(No Model.)

W. A. MALONEY.

SPARK ARRESTER.

No. 284,646. Patented Sept. 11, 1883.

Fig. 1

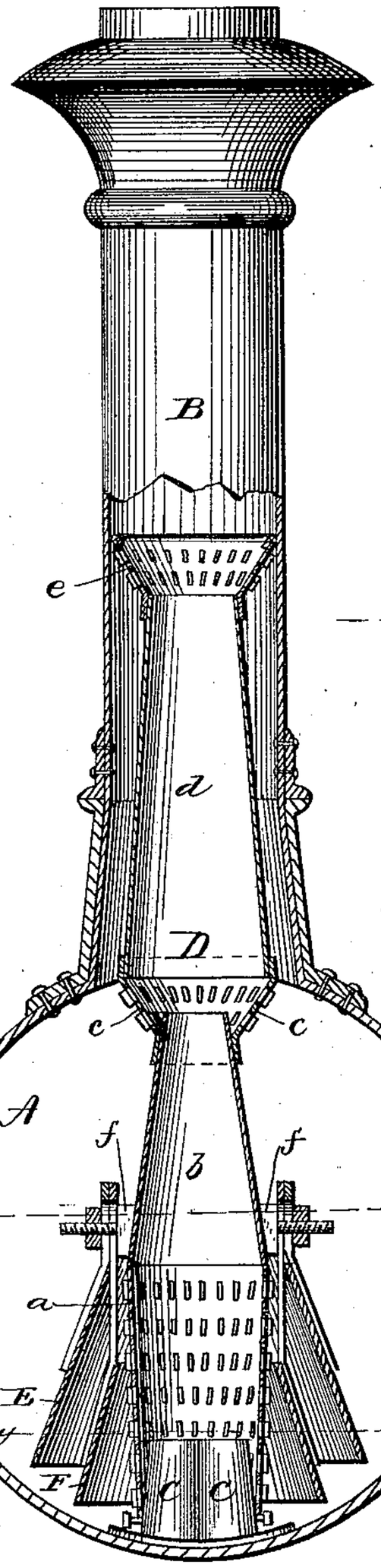
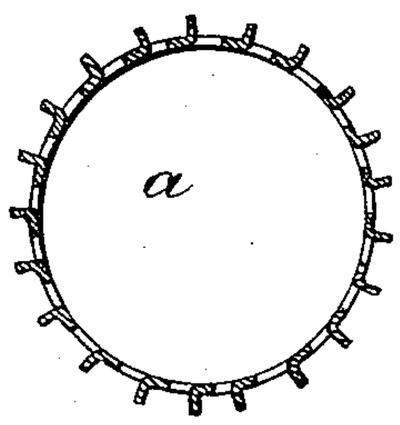


Fig. 3.



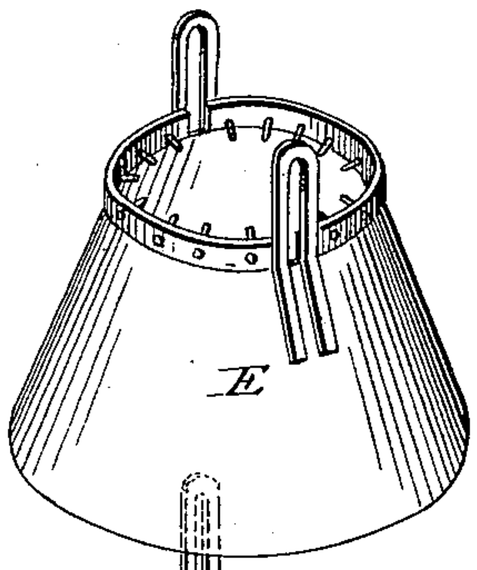


Fig. 4.

