W. E. Cooper,

Exhaust Pipe for Locomotives.

No. 13,939. Patented Dec. 18, 1855.

Fig. 1

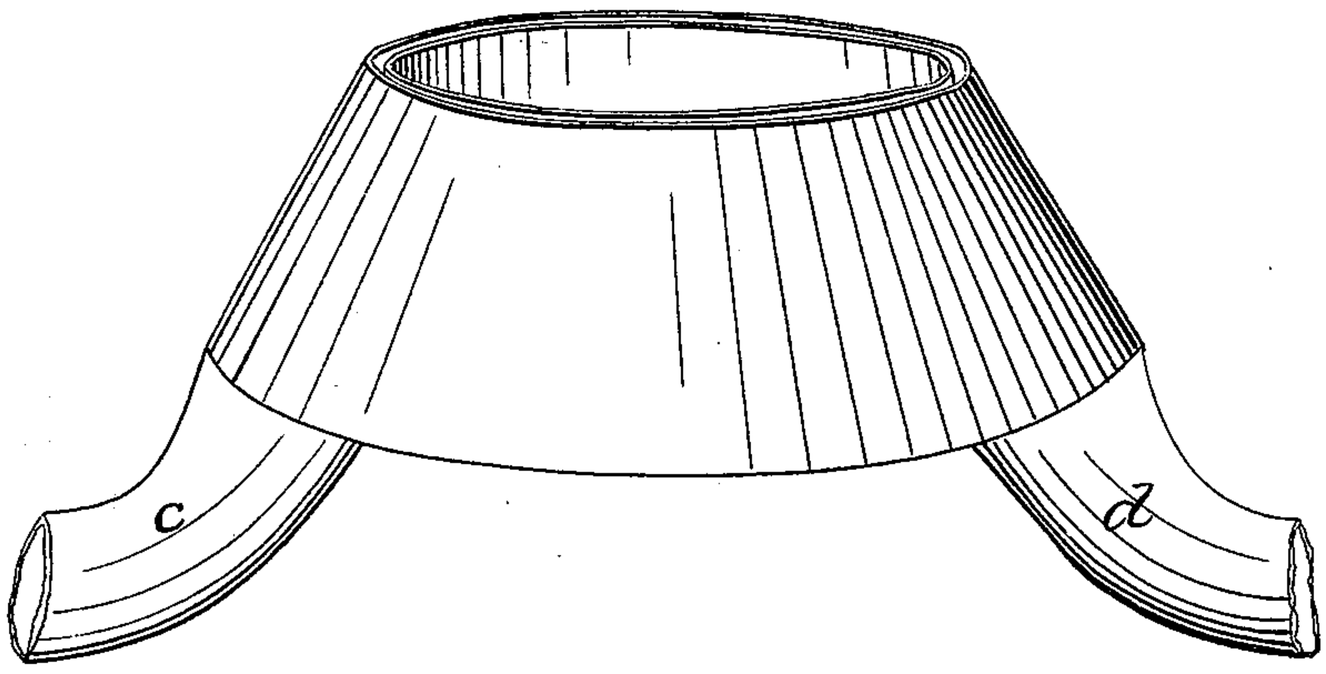
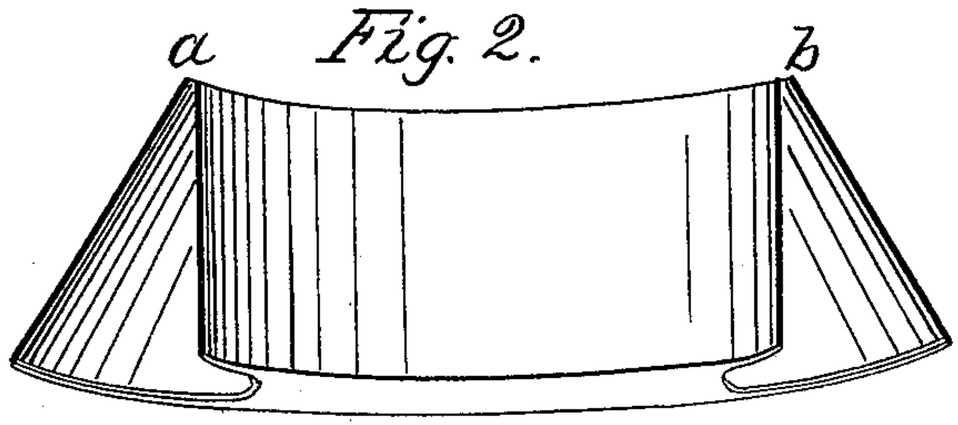


Fig. 2.



UNITED STATES PATENT OFFICE.

