No. 659,791. Patented Oct. 16, 1900.

E. DEATHERAGE.

EXHAUST NOZZLE.

(Application filed Nov. 28, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

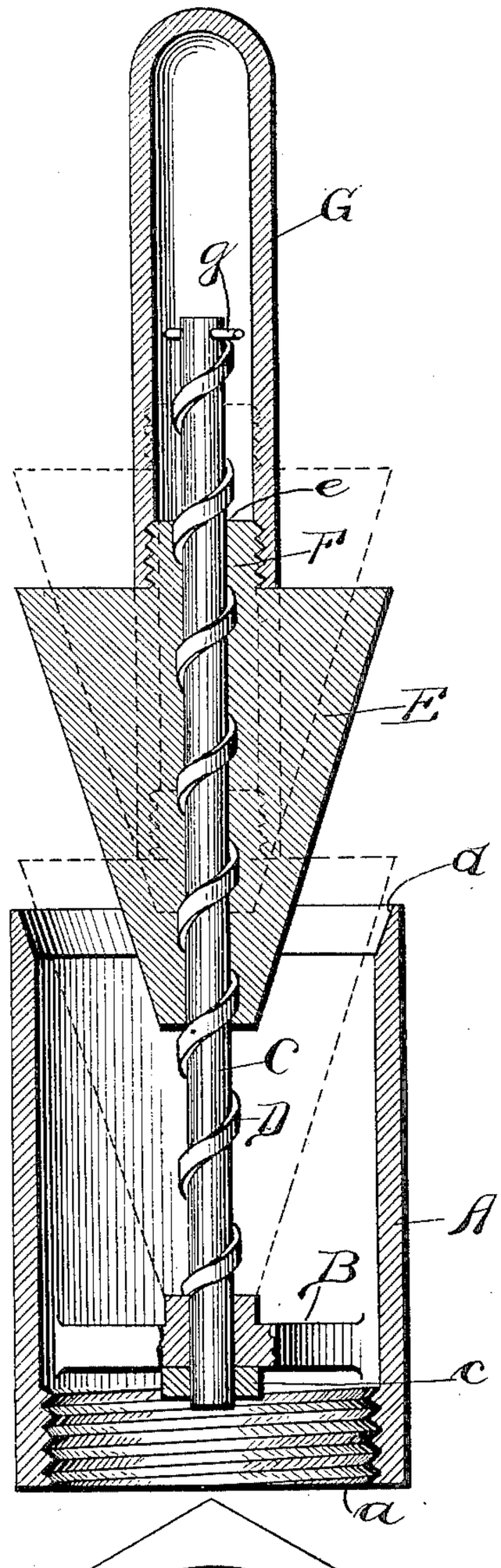
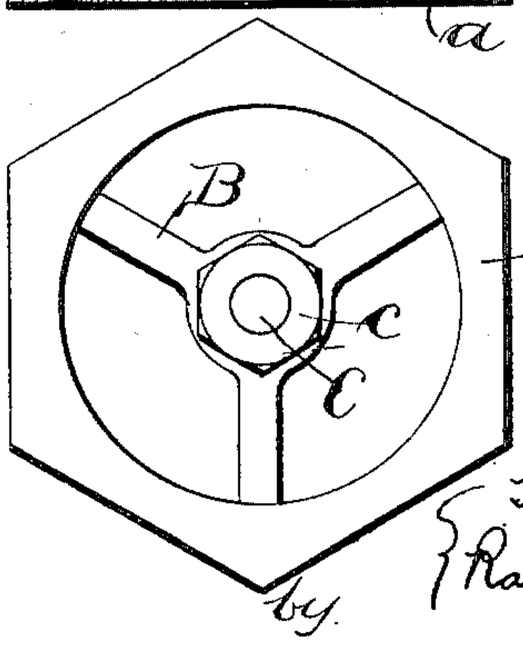


Fig. 2.



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Inventor:
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by.

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Fig. 3.

