

E. A. HILL.
Variable Exhausts for Locomotive and Other
Engines.

No. 158,710.

Patented Jan. 12, 1875.

Fig. 1.

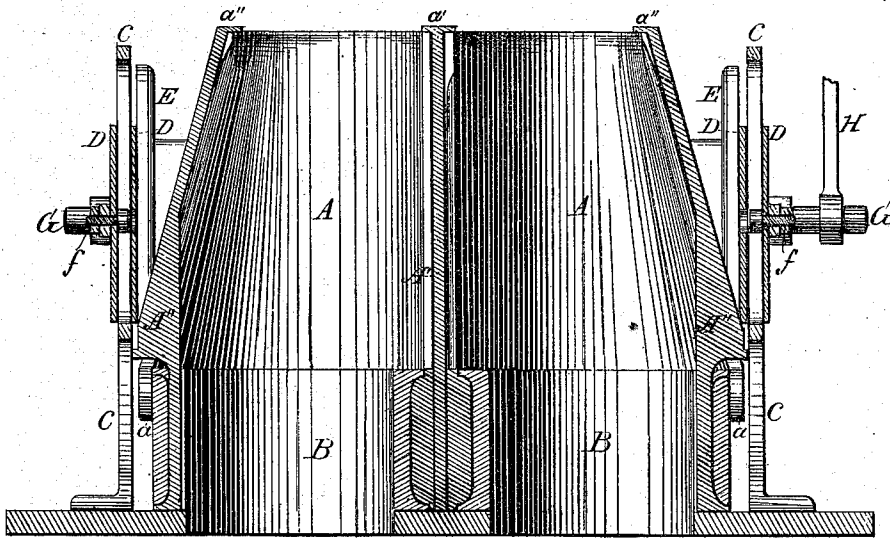


Fig. 3.

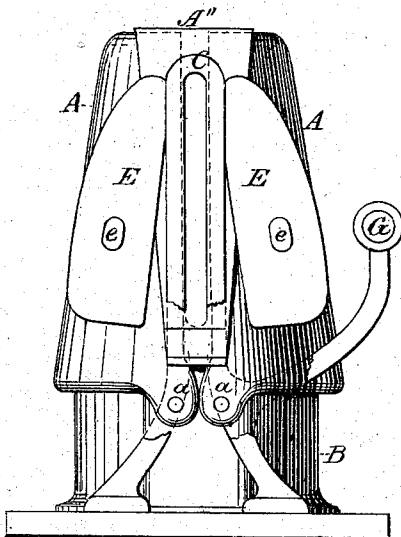
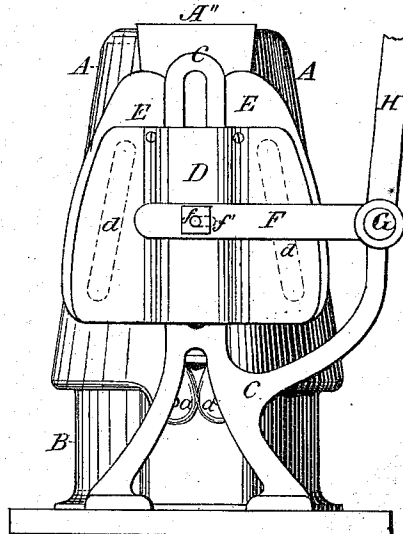


Fig. 2.



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Fig. 4.

