3 Sheets—Sheet 1.

A. M. CUMMING.

LOCOMOTIVE ENGINE.

No. 189,704. Patented April 17, 1877.

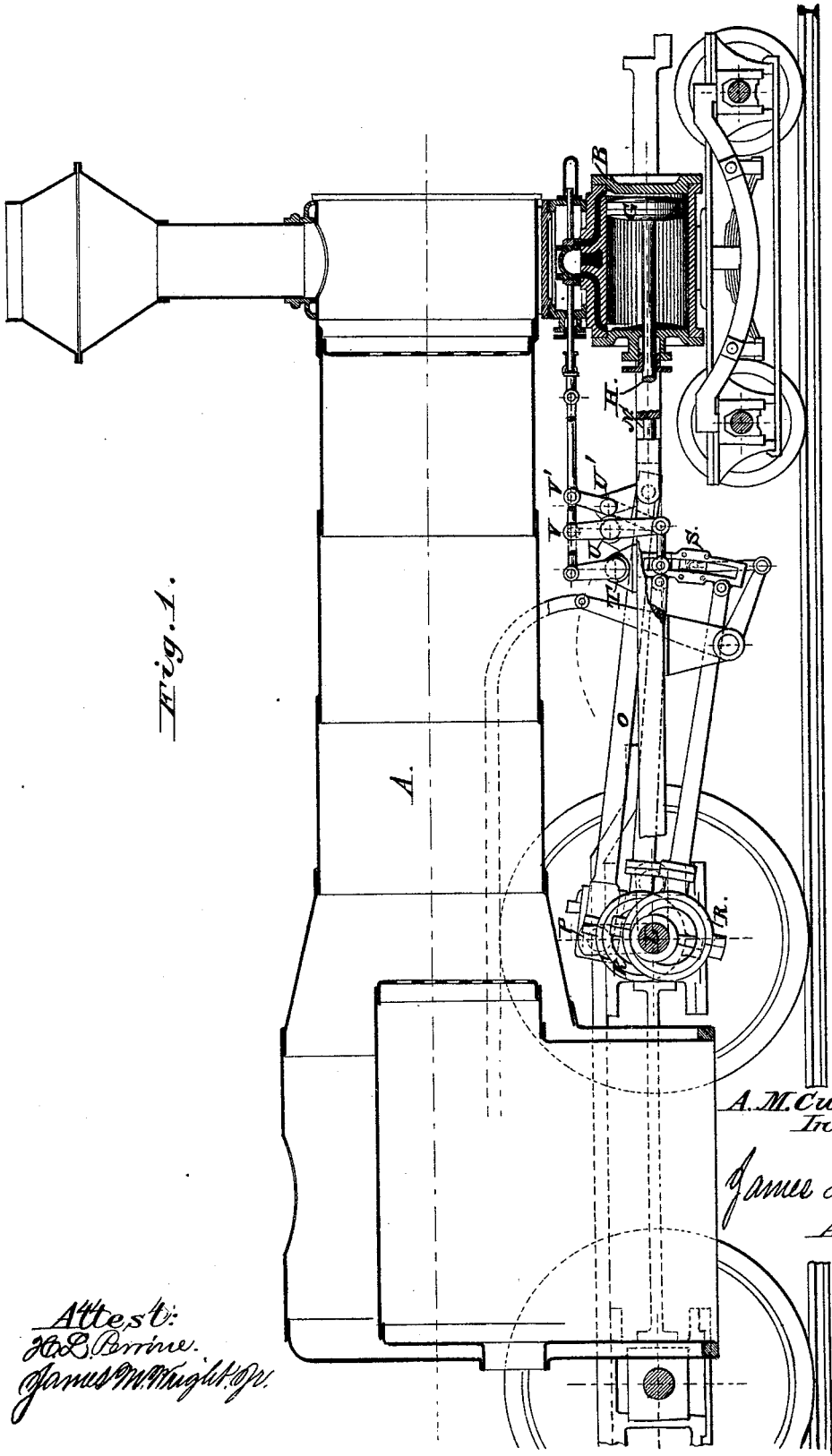

Fig. 1.

A. M. Cumming.
Inventor.

James L. Norris.
Attorney.