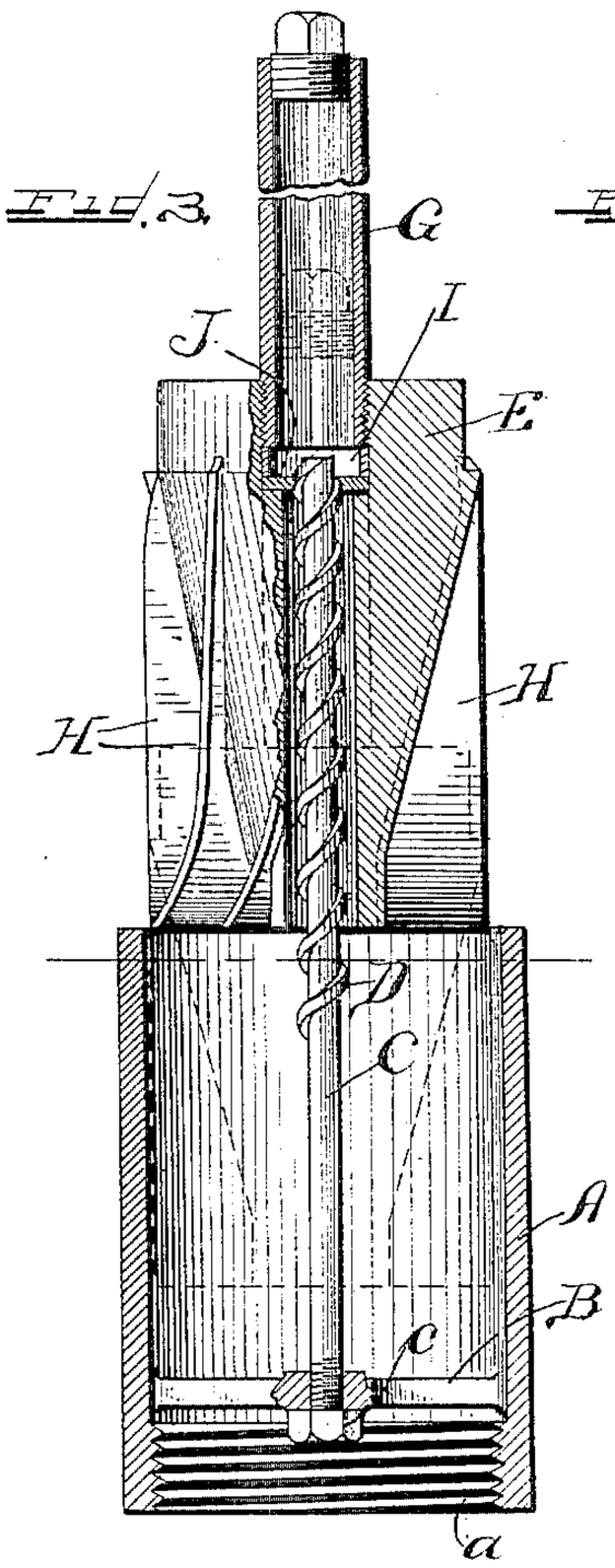


Fig. 6.