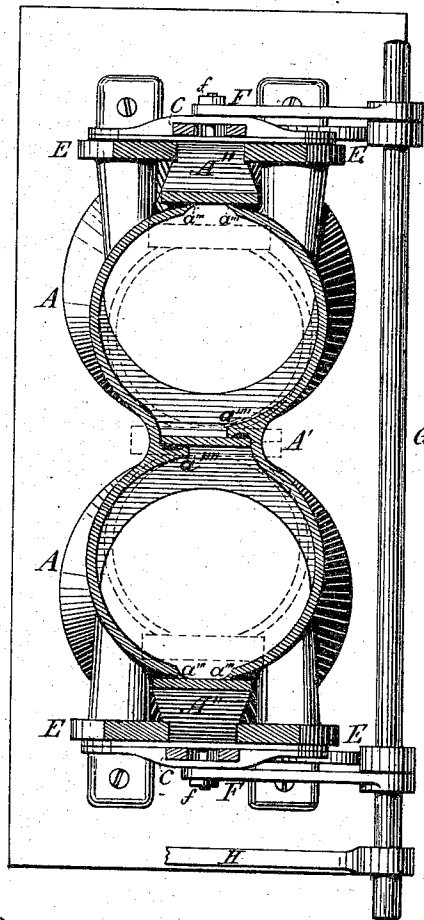
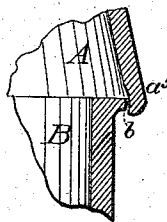


Fig. 5.



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UNITED STATES PATENT OFFICE.

EDWIN A. HILL, OF EAST CAMBRIDGE, MASSACHUSETTS.

IMPROVEMENT IN VARIABLE EXHAUSTS FOR LOCOMOTIVE AND OTHER ENGINES.

Specification forming part of Letters Patent No. **158,710**, dated January 12, 1875; application filed January 4, 1875.

To all whom it may concern:

Be it known that I, EDWIN A. HILL, of East Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Variable Exhausts for Locomotive and other Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to that kind of exhausts for locomotives composed of one or two pipes surmounted by sectional nozzles, which can be expanded and contracted at the pleasure of the engineer to regulate the draft.

My improvement consists of certain herein-after fully explained novelties of construction and combination of parts, to the end of furnishing a comparatively simple apparatus, not liable to get out of order, or to clog or stick by reason of changes of temperature, or of becoming gummed up.

In the drawings, Figure 1 is a vertical longitudinal section of my improved variable exhaust. Fig. 2 is an end elevation of the same. Fig. 3 is also an end view thereof, but with the cross-head and part of the standard broken away to expose parts otherwise hidden thereby. Fig. 4 is a horizontal section. Fig. 5 is a detail, showing the cutting-edges between the base-pipe and movable section.

The same letters of reference are used in all the figures in the designation of identical parts.

The exhaust pipe or pipes B B rise from the base-plate to a height of several inches, and may terminate in cutting-edges. The nozzles are composed, in part, of the sections A A, the sectional contour of which is best seen in Fig. 4, and are fitted with their ends over the pipes B B, and the said sections turn upon pins, as at *a a*, independently of each other. The spaces between the said sections of the nozzles along the line of division are covered by the vertical section A' in the center, and the sections A'' A'' at the respective ends. All these said sections combined unite to form

the nozzle or nozzles proper. On the tops of the sections A' A'' are flanges *a' a''*, the outer edges of which coincide with the respective inner edges of the top of the section A, so that when the said sections are expanded the column of escaping steam will be kept unbroken, and will not permit any side issue of the steam. The sections A'' A'', instead of being inclined inwardly, as now shown, may rise perpendicular nearly to the top, and then curved or bent inward, so as to fit closely upon its cutting-edges of the sections A, and their upper ends or tops be bent inward to overhang the top of the section A, or space between A A, as before. The lower ends of said sections A'' A'' are firmly fixed to the base-pipe, in any convenient manner. Being fixed thus, there is every opportunity for the expansion of the sections A when the device is in use. The edges *a'''* of the section A A are fitted in close contact with the sections A'' A''. To accomplish this, each of said edges is made so as to project outwardly, and form a lip upon the entire length of each of said sections. In the movement of the said section to and fro over and upon the inner face of A'' A'' these lips form sharp cutting-edges, to remove all accumulations of gummy or sticky matter.

In constructing my device it may be found convenient to curve the inner face of each section to correspond with the circle described by said sections A A in their movements to and fro. By this detail of construction the inner edges of *a''''* of said section A come against the central section, A', on diagonally-opposite sides. The said edges perform the same office upon said section, as above described, by the edges *a'''* upon sections A''.