W. E. COOPER, OF DUNKIRK, NEW YORK.

NOZZLE FOR EXHAUST-PIPES OF LOCOMOTIVES.

Specification of Letters Patent No. 13,939, dated December 18, 1855.

To all whom it may concern:

Be it known that I, WILLIAM E. COOPER, of Dunkirk, in the county of Chautauqua and State of New York, have invented a new and improved blast-nozzle for increasing the efficiency of locomotive and other steam engines by generating as strong a draft as now obtained or a stronger, if desired, and at the same time creating less obstruction to the exhaust-steam, and consequently causing less back pressure upon the piston.

The nature of my invention consists in shaping the stream of vapor as it escapes into the form of a large ring or hollow tube, so that the air to be acted on shall be within as well as without such ring, by which means a greatly extended surface is obtained and the useful effect of discharging a given quantity of steam is greatly increased. This increased efficiency may be made available either by increasing the strength of the draft while allowing the same total area of opening for the escape of the exhaust steam or by allowing a greater area for such purpose and consequently diminishing the objectionable back pressure upon the piston, it being well known that a diminution of such opening under ordinary circumstances increases the draft in the chimney by increasing the velocity of the ejected vapor, but also diminishes the effect of a given quantity of steam in the cylinder, by obstructing the escape of the exhaust steam and thus creating a back pressure.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation, and I do hereby declare that the following is a full and exact description thereof.

I construct and arrange the boiler, smoke-box, cylinders, steam-pipes, valve-chests, joints, etc., in any of the usual or known methods. I also place the exhaust pipes or blast pipes very nearly in any of the known positions, allowing them to terminate at any point higher or lower than usual as may be preferred. But I do not lead them into close proximity one with the other, nor do I join into one small nozzle as is the custom with some, but I simply flatten their extremities spreading them in such a manner as not materially to diminish their sectional area and connect them directly to the under side of a hollow ring.

In the drawing Figure 1 represents a perspective and Fig. 2 a sectional view of the hollow ring in its simplest form, Fig. 1 being also accompanied by representations of portions of the exhaust pipes, such portions being represented respectively by *c* and *d*. This ring is cylindrical on its internal, and conical on its external surface, the degree of inclination being made to depend upon the circumstances of the case, or the taste of the designer, the object being to afford sufficient thickness at the base to receive freely all the steam entering through the pipes and distribute it equally to all its parts, and at the same time to allow its escape only through a narrow opening extending continuously around its top. The internal diameter of the ring described must be sufficient to allow the ascent through its interior of a large quantity, say one half of the gases to be expelled and the whole must be so arranged as to permit its flow from the tubes or flues of the boiler to the base of the ring and thence upward through its interior to the chimney, assisted in the latter portion of its route by the friction of the rapidly escaping steam. I would designate as desirable proportions an internal diameter of ten or twelve inches, a thickness of two and a half or three inches at the base and a height of twelve to fourteen inches, but I do not confine myself to either or any of these dimensions. Neither do I confine myself to a circular form of ring nor to a strictly conical exterior or a perfectly cylindrical interior. The ring may be made elliptical, a form which might be superior in some respects, but more difficult of construction, or it may be made in any other curved or angular form desired provided that the great end is attained of spreading the blast into a broad thin sheet and allowing it to act with both its exterior and interior faces on the products of combustion which are to be impelled.

If desired the tubular form of the current may be departed from altogether and the portion *a b* in Fig. 2 which I have termed a ring may be so shaped that the steam may escape through a semicircular or other portion of such a tube, the hollow side of the curve being turned toward the direction from which the smoky gases are received. I prefer for obvious reasons the form and arrangement first described.

I use my improved nozzle either with, or without, what are known as petticoat pipes, but I prefer to construct the base of the chimney of sufficient size to receive the cur-

rent of steam and smoke without such aid, and to prolong the cylindrical portion or interior shell of my ring downward nearly to the base of the chimney should it be desired to increase the draft in the lower portion of the smoke-box.

I am aware that in the various multiplied forms of exhaust nozzles the stream of escaping vapor has been already formed into various shapes, one of which is in effect a ring, a conical plug being fitted in the orifice to regulate the area of the opening by varying its position, but none of these have been with the intent, nor have they produced the effect of mine, inasmuch as the blast has never been efficient except on its outer surface, whereas

What I claim as my invention and desire to secure by Letters Patent is—

The blast nozzle described, which forms the escaping steam into a circle, or its equivalent, and permits the products of combustion to pass up both sides of the annular steam track or current as herein set forth.

WM. E. COOPER.

Witnesses:
J. H. Coover,
C. Vrooman.