Attest:
H. C. Perrine.
James McWright Jr.

3 Sheets—Sheet 2.

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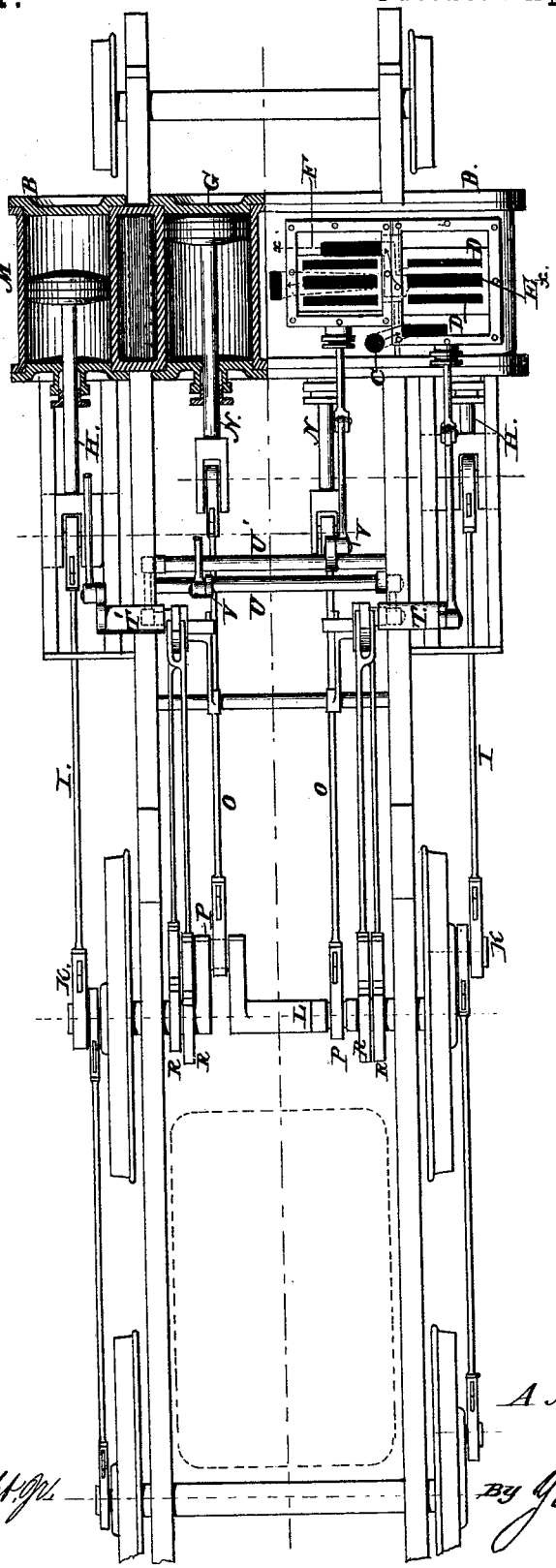

Fig. 2.

Attest
C. L. Perrine
James W. Wright Jr.

A. M. Cumming.
Inventor.
By James L. Norris.
Attorney.

3 Sheets—Sheet 3.

A. M. CUMMING.

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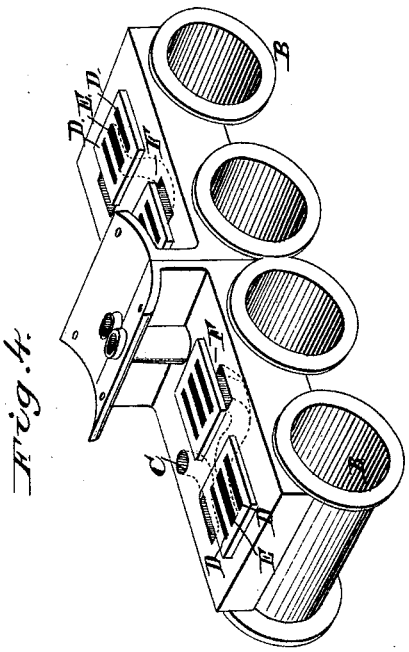

Fig. 4.