In construction, I may put a cutting-edge on each side of said section A', so as to impinge upon and work against the inner face of the edges *a''''* of A'. This is a change I have found of advantage under some circumstances, and it does not materially change the construction or operation of my said device.

The sections A A are swung on their centers in the ends, through which pins *a* pass to expand and contract the exhaust-apertures by means of cross-heads D D sliding vertically on fixed standards C C, and provided on their

interior sides with oblique converging grooves *d d*, engaging, respectively, fixed studs *ee*, projecting from bosses *E* on the sections *A*. The grooves *d* stand at only a slight angle to a vertical line, so that the pressure of the steam on the sections of the nozzles shall be unable to move the cross-heads, but simply aid in holding them, and consequently the sections *A*, in any position in which they may be arranged by the engineer. The outer faces of the bosses *E* are made of such size and shape as to fit against the cross-heads *D*, and fully cover and protect the grooves *d* in all the movements of said sections *A A*. The cross-heads *D* are connected, by studs *f*, to arms *F* of rock-shaft *G*, turning in brackets of the standards *C*. The aperture or slot *f'* in the end of arm *F*, through which said stud *f* passes, is made oblong, so as to allow for the play of the said arm in the motions of the cross-heads *D*. The arm *H* of this shaft *G* is to be operated by the engineer from his cab by means of a suitable connecting-rod. Upon the upper part or top of the pipes *B* I form such an edge, *b*, as that it shall, when the sections *A A* are opened or closed, so impinge upon them at *a^s* as to remove and clear away all accumulations of sticky and gummy matter at these points; or I may make this cutting edge or device upon the lower ends of said sections *A A*. In either event the operation will be the same, and the change in construction will require only the slightest mechanical skill.

As I have illustrated my invention in the present instance, the sections of the nozzle converge or incline toward each other from base to top, but it may be found of advantage to construct these parts so that the sides shall be parallel, or nearly so, from the lower ends almost to the top; here they shall contract suddenly, so as to materially reduce the size of the exit. This form of construction, under some circumstances, will materially increase the effects of the force of the steam as it issues from the nozzle.

When the movable sections are brought together the apertures are somewhat elliptical in shape; but when expanded about half their limit of movement, which is the position of ordinary use, these openings are round, or nearly so, which is thought to be the best and most effective form of exit.

Variable exhausts are made and used, but have but one nozzle, and when more than one is needed, a second is placed at its side.

In my device I have produced an exhaust that practically combines two in one, and thus have an exhaust that can be more easily and surely worked than under former condition, where two exhausts were placed side by side. But, while I thus present my invention, I do not mean to so limit it as to prevent my using one nozzle instead of two. Ordinarily and generally two are used, as hereinbefore described and explained.

I am aware that exhaust-nozzles provided with cutting-edges and incased have been used before, but such a device or method of construction is not what I claim.

I claim—

1. The pipes *B B*, in combination with the sections *A A* of the nozzles, and the expansible sections *A'' A''* and center section, *A'*, substantially as and for the purpose specified.

2. The combination of the base-pipe *B* with section *A*, having cutting-edges *a'''*, and fixed sections *A' A''*, substantially as and for the purpose specified.

3. The sectional exhaust-nozzles *A A*, in combination with the center section, *A'*, and end sections, *A'' A''*, provided with flanges or overhanging edges *a' a''*, substantially as and for the purpose specified.

4. The combination of the sections *A A* of the nozzles, having projecting studs *ee*, with the vertically-sliding cross-heads *D D*, provided with oblique converging grooves *d d*, and having arm *F*, slotted at *f'*, and secured by bolt *f*, substantially as and for the purpose specified.

5. The sections *A A* and pipes *B B*, combined to operate with and upon each other by means of cutting-edges *a^s* and *b*, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

EDWIN A. HILL.

Witnesses:

E. F. M. FAEHTZ,
GEORGE T. SMALLWOOD.