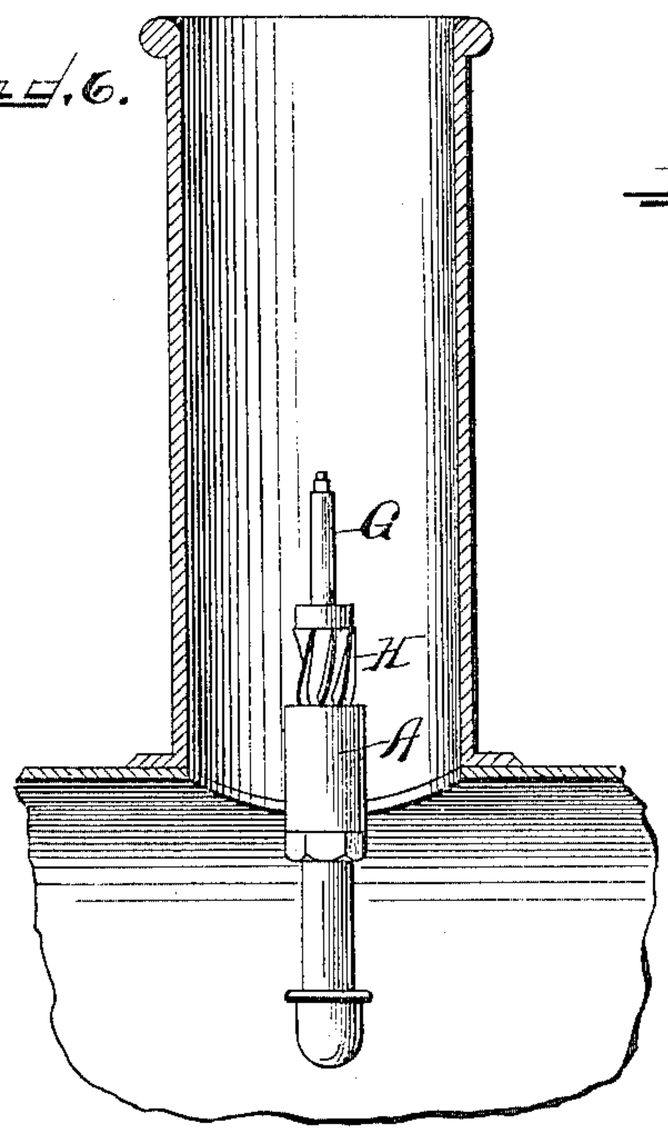


Fig. 8.

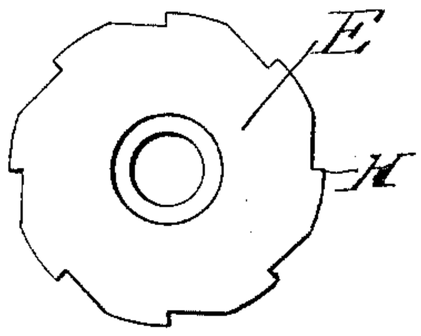


Fig. 4.

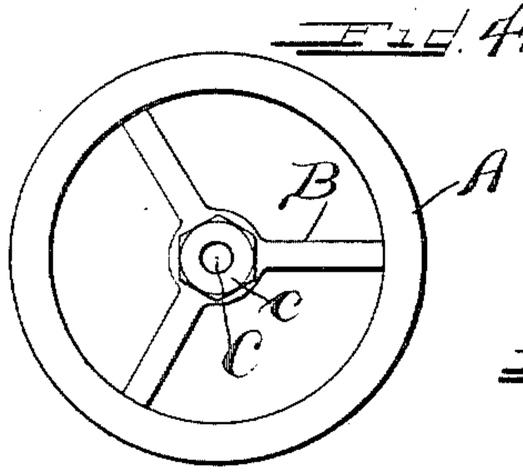


Fig. 5.

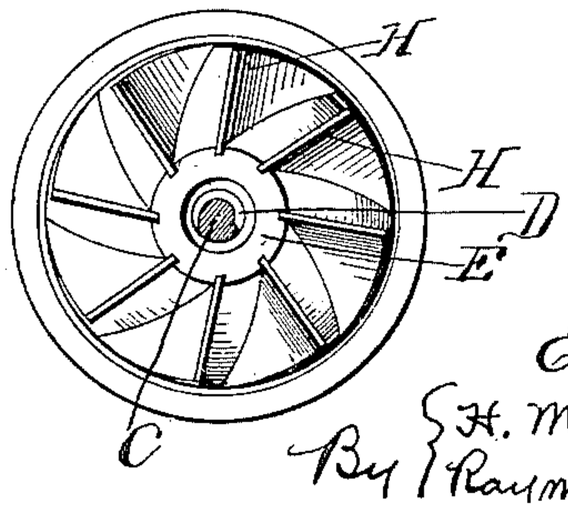
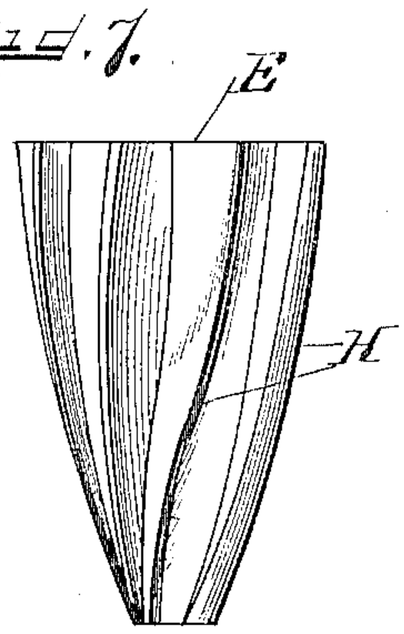