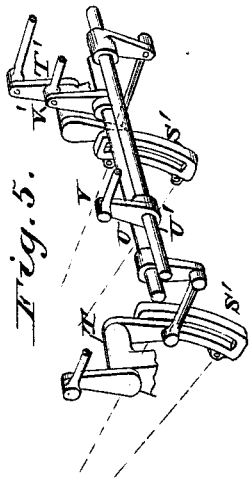

Fig. 5.

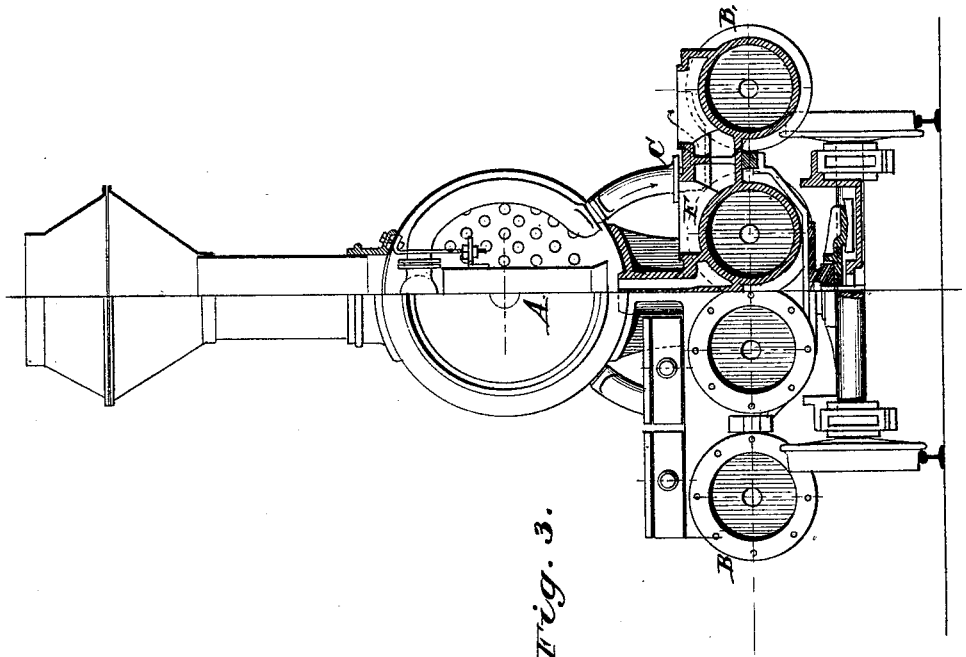

Fig. 3.

Attest:
H. C. Perrine
James M. Wright, Jr.

A. M. Cumming.
Inventor.

By. James L. Norris.
Attorney.

UNITED STATES PATENT OFFICE.

ALEXANDER M. CUMMING, OF ELIZABETH, NEW JERSEY.

IMPROVEMENT IN LOCOMOTIVE-ENGINES.

Specification forming part of Letters Patent No. **189,704**, dated April 17, 1877; application filed April 4, 1877.

To all whom it may concern:

Be it known that I, ALEXANDER M. CUMMING, of Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Locomotive-Engines, of which the following is a specification:

My invention consists, first, in the combination, with the links and eccentrics of a locomotive-engine, of certain levers connected with the valve-rods of the ordinary cylinders, and with rock-shafts connected with the valve-rods of certain secondary cylinders, as hereinafter more fully set forth; second, in combination with the ordinary cylinders of a locomotive-engine provided with outside connections, of two secondary cylinders provided with inside connections, all arranged to operate as more fully hereinafter set forth; third, in the combination, with the ordinary cylinders of a locomotive-engine, of inside connected secondary cylinders, the valves of which are operated by rockers controlled by links on opposite sides of the engine, substantially as set forth; and, finally, in the combination, with the shaft for operating the secondary engine, of a rocker or rock-shaft for operating the primary engine, both being connected by a single link, so that their valves may be reversed and controlled simultaneously, as more fully hereinafter set forth.

In the drawings, Figure 1 represents a longitudinal vertical section of a locomotive-engine, showing the valve-gearing in elevation. Fig. 2 represents a horizontal section of the cylinders and valve-chests, showing a plan view of the valve-gearing. Fig. 3 represents a view, showing a front elevation and partly a vertical transverse section of a locomotive-engine with my improvement applied; Fig. 4, a detached perspective view of the cylinders with the heads and valve-chests removed, showing the course of the respective ports; and Fig. 5, a detached perspective view of the links and valves of the respective cylinders.