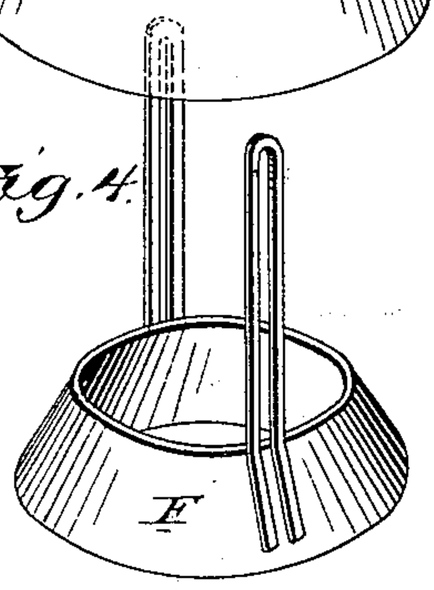
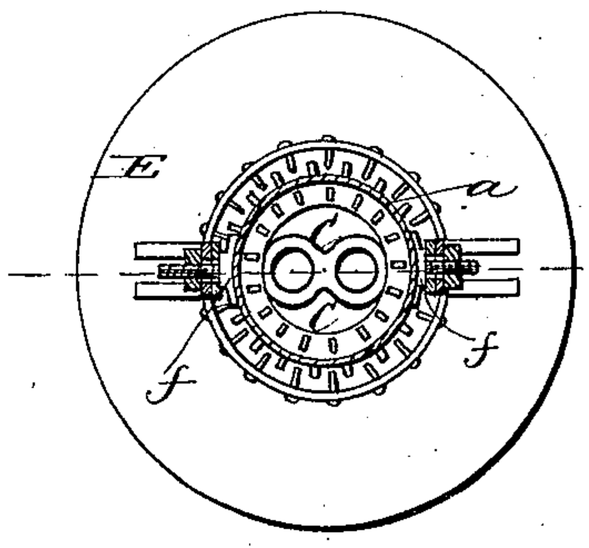


Fig. 2.



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SPARK-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 284,646, dated September 11, 1883.

Application filed July 23, 1883. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. MALONEY, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Spark-Arresters for Locomotive-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a sectional view of my invention; Fig. 2, a section through line *x x*, Fig. 1; Fig. 3, a section through line *y y*, figure showing the construction of the perforated sections; and Fig. 4, a perspective view of the petticoat-pipes.

This invention relates to certain new and useful improvements in that class of inventions known as "smoke-box spark-arresters."

Previous to my invention the great difficulty has been that where the material used for a screen, whether wire-cloth, perforated sheet metal, or other material, was fine enough to prevent dangerous sparks from escaping, such sparks would accumulate in the smoke-box and obstruct the draft, thus preventing the generation of the requisite amount of steam. To overcome this difficulty the openings in the arresting material were made larger, but by this means large and dangerous sparks were permitted to escape, as such spark-arresters did not possess any facilities for properly breaking up the sparks as fast as they accumulated in the smoke-box. A spark-arrester consisting of a long tapering perforated sheet-metal pipe fitting closely around the top of the exhaust-nozzles, and expanding to the diameter of the stack at its top, was employed, said perforated pipe or arrester being surrounded by a draft-pipe held up a short distance from the bottom of the smoke-box and extending up around the base of the stack. This draft or "petticoat" pipe, as it was termed, was necessarily too large in diameter for the work it was designed to accomplish, as, instead of confining the exhaust-steam and directing it in a solid column up the center of the stack, it allowed the same to expand to its own diameter and escape through the perforations of the pipe or arrester, thereby rendering this perforated pipe or arrester valueless, as, in consequence of the exhaust-steam forcing its way out through the openings therein and filling the space between it and the draft-pipe, no vacuum is created in and consequently no rush of outside air obtained through the arrester, thereby preventing the breaking up of the larger sparks, which, by their accumulation, would choke the draft and fill the smoke-box, rendering the generation of a sufficient amount of steam impossible.

The object, therefore, of the present invention is to provide a spark-arrester of the character named that will thoroughly break up and prevent the accumulation of sparks and burning lumps of fuel in the smoke-box, thereby preventing the obstruction of the draft, and at the same time carrying the residue of such sparks or burning fuel out of the stack with such force as to prevent their lodgment on the operative portions of the engine to clog them up and cause hot boxes or unnecessary wear and tear of the machinery. These objects I attain by the construction substantially as shown in the accompanying drawings and hereinafter more fully described.