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDA DEATHERAGE, OF RIO, ILLINOIS.

EXHAUST-NOZZLE.

SPECIFICATION forming part of Letters Patent No. 659,791, dated October 16, 1900.

Application filed November 28, 1899. Serial No. 738,605. (No model.)

To all whom it may concern:

Be it known that I, EDA DEATHERAGE, a citizen of the United States, residing at Rio, in the county of Knox and State of Illinois, have invented certain new and useful Improvements in Exhaust-Nozzles, of which the following is a specification.

My invention relates to certain new and useful improvements in exhaust-nozzles which are adapted for use on all steam-engines employing the exhaust-steam to assist the draft, such as locomotive, traction, and other engines.

The prime object of this invention is to provide an exhaust-nozzle whose steam-escape opening is automatically regulated as to its area according to the pressure of the steam, so that the discharge-opening will be reduced in area as the pressure decreases, and vice versa, and extreme changes of the draft will thereby be avoided.

Another object of the invention is to provide an artificial draft for an engine which will conform to the various conditions requiring draft—for example, providing for the free escape of the exhaust-steam while the engine is at heavy work, and thereby increasing the power of the engine.

Other objects of my invention are to provide an automatic valve for an exhaust-nozzle which is freely and quickly adjusted by the escaping steam to vary the size of the opening in the nozzle, to provide a simple and inexpensive construction for nozzles of this character, and to construct the parts in such a manner that they are not liable to get out of order.

With these and other objects in view my invention consists of the peculiar construction and arrangement of parts hereinafter described and shown in the accompanying drawings, in which—

Figure 1 is a sectional elevation of my improved exhaust-nozzle. Fig. 2 is a bottom plan view of the nozzle. Fig. 3 is a sectional elevation showing my improved nozzle with the valve provided with wings. Fig. 4 is a bottom plan view of the nozzle shown in Fig. 3. Fig. 5 is a bottom plan view of the valve shown in Fig. 3. Fig. 6 is a sectional view illustrating the manner in which the nozzle may be arranged in a smoke-stack. Fig. 7 shows another manner of constructing the wings on the valve. Fig. 8 is a top plan view of the valve shown in Fig. 7.

Referring to the drawings, in which like letters of reference denote corresponding parts in all of the figures, A designates the body of my improved nozzle, and it is provided with an interior thread *a* at its lower end, by means of which it can be attached to the exhaust-pipe or flanges, or other means may be provided for this purpose, as desired. A spider B is arranged in the lower portion of the body and forms a bridge in which the guide C is secured by means of a lock-nut *c*. This guide is provided with a coarse thread D, extending substantially throughout its length, and a valve E is arranged on this guide and provided with an interior thread in its central opening *e*, which corresponds in its pitch with that of the thread D on the guide. The pitch of the threads must be such that the valve will descend by gravity as the pressure of the escaping steam diminishes, and when the pressure of steam increases the valve will respond quickly and freely and rise accordingly. The upper end of the valve is provided with an extension F to receive the cap G, which is secured thereon to protect the upper end of the guide from injury and soot. The valve is preferably conical in shape, as shown in Fig. 1, and the upper end of the body may be flared to form a seat *d*, so that when the valve is in its lowest position a passage-way will always be maintained for the escape of some steam. The working parts are lubricated by the oily steam passing around the guide and through the valve to the cap, and to limit the upward movement of the valve I provide a key *g*. It will thus be observed that the valve being in its lowest position, as indicated in dotted lines in Fig. 1, the pressure of steam thereon being increased will cause the valve to rise, and this rising of the valve will be governed entirely and regulated in accordance with the amount of pressure exerted by the escaping steam, so that as the pressure increases the valve will be raised higher to permit of the proper escape of steam, and this enlargement of the escape-opening for the steam will correspond to the demands of the engine for an increased draft, all of which is accomplished automat-

