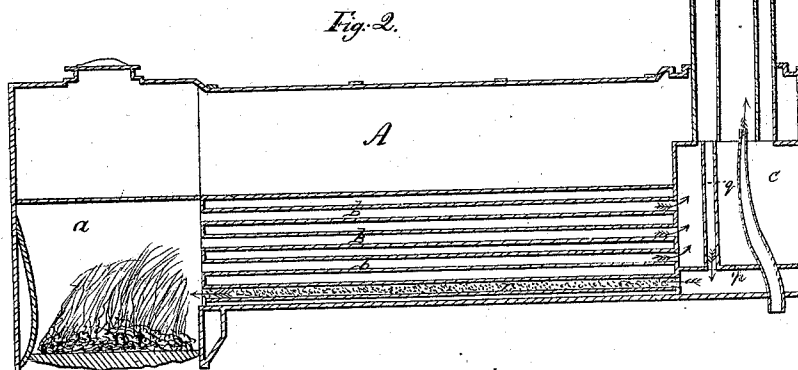
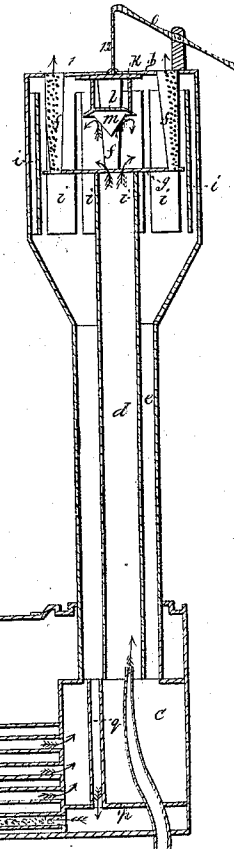
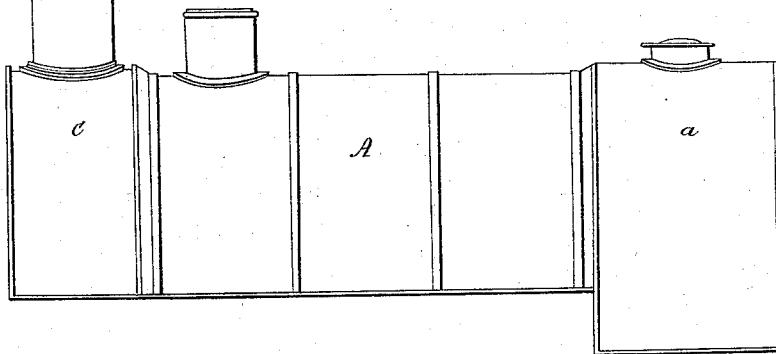
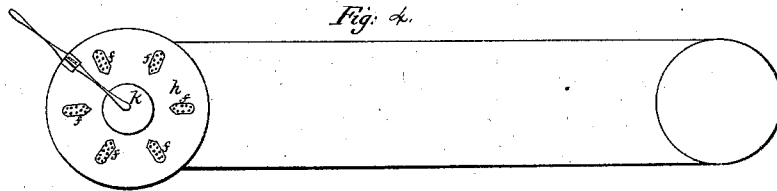
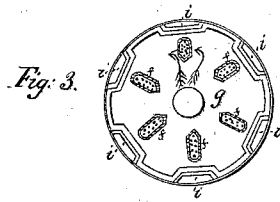
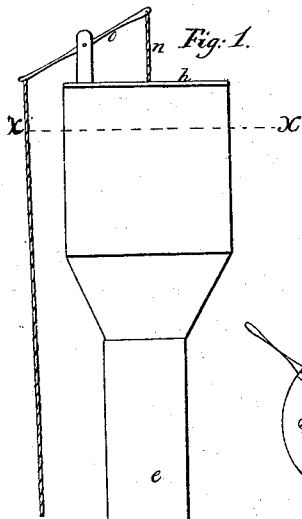


W. Duff,
Spark Arrester,

Patented Sept. 30, 1845.

No 4, 217,



UNITED STATES PATENT OFFICE.

WILLIAM DUFF, OF BALTIMORE, MARYLAND.

IMPROVEMENT IN SPARK-ARRESTERS.

Specification forming part of Letters Patent No. 4,217, dated September 30, 1845.

To all whom it may concern:

Be it known that I, WILLIAM DUFF, of the city and county of Baltimore, and State of Maryland, have invented new and useful Improvements in the Method of Arresting and Consuming Sparks in the Chimneys of Locomotives and other Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the principle or character thereof which distinguishes it from all other things before known, and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is an elevation of the chimney on a locomotive-boiler; Fig. 2, a longitudinal vertical section; Fig. 3, a horizontal section taken at the line X X of Fig. 1, and Fig. 4 a top view.

The same letters indicate like parts in all the figures.

The nature of my invention and what distinguishes it from all other things before known consists in making the side of the perforated tubes which surround the central tube of the chimney and through which the smoke and other products of combustion have to pass of imperforated sheet metal, to avoid the direct action of the exhaust from carrying sparks through the perforations in the tubes, and also in making a communication between the spark-reservoir around the chimney and a space at the lower part of the smoke-box made by a partition therein, which space communicates with the fire-chamber by means of a tube or tubes corresponding with the flues, but below them, so that the action of the exhaust in producing a draft through the flues partly exhausts the tubes below the flues, and thereby tends to draw all the sparks back into the fire to be consumed, while at the same time this back current tends to keep the perforated surfaces clear for the passage of the smoke, &c.

