 4, 5, 6, and 7.

As before remarked, I is the high-pressure valve-chest, and J is the low-pressure valve-chest, the latter being situated under the high-pressure valve-chest and both chests being on the inner side of their respective cylinders.

Referring to Figs. 4 and 7, *a* is the inlet-chamber communicating with the inlet-passage *x*, and *b* are the induction-ports for the live steam from the inlet-chamber *a*, these ports communicating through a passage *e* with the rear ports *c* of the high-pressure cylinder, while *b'* are the induction-ports communicating through a passage *e'* with the front ports *c'* of the high-pressure cylinder. The valve-chest has eduction-ports *f* and *f'*, which communicate with the common inlet-chamber *g* of the low-pressure cylinder through the passages *h* *h'*.

The low-pressure valve-chest is substantially the same as the high-pressure valve-chest, *k* *k'* being the induction-ports, *l* *l'* the end ports, *m* *m'* the connecting-passages, and *n* *n'* the eduction-ports, the latter communicating with exhaust-passages *p* *p'*, which unite at *p*² in the main exhaust pipe or passage *y*.

R is the high-pressure valve-rod, having a valve *R'*, and *S* is the low-pressure valve-rod, having a valve *S'*. These two rods are connected to the cross-head *T*, which is secured to a single valve-rod *T'*, as shown in Fig. 4, so that this valve can be connected to the ordinary valve-operating gear of the locomotive, no change in the latter being required to adapt it to the compound structure forming the subject of my invention.

If the valve-rod *T'* be moved in the direction of the arrow, Fig. 4, so as to uncover the induction-ports *b* and *k* and eduction-ports *f'* and *n'*, live steam will be admitted from the chamber *a* through the ports *b*, passage *e*, and ports *c* to the rear end of the high-pressure cylinder, while steam will be exhausted from the front of the high-pressure cylinder through the ports *c'*, valve-chest, ports *f'*, and passage *h'* into the inlet-chamber *g* of the low-pressure valve-chamber, and thence will pass through the induction-ports *k*, passage *m*, and ports *l* into the rear end of the low-pressure cylinder.

It will thus be seen that both cylinders receive steam simultaneously at the same end of the cylinder, the exhaust from the low-pressure cylinder escaping through the ports *l'*, valve-chest, eduction-ports *n'*, and passage *p'* to the main exhaust-passage *y*.

When the valves are moved so as to cover the inlet-ports *b* and *k* and open the inlet-ports *b'* and *k'*, steam is admitted to the front of the cylinders and exhausted from the rear of the same, as will be readily understood without further description.

It will be evident that the special arrangement of the cylinders, their pistons, and piston-rods in respect to each other can be adopted in other than locomotive-engines without departing from my invention.

The cylinders and valve-chests are cast in a single piece; but it will be understood that the cylinders may be cast separately, with or without their valve-chests, and bolted to each other, or the valve-chests may be made separately and bolted to their respective cylinders; or, in the case of a single valve-chest for both cylinders, the chest may be made separately and bolted to the two cylinders, although I prefer, where circumstances permit, to make the cylinders and their valve-chests in a single casting.

I claim as my invention—

1. The within-described compound cylinder structure for locomotives, said compound structure comprising a portion on the outer side of the engine-frame and a portion on the inner side of said frame; the portion on the outer side containing the high and low pressure cylinders, situated side by side, and the valve-chest structure for said cylinders, and the portion on the inner side containing the inlet and exhaust passages, which extend up to the smoke-box, so that the structure is capable of being substituted for the usual single-cylinder structure of a locomotive without change of the adjacent structure, substantially as specified.

2. The combination of the valve-stems, each having a valve, with the high and low pressure valve-chests, each having central inlet-chamber, opposite end ports communicating with the cylinder, and two sets of intermediate ports, the induction-ports communicating with the end ports, the eduction-ports of the high-pressure chest communicating with the inlet-chamber of the low-pressure chest, and the eduction-ports of the latter communicating with the exhaust-passage, substantially as specified.

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

SAMUEL M. VAUCLAIN.

Witnesses:

HENRY HOWSON,
HARRY SMITH.