H. D. DUNBAR.

Exhaust-Nozzle for Steam-Engines.

No. 164,277. Patented June 8, 1875.

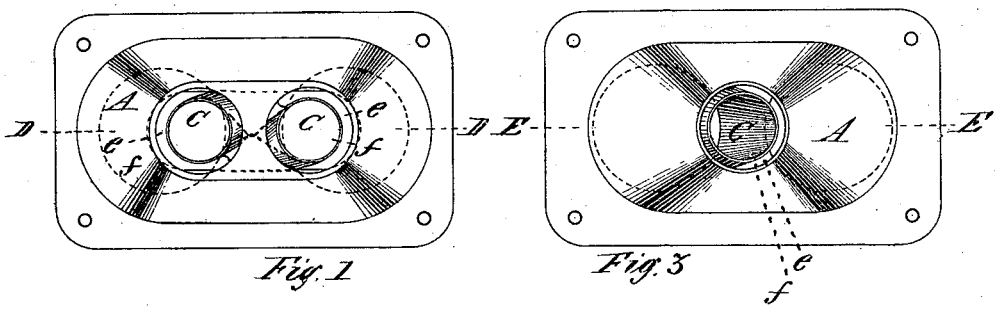

Fig. 1 Fig. 3

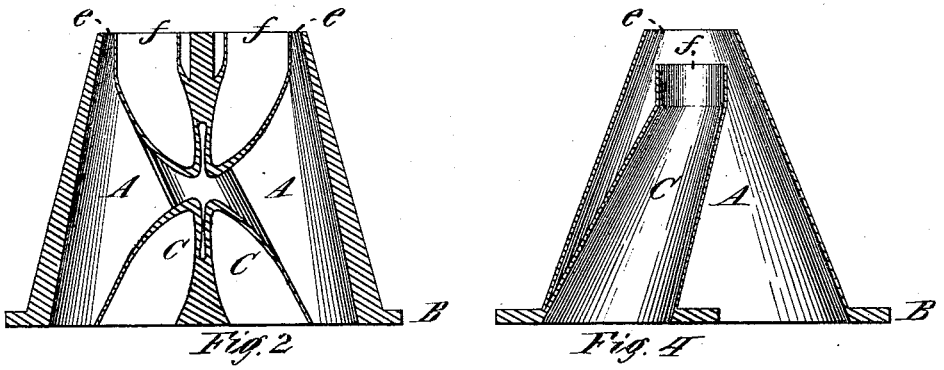

Fig. 2 Fig. 4

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UNITED STATES PATENT OFFICE.

HENRY D. DUNBAR, OF NORTH HARTLAND, VERMONT.

IMPROVEMENT IN EXHAUST-NOZZLES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **164,277**, dated June 8, 1875; application filed October 27, 1874.

To all whom it may concern:

Be it known that I, HENRY D. DUNBAR, of North Hartland, in the State of Vermont, have invented a new and useful Improved Exhaust-Nozzle for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings making a part of this specification, and to the letters of reference marked thereon, in which—

Figure 1 represents a plan view of my invention arranged with a double set of pipes. Fig. 2 is a longitudinal vertical section through line D. Fig. 3 is a plan view of my invention arranged with a single set of pipes, and Fig. 4 is a longitudinal vertical section through line E of Fig. 3.

My invention relates to an exhaust-nozzle for steam-engines; and it consists of sets of pipes arranged with the lower end of one of the pipes of a set made to cover the exhaust-outlet of one of the cylinders of the engine, and the lower end of the other pipe of the same set made to cover the exhaust-outlet of the other cylinder, and the upper ends of both pipes of the same set are arranged with the orifice of one within that of the other, so that the exhaust-steam from one cylinder blowing through one pipe will create a draft through the other pipe and out of the other cylinder.

In the drawings, A represents, in Fig. 1, the outside pipe of two sets, which are provided with a base, B, by means of which to bolt the device to its place over the exhaust-outlets of a steam-engine, and within these pipes A are made the smaller pipes, C, which are so arranged that the lower end of one pipe, C, is within the lower end of one of the pipes A, and both are sufficiently different in their diameter as to permit the free entrance of steam into both pipes A and C. As the said pipe C extends upward it crosses over into the other pipe, A, and its opening *f* at the upper end is within the opening *e* of the pipe A. It is better that these openings should be concentric, one within the other, as in that case the effect of the steam in passing out of one is more uniform and thorough upon the other pipe. The other pipe, C, in the double arrangement of pipes, is precisely similar in its relation to the other pipe, A, as that hereinbefore described, so that the orifice of each pipe C at the lower end is within that of each pipe A, and as the pipes C extend upward they cross or extend past each other, and terminate at the upper end in the end of the pipe A, opposite that in which each started at the bottom, as shown clearly in Fig. 2, and the pipes C may be somewhat flattened or bent, if necessary, to enable them to be arranged properly past each other within the pipes A. Of course it is necessary that the two outer pipes A should not communicate with each other, and the joints are all made tight around the pipes C, at the point where they cross from one pipe, A, into the other.

The operation of the invention is as follows: The device is bolted into place firmly in the smoke-arch, in a position with the lower end of each pipe A covering one of the exhaust-outlets. As the engine exhausts, the exhaust steam from one cylinder enters the lower end of one pipe, A, and also the lower end of the pipe C within that pipe A, and the steam which passes up in the pipe A and out at its upper opening *e*, around the opening *f* of the pipe C, creates a strong draft out of said pipe C, which extends down into the other pipe, A, and over the exhaust-outlet of the other cylinder of the engine. The steam also which entered the lower end of the pipe C passes up with great force out the opening *f*, and creates a draft out the opening *e* of the other pipe, A, and consequently out of the exhaust-outlet and cylinder, and a much more effective stroke or movement of the piston in that cylinder is the result, caused by the more effectual withdrawal of the steam from that cylinder. Of course, when that cylinder exhausts the same effect is produced upon the opposite cylinder, and the practical result obtained is, more effective work from a given expenditure of fuel.

Figs. 3 and 4 represent a single set of pipes, in which A is one pipe and C another, both provided with a common base, B, to bolt it to its position over the exhaust-outlets, the lower end of the pipe A covering one exhaust-outlet, and the lower end of the pipe C covering the other exhaust-outlet. The pipe A encircles the pipe C at the upper end, so that the orifice or opening *f* of the pipe C is within the

opening *e* of the pipe A—that is to say, the opening *e* is outside of and surrounds the upper end of the pipe C. When one cylinder exhausts the steam enters the lower end of the pipe A, and, passing up with great force, creates a draft out of the pipe C and out of the cylinder, the exhaust-outlet of which it covers at its lower end, and when the other cylinder exhausts the steam passing up through the pipe C creates a draft up through the pipe A and out of the cylinder opposite.

The only objection to the use of the single set of pipes shown in Figs. 3 and 4 is, that with the pipes C and A of the same or equal length the sound of the exhaust steam in passing out differs in pitch or tone at each exhaust. If one of the pipes is made shorter than the other, as shown in Fig. 4, this objection is partially overcome.

To overcome entirely this objection of sound, I deem it best to make or arrange the pipes in two sets, as shown in Figs. 1 and 2, as by that arrangement the objection of sound is thereby entirely overcome.

Having thus described my invention, what I claim as new is—

The combination and arrangement of the pipes A and C with the exhaust-passages of a steam-engine, the same forming an improved exhaust-nozzle, substantially as described.

HENRY D. DUNBAR.

Witnesses:

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