In the accompanying drawings, A represents a locomotive-boiler of the usual construction with a fire-chamber *a*, flues *b*, smoke-box *c*, and chimney *d*. The chimney *d* is surrounded by an outer casing *e* to form a receptacle for catching the sparks, which is enlarged at the upper end for the reception

of a series of tubes *f*, arranged around the chimney and parallel to it, and extending from a flat ring *g* (that projects from the upper end of the chimney toward the enlarged part of the surrounding case, but leaving a sufficient space between them for the passage of sparks) to the top or cap-plate *h* which is pierced with holes to correspond with the ends of the tubes *f*, and a central hole immediately above and of the same size as the chimney, for the escape of smoke, &c. The flat ring *g* is perforated with small holes at the ends of the tubes *f*, and its outer periphery is cut out to leave a space between it and a series of vertical tubes *i*, attached to the surrounding case *e* and extending from near the top to within a short distance of the bottom of the enlarged part of the surrounding case. These tubes may be dispensed with and a space between two concentric rings substituted. The central holes in the cap-plate *h* are governed by a damper or valve *k* *l*, the upper one *k* to close the central hole in the cap-plate, and the lower one *l* is made with its under face concave, and to it is attached an inverted cone *m*, the base of which is of less diameter than the damper, and the two are attached together and suspended by a jointed link *n* to a lever *o*, by which they are operated.

The series of tubes *f* may be made of any desired form in their cross-section, although I prefer that given in the accompanying drawings, which consists in making the face toward the chimney of two planes at right angles to each other and at an angle of forty-five degrees with the sides, which are connected together by a semicircle. The face toward the chimney is to be imperforated and the sides and back perforated in the usual manner, or made of wire-gauze, for the passage of smoke and other gaseous products of combustion, but to intercept the sparks. In their vertical section I prefer to make them larger at top than bottom.

The smoke-box is divided into two compartments by a horizontal partition *p*, and a communication is established between the lower chamber and the receptacle for sparks around the chimney by means of a vertical tube *q*. This partition is placed just below the lower range of flues *b* and above a range

of flues or a single flue *r*, which correspond with and would operate as flues were it not for the partition *p*, but which in consequence of this form a communication between the compartment below the partition and the fire box or chamber *a* to reconduct the sparks from the chamber around the chimney to the fire-box, there to be consumed.

For the purpose of firing up, at which time a free and strong draft is required, the double valve or damper *k l* is suspended midway between the top of the chimney *d* and the cap-plate *h*, so that the smoke and other products of combustion pass directly out the inverted cone *m* on the bottom of the valve or damper *l*, deflecting the current and directing it around the edge of the valve; but when it is desired to arrest the sparks the double valve or damper is drawn up so as to close the central aperture in the cap-plate *h*. The smoke, sparks, and other products of combustion are carried up by the action of the exhaust-steam as generally employed against the inverted cone and curved surface of the damper *l*, by which they are deflected and thrown against the imperforated surface of the tubes *f*, thus directing the sparks against the outer casing, from whence they will fall through the space between it and the edge of the flat ring *g* into the receptacle for them, while the current of smoke and other gases still under the influence of rarefaction, &c., pass through the perforations in the tubes *f*, and then through the open ends at top. The few sparks that by the force of the current reach the cap-plate are carried into the tubes *i*, attached to the outer case, or a space formed by two concentric rings as a substitute and equivalent therefor, and thence down into the spark-receptacle. From this receptacle the sparks are carried down by the vertical tube *q* into the chamber below the smoke-box formed by the partition *p*, and from this they are drawn by the action of the current into

the fire-chamber *a*, to be consumed, for it will be evident that the action of the rarefied air and the exhaust-steam produces a current into the fire-chamber, and that this draft will necessarily cause the sparks to fall into the spark-receptacle, instead of adhering, as they frequently do in other spark-arresters, to the perforated surfaces, to the obstruction of the draft. The double damper or valve *k l* is provided with a rod or cord to be at the command of the engineer or fireman.

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

1. The arrangement of the series of tubes around the chimney with their imperforated surfaces toward the center of the chimney to prevent the direct action of the exhaust, &c., from forcing the sparks through the perforations, as herein described.

2. The arrangement of the damper or valve with the inverted concave plate and cone at bottom, in combination with the series of tubes composed of perforated and imperforated surfaces.

3. In combination with the series of tubes surrounding the chimney, the tubes attached to the outer casing or the equivalents thereof for conducting the sparks into the receptacle, that are carried by the force of the current up to the top, as herein described.

4. Connecting the fire-chamber with the receptacle for the sparks made in the lower part of the smoke-box by a partition therein by means of a lower tube or range of tubes corresponding with the flue-tubes, so as to carry back the sparks to the fire-chamber by an arrangement entirely within the casing of the boiler and furnace and acted upon by the current, as herein described.

WILLIAM DUFF.

Witnesses:

SHEPARD STAMMERS,
PETER MOWEL.