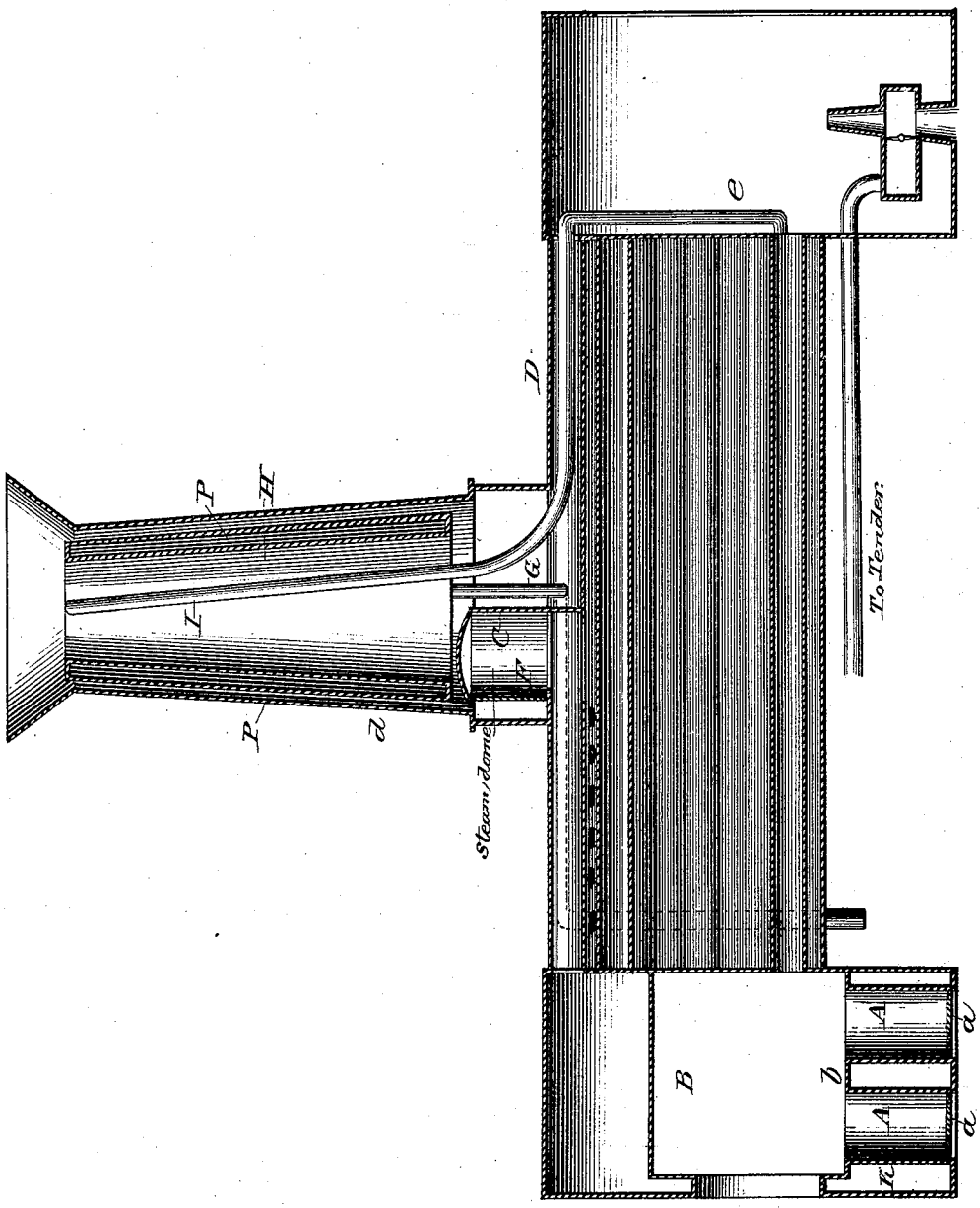
L. K. MANN & L. B. THYNG.

MODE OF CONSTRUCTING LOCOMOTIVE ENGINES.

No. 628. Patented Mar. 10, 1838.



Witnesses:

Inventor:

UNITED STATES PATENT OFFICE.

ZADOK H. MANN AND LEVI B. THYNG, OF LOWELL, MASSACHUSETTS.

IMPROVEMENT IN THE MODE OF CONSTRUCTING LOCOMOTIVE-ENGINES.

Specification forming part of Letters Patent No. **628**, dated March 10, 1838.

To all whom it may concern:

Be it known that we, ZADOK H. MANN and LEVI B. THYNG, both of Lowell, in the county of Middlesex and Commonwealth of Massachusetts, have invented new and useful Improvements in the Mode of Constructing Locomotive-Engines, whereby anthracite and other coal may be used as fuel and a great amount of heat saved by supplying hot water to the steam-boiler and by protecting the dome from the action of the cold external atmosphere; and we hereby declare that the following is a full and exact description.

The nature of our improvements and inventions consists in these particulars:

First. We construct a fire-box with cylinders immersed in water to prevent them from being fused or consumed by the intense heat of anthracite coal.

