M. B. MASON.

Spark-Arrester.

No. 161,803. Patented April 6, 1875.

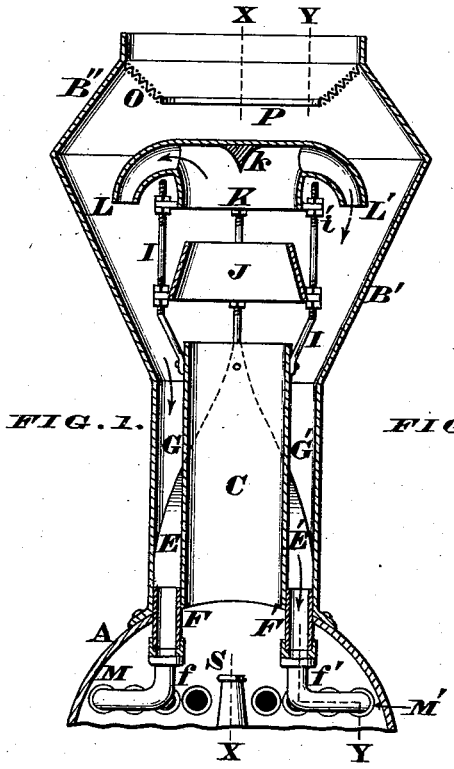


FIG. 1.

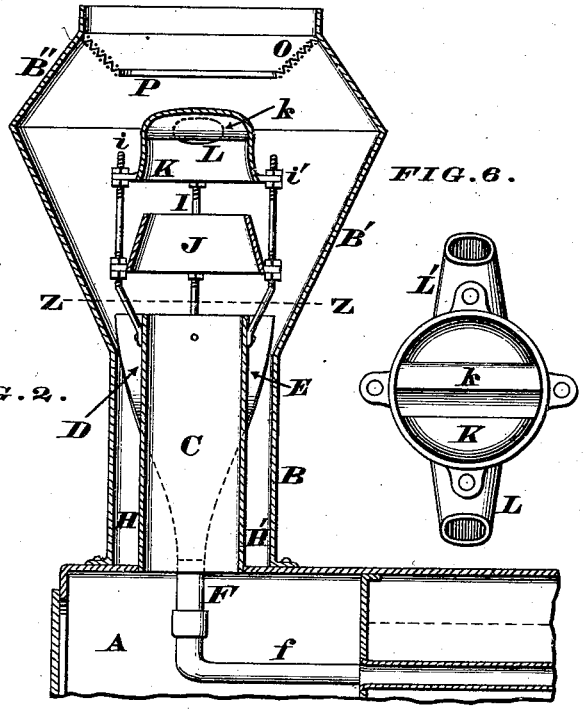


FIG. 2.

FIG. 6.

FIG. 4.

FIG. 5.

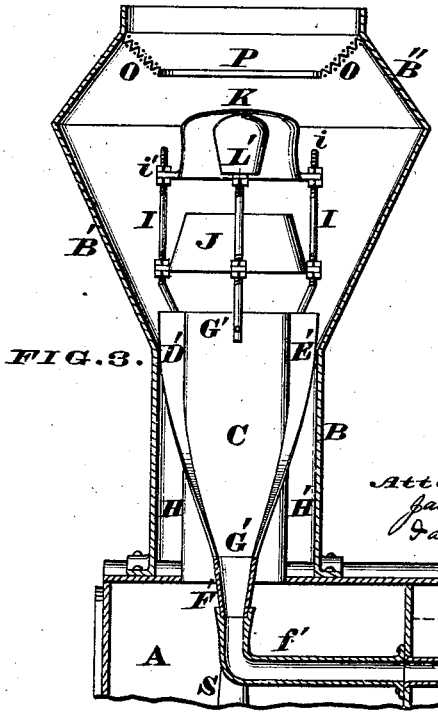
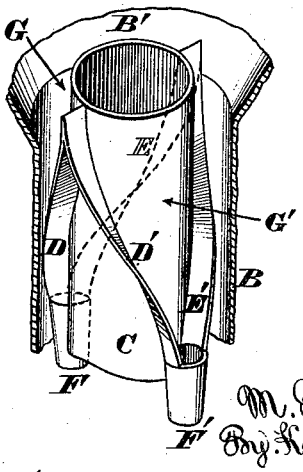
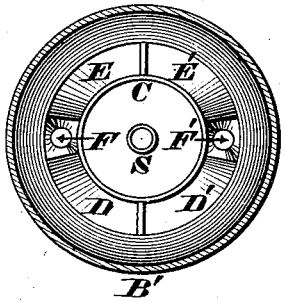


FIG. 3.





