W. H. RICHARDSON.

Spark-Arrester.

No. 162,691. Patented April 27, 1875.

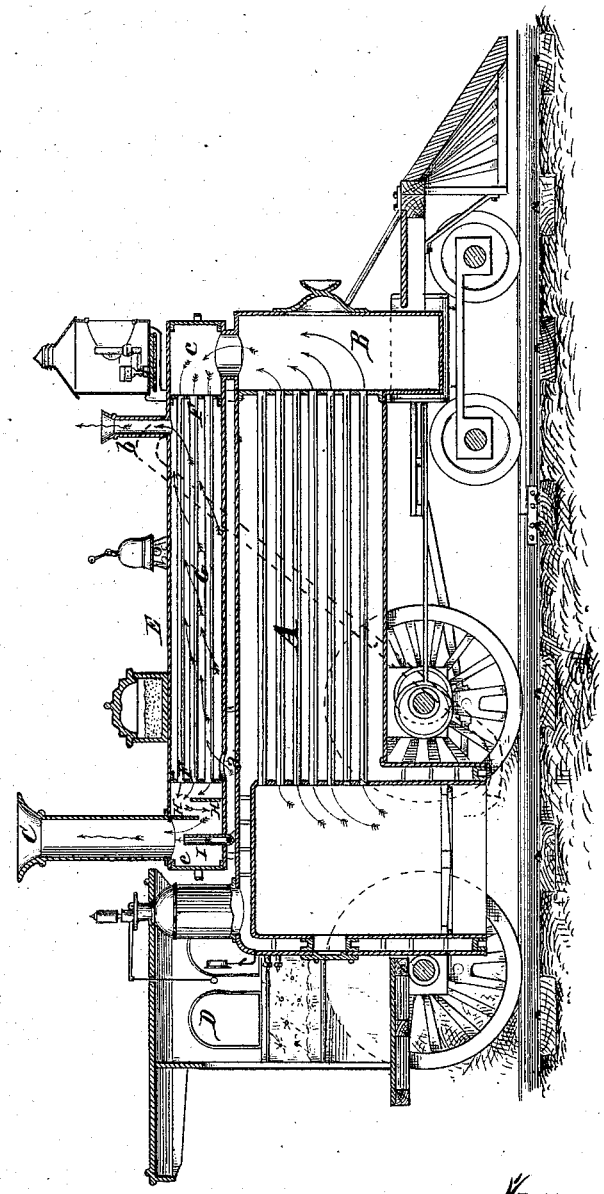

Fig. 1

Attest

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UNITED STATES PATENT OFFICE.

WILLIAM H. RICHARDSON, OF CINCINNATI, OHIO.

IMPROVEMENT IN SPARK-ARRESTERS.

Specification forming part of Letters Patent No. **162,691**, dated April 27, 1875; application filed October 17, 1874.

To all whom it may concern:

Be it known that I, WILLIAM H. RICHARDSON, of Cincinnati, Hamilton county, State of Ohio, have invented certain new and useful Improvements in Locomotives, of which the following is a specification:

The object of my invention is to prevent the escape of heavy smoke, sparks, &c., from the smoke-pipes of locomotives; and my invention consists in locating the smoke-pipe near the cab, and interposing between the said pipe and the smoke-box of the boiler an apparatus of peculiar construction, by the construction and operation of which the heated gases are carried over the boiler before escape, and caused to precipitate sparks, cinders, condensed or unconsumed carbon, &c., by the action, and against the sides of surfaces cooled by, a current of air.

This patent is intended to cover a special adaptation of the smoke-precipitator described and claimed in another application of even date with this.

Figure 1 is a sectional elevation of my improved locomotive.

