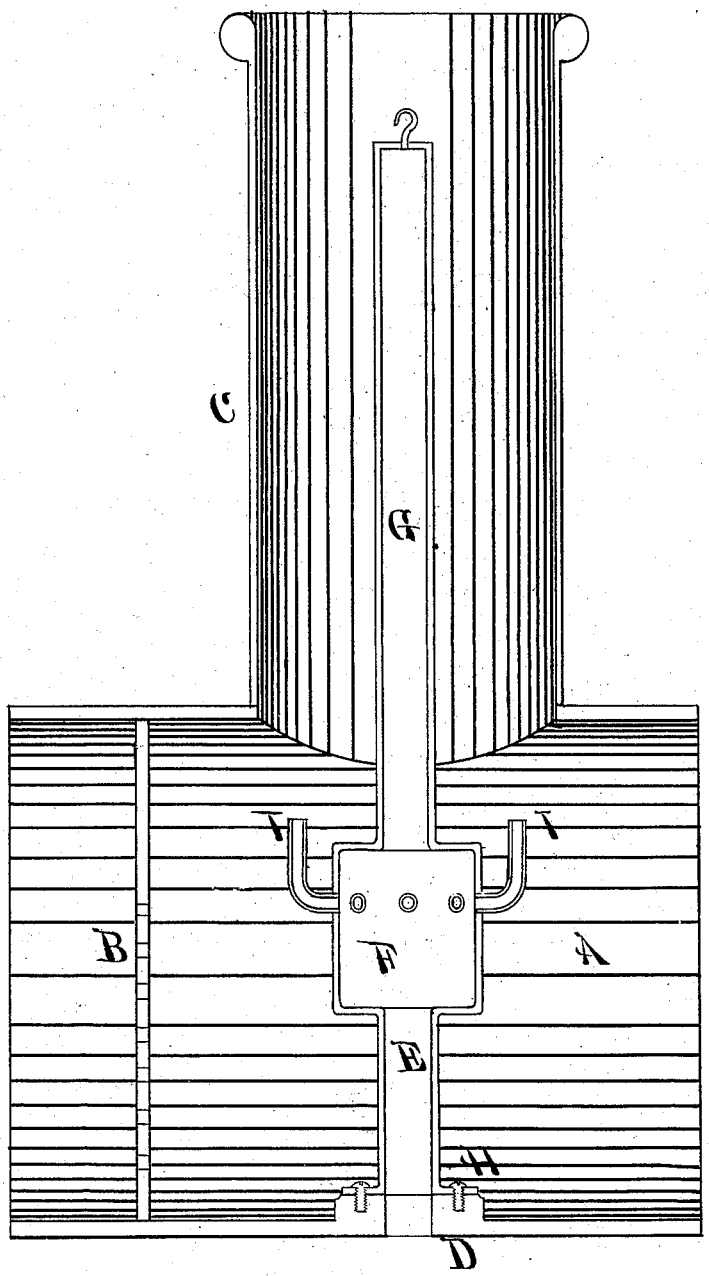
T. SHAW.

SPARK-ARRESTERS.

No. 194,732. Patented Aug. 28, 1877.



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IMPROVEMENT IN SPARK-ARRESTERS.

Specification forming part of Letters Patent No. **194,732**, dated August 28, 1877; application filed May 16, 1877.

To all whom it may concern:

Be it known that I, THOMAS SHAW, of the city and county of Philadelphia, Pennsylvania, have invented a new and Improved Method of Arresting Sparks in Locomotive or Portable Engine Smoke-Stacks; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon.

My invention consists in the construction of smoke-stacks and exhaust-nozzles, for the purpose as hereinafter described.

The object of the invention is to cause the escaping steam and gases to pass out of stack at velocities sufficiently low to prevent the floating and carrying off of the usual solid matter ejected from smoke-stacks, and to convert the smoke-arch and smoke-stack into a subsiding-reservoir for the subsidence of solid particles.