M. B. Mason.
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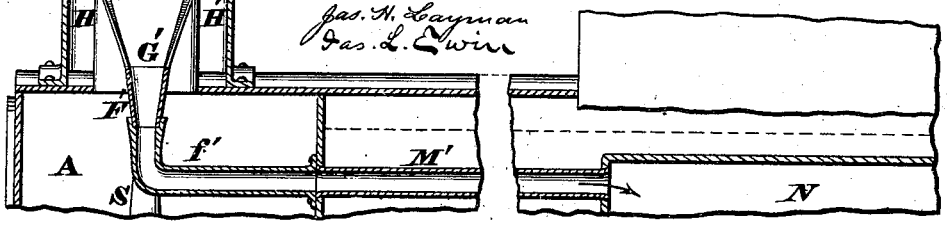

UNITED STATES PATENT OFFICE.

MATTHEW B. MASON, OF KANSAS CITY, MISSOURI, ASSIGNOR TO HIMSELF AND ROBERT H. HUNT, OF SAME PLACE.

IMPROVEMENT IN SPARK-ARRESTERS.

Specification forming part of Letters Patent No. **161,803**, dated April 6, 1875; application filed March 26, 1875.

To all whom it may concern:

Be it known that I, MATTHEW B. MASON, of Kansas City, Jackson county, Missouri, have invented a new and useful Combined Smoke-Stack and Spark-Arrester, of which the following is a specification:

The object of my invention is to arrest sparks, soot, cinders, and similar grosser emanations of combustion, that usually escape from a locomotive smoke-stack, and return them to the fire-box, so as to insure their complete consumption, and I accomplish this very desirable object by a peculiar arrangement of deflecting plate, flues, and tubes, the details of which devices, together with their mode of operation, being hereinafter fully described.

In the accompanying drawings, Figure 1 is a vertical section of my improved smoke-stack and spark-arrester, the section being taken transversely of the smoke-arch. Fig. 2 is a vertical section of the stack at the line X X, and longitudinally of the boiler. Fig. 3 is a vertical section of the stack and boiler at the line Y Y, the central portion of the boiler being removed. Fig. 4 is a perspective view, showing the inner pipe of the stack, and a portion of the inclosing-shell, the deflectors and upper portion of the shell being removed. Fig. 5 is a horizontal section through the stack at the line Z Z, and Fig. 6 is a plan of the under side of the deflecting-plate.

A represents a portion of the smoke-arch of a locomotive, and B is the customary cylindrical barrel or outer shell of the stack or chimney, said shell having the usual outward flare B′ and inward flare B″. Fitted within the shell B is the smoke pipe or chimney proper, C, whose lower end enters the smoke-arch A, while the upper end of said chimney is elevated about eight or ten inches above the barrel B. This chimney is confined to its proper axial position within the shell by means of four helical flanges, ribs, plates, or partitions, D D′ and E E′. Of these plates, the ones D D′ have their upper ends united at the top of chimney C, and at the front of the latter, as more clearly shown in Fig. 4. The plate D winds spirally around the chimney to the left, making about one-fourth of a revolution, and then terminates near the lower end of smoke-pipe C. The other plate D′ winds spirally around the chimney in an opposite manner, or toward the right, making about one-fourth of a revolution, and terminating at a point diametrically opposite the lower end of plate D. The other plates E E′ have their upper ends united to the chimney at a point diametrically opposite the junction of plates D D′, or at the rear side of said chimney, and they are then wound spirally around the pipe C, the lower end of plate E converging toward the termination of rib D. The other plate E′ winds spirally around the chimney toward the right, and slopes toward the lower end of plate D′. The lower ends of plates D and E, are joined to a short tube, F, while the corresponding ends of the other two plates D′ and E′ are united to a similar tube, F′, the object of said tubes being hereinafter explained.

Owing to this arrangement of helical flanges and tubes, the space between shell B and chimney C is divided into two annular and downwardly-converging chambers, G and G′, of which the former communicates with the tube F, while the latter chamber G′ connects with the opposite tube F′. In addition to the chamber G to the left of the chimney C, and the chamber G′ to the right of said chimney, there are two other chambers, H and H′, the former being at the front of the stack, and the latter at the rear of the same. These chambers H and H′, being located beneath the spiral flanges D D′ and E E′, have no communication with the exit at the top of the stack, and being mere dead-chambers, not performing any useful purpose, they may be entirely closed at their lower end, so as to prevent smoke or soot entering them. Projecting from the upper end of chimney C are two or more rods, I, which support the frustum of a hollow conical deflector, J, that is located a suitable distance above the mouth of said chimney. The inner sides of this cone should slope at such an angle, and the cone should be so located as to cause the sparks and cinders ejected from the chimney to be deflected inwardly and upwardly against a peculiar-shaped deflector, which is arranged as follows:

The upper ends of rods I are screw-threaded at *i* to receive nuts *i′*, wherewith the deflector

K is adjusted vertically, in order to bring it in just such a position as will render it the most effective. This uppermost deflector is composed of a concave or bowl-shaped vessel having two downwardly-bent nozzles or outlets, L L′, and a central boss or projection, *k*. The object of the nozzle L is to discharge part of the cinders, &c., down into the receptacle G, while the other nozzle L′ discharges the balance of the grosser emanations of combustion into the chamber G′, as indicated by arrows in Fig. 1.

There are two important advantages gained in the peculiar form of the deflector K over forms previously employed. With the ordinary deflectors the sparks are arrested and their direction reversed without increasing their force, but the crown and nozzles of this arrester operate to receive the sparks and to concentrate them into forced jets directed downward toward the mouths of the conducting-flues on either side of the chimney C. Large clear openings are also formed, and these permit the smoke and unconsumed gases to pass with superior freedom into the outlet-opening P, and through the same into the air.

Attached to the tubes F F′ are elbows *f f′*, which communicate with two of the flues or tubes, M M′, extending from the fire-box N of the locomotive to the smoke-arch A, as shown in Fig. 3. By this arrangement two of the ordinary boiler-tubes will serve as the return flues from the smoke-stack, but it is evident that said return flues may be separate and independent channels from the tubes M, and may be located either outside of or within the boiler, provided their discharging ends communicate with the fire-box. Sloping downwardly and inwardly from the upper member B″ of the smoke-stack is a netting or wire gauze, O, having a central circular opening, P, which latter is directly over the deflector K. S is the ordinary blast-pipe, which discharges exhaust steam vertically up through the smoke-pipe or inner chimney C.

The operation of my spark-arrester is as follows: The blast produced by the discharged steam issuing from the pipe S, causes a violent draft to take place through the boiler-tubes, and up the chimney C in the usual manner, but instead of being allowed to escape freely from the top of the smoke-pipe, the products of combustion are momentarily detained, and compelled to take a circuitous route before they pass out at the exit P. The draft up the chimney C first forces the sparks, cinders, and other denser materials against the cone J, from which they are deflected inwardly and upwardly against the concave cap or bowl-shaped vessel K *k*. Here these denser particles are deflected to the right and left by the central swell or boss *k*, and caused to enter and traverse the nozzles L L′, and be precipitated downwardly into the receptacles G G′ and tubes F F′. The draft in the fire-box N carries the sparks, cinders, &c., rearward through the flues M M′, thereby depositing these denser particles upon the mass of incandescent fuel in the furnace, thus insuring their complete combustion. While the sparks, cinders, &c., are being consumed, the smoke and non-combustible gases escape freely around the margin of the deflector K, and thence out through the opening P, and it will thus be seen that one of the greatest nuisances attendant upon railway-travel is entirely avoided, and without interfering with the draft, or materially altering the construction of the stack.

While describing the preferred form of my improvement, I reserve the right to vary the details of construction—as, for example, three or more tubes, similar to the ones F F′, may be employed, and a greater number of flues can be used for returning the sparks and cinders through or along the boiler to the fire-box.

An inferior modification may be formed by dispensing with the concentrating cone J, and lowering the deflector K L L′, so as to bring it nearer the mouth of chimney C than shown in the drawings.

It is evident that the cone J and deflector K may be of any appropriate size to suit the class of locomotives to which the spark-arrester is applied.

I claim as my invention—

1. The spark-crown K*k*, having down-turned nozzles L L′ for concentrating the products of combustion in forced jets, in combination with concentrating-chambers G G′ beneath said nozzles, and conducting-tubes leading from the latter, substantially as herein described, for the purpose set forth.

2. The combination, with the stack-shell B and central chimney C, of the cone J, the adjustable deflector K, having the lateral concentrating-nozzles L L′, the helical flanges D D′ E E′, and conducting-pipes F *f* F′ *f′* leading through two or more of the upper smoke-flues of the boiler to the fire-box, as herein shown and described, for arresting, concentrating, and carrying back the grosser emanations of the burning fuel, in the manner specified.

In testimony of which invention, I hereunto set my hand.

MATTHEW B. MASON.

Attest:

GEO. H. KNIGHT,

J. E. REEVE.