A represents the body of a locomotive, B being the usual smoke-box. In place of locating the chimney C over this smoke-box, I remove it to a location near the cab D, and interpose between it and the smoke-box a conveying and cooling apparatus, as follows: E is a case or shell having heads F F, in which are fitted one or more tubes, G. The tubes provide passages for the products of combustion, and the spaces around the tubes constitute or compose a chamber for the introduction of air. The gases pass in the direction of the arrows; and in order that the gases may be considerably cooled by the simple passage of the air naturally through the apparatus, I provide for the reception of it at *a*, where the tubes are coolest, and for the escape of it at *b*, where the tubes are hottest. In this way the currents are in reverse directions, and the cooling properties of the air introduced are more fully utilized than if the currents were in the same direction. In the passage of the products of combustion through the pipes G a reduction of temperature is caused by the current of air, sufficient to cause the vapors emitted in the furnace from the liquids contained in the coal to condense, and the accompanying particles of condensed carbon, with cinders, sparks, &c., to adhere to the interior of the tubes. By this means a great portion of the heavy smoke and the sparks and cinders are caught or collected before escape into the chimney. At one or both ends of the chamber diaphragms H may be introduced, and placed in reverse direction, as shown. If occupying the smoke-box end of the boiler, they serve to cause eddies in the current sufficient to check and take up the heaviest particles of floating matter, and prevent the same from entering the tubes; and, if at the chimney end, they also cause eddies, which cause the collection of the floating particles that have escaped from the tubes.

Suitable receptacles may be attached for the soot, &c., to fall into from the diaphragms or ends of the tubes, for the purpose of collecting the matter caught up, which receptacles may be emptied at any time through proper doors or openings.

I is the exhaust-pipe from the engine. This I prefer to introduce, not into the smoke-box, but in the newly-located chimney, as shown, either below the mouth, as shown, or in the cylindrical part. Its location here will not cause such fluctuation in the speed of the current of gases from the furnace as is customary when it is located in the smoke-box, and my apparatus, therefore, will not receive as much floating matter as ordinarily passes through a locomotive-chimney.

The escape of heated air from the pipe *b* may be either turned into the chimney to assist draft, or passed in a pipe or pipes (shown in dotted lines) to the furnace, and there introduced as hot blast to assist combustion, or to heat the feed-water of the boiler, or it may be allowed to freely escape; and the current may be natural, as shown, or be increased by the use of a blowing apparatus.

When the current of air is introduced into the fire-box from the apparatus which heats it it serves to economize fuel by reason of its high temperature, and serves also to increase the draft. It may be introduced either above or below the grate-bars in any preferred way. The blast may be either sufficient of itself to feed the fire with oxygen, or it may be used to partially feed it, the balance being the cold

air admitted by natural draft, and it will, in either case, assist in the ignition of the gases in the furnace, and facilitate perfect combustion and the prevention, to a large extent, of smoke. The cinders, soot, &c., caught up by the receptacles in communication with the chambers *c c* may be introduced into the furnace for rekindling and consumption as fuel.

In the drawing the products of combustion are shown as passing through tubes, and the air circulating outside; but it is obvious that they may be reversed, so that the air passes through the tubes, and the products of combustion outside.

The diaphragms H H may be detachable slides, to provide for their removal, and provision may be made for the swabbing or cleaning out of the tubes, so that all the matter cleaned out may be received into the dust-receptacles below the chambers *c c*. The smoke-box B may of itself act as a receptacle for the collection of soot, &c., both from the boiler and from the tubes of the apparatus E F G.

The gases may be prevented from entering the cooling apparatus, when the locomotive is in the round-house or elsewhere, by the provision of a separate chimney over the smoke-box, and a damper to cut off the gases from the apparatus.

I claim—

In a locomotive, the conveying and cooling apparatus E F G *c*, having air induction and eduction openings *a b*, to admit of a natural circulation of air through it, the apparatus being supported horizontally on top of the boiler, connecting at its forward end with the smoke-box B, and terminating at its rear end in the chimney C, all substantially as and for the purpose specified.

In testimony of which invention I hereunto set my hand.

WILLIAM H. RICHARDSON.

Witnesses:

EDGAR J. GROSS,

J. L. WARTMANN.