The letter A represents the boiler of a locomotive-engine mounted upon its framings, as usual; and B, the ordinary cylinders thereof, constructed in the usual manner, and forming the primary cylinders of the present compound engine. The valve-chests of said primary cylinders are connected with the boiler by means of the ordinary ports C, and are provided with the ordinary induction-ports D D and eduction-ports E, connected with said cylinders and controlled by means of the usual slide-valves. The exhaust-ports of said primary cylinders, instead of leading to the exhaust-pipe, as usual, lead, by means of the induction-ports F, to the steam-chests of the secondary cylinders. The said secondary cylinders and valve-chests are counterparts of the primary cylinders, with the exception that the ports leading from the exhaust-ports of the primary cylinders enter the valve-chests of the secondary cylinders at the front ends of said secondary cylinders, instead of at the rear ends, as in the primary cylinders. This, however, is mainly for convenience in the arrangement of said respective ports, as their relative positions may be varied, if found desirable. The letters G G represent the pistons of the primary cylinders, H H their piston-rods, and I I the pitmen connecting with the cranks K K of the driving-shaft L. The letters M M represent the pistons of the secondary cylinders, N N their piston-rods, and O O the pitmen connecting them to the secondary cranks P P on the driving-shaft L. The letters R R′ represent the eccentrics arranged, as usual, on the crank-shaft L, and connecting, as usual, with the links S S′. Said links, instead of connecting directly with the valve-rods of the primary cylinder, as usual, connect with the levers T T′, the upper arms of which connect with the valve-rods of the primary cylinders, and the lower ends, respectively, with two rock-shafts, U U′, extending transversely under the engine. These rock-shafts are provided with arms V, which connect with the valve-rods of the secondary cylinders, the rock-shaft U, operated by the lever T, which operates the valve-rod on one side of the engine, having its arm V connected with the valve-rod of the secondary cylinder on the opposite side of the engine, and vice versa.

The cranks on the driving-shaft, which are connected to the primary and secondary cylinders, are formed in such relation to each other that while one is at the dead-center, the other is at its most effective working position,

and the valve-gearing and valves are so arranged in connection with the driving-shaft that when the piston in one primary cylinder is about at the commencement of its stroke, the cylinder just beginning to take steam, as shown in Fig. 1, the secondary cylinder connected therewith will be on about its half-stroke, while the primary cylinder on the opposite side of the engine will be on its half-stroke, and its secondary cylinder at the commencement of its stroke, as shown in Fig. 2.

The primary and secondary cylinders may be constructed in separate pieces, with the proper ports, and bolted or otherwise connected together; but I prefer to construct the two in one piece, as represented in Fig. 4.

The advantages of my improvement are apparent from the foregoing description.

It will be seen that in my improved compound engine the steam exhausts directly from the primary into the secondary cylinders, without passing pipes or passages of any great length, as in the compound engines heretofore constructed, and that by the peculiar arrangement of the valve-gearing I effectually provide for effectually operating the valves of both the primary and secondary cylinders, by means of the ordinary eccentrics and link-motion, which not only greatly simplifies the machinery, but provides for reversing the engine with the same facility as in the ordinary single engines heretofore used.

What I claim, and desire to secure by Letters Patent, is—

1. In combination with the links operated by the eccentrics of a locomotive-engine, the levers connected with the valve-rods of the main or primary cylinders, and with the rock-shafts connected with the valve-rods of the secondary cylinders on opposite sides, substantially as herein set forth.

2. The combination of the primary cylinders provided with outside connections, and the secondary cylinders provided with inside connections, substantially as described, for the purpose specified.

3. In a locomotive-engine, the inside connected secondary cylinders, the valves of which are operated by rockers controlled by the links on opposite sides of the locomotive, substantially as herein set forth.

4. The combination of the shaft for operating the secondary engine, and the rocker for operating the primary engine, both being connected by a single link, so that the valves of both may be reversed and controlled, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

ALEXANDER M. CUMMING.

Witnesses:

CHAS. L. COOMBS,

J. A. RUTHERFORD.