ically and by the pressure of the escaping steam. The object of the revoluble movement which is communicated to the valve as it is acted upon by the steam and caused by the manner in which it is mounted upon the guide is to retard this movement of the valve, and particularly at intervals between the slow and heavy exhausts. I have found, however, that while the valve, as hereinbefore described and shown in Fig. 1, may be suitable for some purposes in order to avoid making a valve of considerable size and weight it is desirable to provide other devices for retarding the movement of the valve and in this way accomplishing the same result as would be had by a valve of greater size and weight. I have therefore shown in Figs. 3 and 7 two different constructions which may be embodied with the general form of valve shown in Fig. 1 and which I will now describe. Referring to Fig. 3, the conical valve is provided with wings around its sides, and these wings are inclined and disposed in such a manner that the pressure of the escaping steam exerted against them will tend to screw the valve down to its seat, while the direct pressure of the escaping steam on the valve itself tends to raise the valve from its seat, and as the area of the valve-body is greater than the combined area of the wings the force of the escaping steam will raise the valve a sufficient distance to permit the steam to escape freely therefrom, and as the pressure of the steam diminishes the valve will descend. The wings (shown in Fig. 3) are made in the form of blades, which are attached to the valve in a suitable manner, but these wings may be made as shown in Fig. 7 by cutting or grooving the body of the valve. It will therefore be observed that instead of increasing the size and weight of the valve, as would be necessary to provide for the proper regulation thereof under heavy exhausts, I accomplish the same result by employing devices for retarding the movement of the valve, and these devices are embodied with the valve in such a manner that they operate in a highly-satisfactory manner to accomplish the desired results.

Instead of securing the cap G on a projection F of the valve, as shown in Fig. 1, I may screw this cap into a recess I in the upper end of the valve, as shown in Fig. 3, and also provide a guide-plate J for the guide C.

While I have described my invention as particularly adapted as a steam-exhaust nozzle, it will be understood that I reserve the right to use it in all other connections and with other fluids wherever it may be practicable. It is also important that as the steam escapes from the nozzle it is distributed in such a manner as to produce a more effective draft than would be the case if it escaped therefrom in a solid body.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a steam-exhaust nozzle, the combination with the body and a guide connected therewith, of a valve mounted on the guide, said valve being so constructed and arranged as to be operated vertically and revolubly by the escaping steam.

2. In a steam-exhaust nozzle, the combination with a body and a spirally-threaded guide, of a valve adapted to be moved vertically and revolubly on the guide by the escaping steam to vary the escape-opening, substantially as described.

3. In a steam-exhaust nozzle, the combination with a body and a guide, of a valve adapted to be adjusted vertically on the guide by the escaping steam and means for imparting a revoluble movement to the valve coincident with its adjustment on the guide.

4. In a steam-exhaust nozzle, the combination of a body, a guide mounted therein and provided with a spiral thread and a valve mounted on the body and provided with a thread to receive the thread of the guide, whereby the valve is vertically and revolubly adjusted by the escaping steam, substantially as and for the purpose described.

5. In a steam-exhaust nozzle, the combination with a body, of a spirally-threaded guide mounted therein, a valve operating vertically on said guide and a cap carried by the valve to receive the upper end of the guide, substantially as described.

6. A steam-exhaust nozzle provided with a spirally-threaded guide mounted therein and having a spirally-threaded valve provided with exterior wings, said wings being disposed around the valve so that the pressure of the escaping steam thereon will retard the upward movement of the valve.

7. In a steam-exhaust nozzle, the combination with a body, of a guide mounted therein and provided with a spiral thread, a valve operating on the guide and wings on said valve, substantially as and for the purpose described.

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