In order to enable others to use and practice my invention, I will proceed to describe its construction and operation.

On reference to the accompanying drawing, which forms part of the specification, the sketch represents a longitudinal vertical section through the center of smoke arch and stack of front end of locomotive, of which A is the shell of smoke-arch, and B the tube-sheet, and C the smoke-stack. D is the exhaust-passage, leading from the engine in the usual manner. H is a disk, secured to the exhaust-passage D by bolts. E is an exhaust-pipe connected to disk H, which leads into and is attached to expanding-chamber F, above which is attached a steam-cushion chamber, G. The expanding-chamber F is provided with numerous outlet-tubes I, pointing in an upward direction, for the purpose of artificial draft.

Locomotive smoke-stacks and exhaust-nozzles, as ordinarily arranged, pass an average of over seven thousand cubic feet of gas per minute. The diameter of stacks ordinarily is regulated and controlled by the diameter of the cylinders of the engines, the stack being made usually about two or three inches smaller in diameter than the cylinders, which diameter of stack has an average of less than fifteen inches, and the maximum velocities induced in smoke-stack to pass the average amount of gas—seven thousand feet per minute—gives a speed of about one hundred and six feet per second, which velocity of gas is sufficient to carry a two-inch cube of coal out of the stack. Therefore, all solid matter within the size of a two-inch cube is ejected from the stack, and, as the solid matter ejected is in a state of incandescence, the locomotive is often involuntarily converted into an engine of destruction, causing conflagration in its path. All attempts to arrest this solid matter within the locomotive have been of a screen character, the solid particles being driven by the force of the gases violently against the screens until they are beaten to particles fine enough to pass through the meshes of the screen, when they are at liberty to pass out and go on their errands of destruction.

All efforts to retain the sparks for a temporary period within the engine have been of a screen or partition character, the prime object aimed at being to arrest the sparks by forcible contact with metal surfaces, which devices have only in a moderate degree served the purpose for which they were intended, as the locomotives this day running bear witness.

This explanation of the state of the art to date is given in order to strike more fully the line of demarcation between this invention and other spark-arresting devices.

The operation of the invention is in this wise: The exhaust steam from the engine passes up tube-passage E into expanding-chamber F, and compresses into and recoils from steam-cushion chamber G, and in the meantime escapes through tubes I in a prolonged and modified blast, giving artificial draft by ejecting the gases into and from the stack C. The combination of steam-chamber F with steam-cushion G modifies the force of blast from the exhaust steam, and lowers the maximum, but gives a higher average draft as compared to the ordinary exhaust arrangements.

The stack C is made with diameters about double those ordinarily used, the object being to give an area of outlet of four times that generally employed. The only proper regulation controlling the area is the velocity of the escaping gases, which, in the proper use of this invention, is so low that solid carbon will not pass out, but will settle within the stack with-

out the intervention of any screens whatever, converting the smoke-arch and the smoke-stack into a subsiding-reservoir for the arresting of solid incandescent carbon.

It will be observed that with this invention there is scarcely any limit to the ability to arrest solid particles within the stack, for here is offered unlimited control to modify and reduce the velocity of the escaping gases to an extent of even arresting the escaping dust, if desired.

It is evident that an increase of double the diameter gives four times the area, which enables the passing of the same amount of gas at a proportionate reduced velocity.

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

1. In a spark-arrester in which all screens and intercepting parts can be dispensed with, a smoke-stack of such area that the velocity of the ascending current of gases will be such as to cause the subsidence of the sparks in the smoke stack and arch.

2. The smoke-stack of the described increased area, in combination with an exhaust-nozzle, constructed substantially as described, to produce a high average with a low maximum draft.

3. The exhaust-nozzle composed of the passage E, expanding-chamber F, steam-cushion G, and escape-pipes I, arranged as described, for the purpose set forth.

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Witnesses:
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