Second. We conduct the water from the forcing-pumps to a water cylinder or tube in the chimney, then take the water from the top of this cylinder and carry it by small pipes down through the smoke-flue and throw it into the boiler at the forward end. The action of the heat within the flue will make the water hot, if not boiling, before it enters the boiler.

Third. We place the dome within the chimney, and thereby protect it from the external atmosphere.

To enable others skilled in the art to make and use our improvements, we will describe their construction and operation.

First. We construct a fire-box for the use of coal in the following manner: We place within the box perpendicular cylinders, Figures 5 and 6, A A A A, of about two feet in length, with a grate *a* at the lower end to retain the coal. Within these cylinders coal may be burned. The cylinders occupy the lower part of the fire-box B. They may vary in number and dimensions at the pleasure of the constructor, and may be used in a round or a square furnace. These cylinders are made fast at both ends. They are made fast at the top by a partition *b b* in the fire-box through which they pass, and at the bottom by a head. The space K, Fig. 7, around the cylinders is made tight and filled with water, which space is a part of the boiler. We thus bring the water in contact with the entire exterior surface of the fire-cylinders, which will prevent them from being fused by intense heat of the ignited coal.

Second. We construct an appendage D, Fig. 6, on the top of the common boiler. It may be eight inches in height, twelve inches in breadth, extending the whole length of the cylinder part of the boiler. Under the center of the chimney this appendage is divided across by a tight partition *c*. The space front of this partition is used as a flue to conduct the smoke and flame to the chimney after they have passed through the small tubes within the boiler. The space E in the rear of this partition is a steam-chamber intended to purify and separate the steam from the water. On the top of this appendage the chimney *d d* is placed, either at the center or elsewhere. The chimney is like the one now in use, with a single addition, which is our invention. This addition is a cylindrical space or tube P P for water within the chimney and surrounding the smoke-flue H, formed by two concentric cylinders, the inmost of which cylinders incloses the common smoke-flue. This cylindrical tube for water is situated between the smoke-flue and the surrounding tube or cylinder now in use to receive the cinders or sparks from the bonnet, and extends from the bottom to the top of the chimney and is made tight at both ends, so that our chimney consists of three concentric cylinders or cylindrical spaces. The first or center space is the smoke-flue, the second space, which completely surrounds the center space or smoke flue, is the cylinder for water, which we have invented, and the third or exterior space is a tube heretofore in use to receive the cinders. We supply water to the cylinder in the chimney by pipes G from the forcing-pumps to the lower end of the cylinder. We construct two small pipes I, which take the water from the cylinder at the top of the chimney at the opposite sides and carry it down within the smoke-flue and empty it into the boiler at the forward end *e*, or in any other convenient or suitable way. Thus we subject the water twice to the action of the smoke and flame in the flue—that is, once while it ascends in the cylinder within the chimney which surrounds the flue, and again while it descends in the pipes within the flue on its way to the boiler. The cinders in the space around the water-cylinder will be also hot and impart heat to

the water. All this heat, both that of the smoke and flame in the chimney and that of the cinders, which is lost and wasted by locomotive-engines now in use, will be saved by our improvement and will heat the water nearly or quite to boiling-temperature before it enters the boiler.

We feel confident that so much heat will be saved by our improvement which supplies the boiler with hot water and that so much more heat will be obtained by the use of coal that a part of the exhaust-steam, all of which by locomotive-engines now in use is required to produce a draft, may be saved and returned to the tender. For this purpose we have invented the following simple apparatus: At the bottom of the blast-pipe we place a valve-box to receive the steam, about four and a half inches wide and six inches long, on which box are placed two pipes, one the blast-pipe and the other a condensing-pipe, to carry the exhaust-steam to the tender. Within this box D, Fig. 3, is a valve E, which is moved by a rod and lever, by which the steam may be shut off and carried wholly or in part into the blast-pipe H or wholly or in part into the condensing-pipe I and returned to the tender.

Third. At the rear of the tight partition (shown in Fig. 6, *c*) in our new appendage we place the dome within the smoke-flue of the chimney. The dome F will thus take a portion of the heat from the smoke and flame in the flue and not be exposed to the cold external atmosphere.

What we claim as our improvements and invention in the construction of locomotive-engines, and desire to secure by Letters Patent, is—

1. The construction of the fire-box with separate cylinders, immersed in water in the manner described, for burning anthracite or other coal in locomotive-engines.

2. The method of carrying water into the cylinder within the chimney and conducting it down from the top of the cylinder in contact with the flue, and thereby heating the water to boiling-temperature, or nearly so, before it enters the boiler.

3. The construction of the dome within the chimney to protect it from the external atmosphere, the whole combined and arranged substantially in the manner herein set forth.

4. The manner of turning the exhaust-steam into the tender, for the purposes set forth.

ZADOK H. MANN.
LEVI B. THYNG.

In presence of—
JOHN A. KNOWLES.