In the drawings, A represents the front or smoke-box of a locomotive boiler, B the smoke-stack, and C the exhaust-nozzles. Over these exhaust-nozzles, and extending up through the smoke-box and into the stack, is placed a draft-pipe or spark-arrester, D, constructed of either sheet or cast metal, or in part of both, said pipe or arrester being formed of sections *a b c d e*, suitably united.

The sections *a*, *c*, and *e* are preferably of perforated sheet metal, the perforations being made in the form of a slot, cut out with a suitable punch, which, when forced through the metal into a die, turns out a lip or burr on either one or both sides of the openings, said perforations or openings being of any sufficient length and width, and as close together as possible. These perforated sections serve the purpose of arresters or screens, through which the sparks are made to pass, the larger ones being prevented from escaping until sufficiently broken up by coming in contact with the burrs or roughened surface of the sections, the said sparks being very quickly

broken and reduced to fine particles, which then find their escape through the slots or openings, thus preventing their accumulation in the smoke-box.

The section *a* fits closely on the bottom of the smoke-box A around the exhaust-nozzles C, and extends upwardly to about the center of the said smoke-box, its upper diameter being somewhat greater than its lower; or, if desired, the diameter of both upper and lower ends may be equal; but in either case the construction must be such that the steam after leaving the exhaust-nozzles will not expand or spread enough to escape through any of the perforations until it enters the section *b*, which is formed without perforations and tapered upwardly, thus serving to keep the exhaust-steam contracted and direct it in a solid column up the center of the smoke-stack. Suitably secured to this section *b* is another section, *c*, similar to the one *a*, said section being made very flaring—say at angle of about thirty degrees from a vertical—its upper edge being on a level with the base of the smoke-stack and of a circumference to leave an opening or space between it and the stack-base. Connected to this perforated section *c* is a section, *d*, somewhat larger in diameter than the one *b*, but like it formed without perforations and tapered upwardly. Upon this section *d* is placed another section, *e*, of perforated sheet metal similar to the one *c*, its upper edge constructed so as to fit the inside of the smoke-stack loose enough to permit of its being moved up and down therein, these sections *d* and *e* being for the purpose of obtaining a sufficient area of opening at the top of the smoke-box, and the perforated sections should be so constructed as to contain as nearly as possible the same area of openings as that contained in all the flues in the boiler, one-half of such area being contained in the section *a* and the other half in the sections *c e*. These perforated sections *c e* are made flaring or funnel-shaped, so that the exhaust-steam may not escape through the slots or openings, the escaping steam, in its passage from the section *b* into the one *d*, passing clear of the openings in the section *c*, thus rendering the vacuum as nearly perfect as possible, and increasing the strength of the rush of smoke and air through the slots or openings in said section *c*, the same result being repeated at the section *e* and in the one *d*, the exhaust-steam escaping at no point through the spark-arrester, as the breaking up of the larger sparks depends on the vacuum created upon the inside and the force with which they are brought against the outside. The steam blowing out through the perforations or openings, there can be no current inwardly, and as the atmospheric pressure down the stack has a tendency to spread the steam, its escape through the arrester is guarded against and prevented by the construction described.

Adjustably secured to lugs *f* upon the section *b* of the arrester is what is generally termed the "petticoat-pipe," constructed in the form of a frustum of a cone, this pipe serving to lift the sparks collecting on the bottom of the smoke-box, said pipe being nearly twice as large at its base as at its top, and said top larger by some degrees than the outer circumference of the section *a* of the arrester, so as to leave a space between them. This petticoat-pipe E has its upper portion flanged outwardly, so as to stand vertical, and said flanged portion is provided with inwardly-projecting pins or studs sufficiently long so as to nearly touch the base of the section *b* where it joins the one *a*, the purpose thereof being to break up the sparks passing out at the upper portion of said pipe.

Beneath the petticoat-pipe E is placed a similar pipe, F, also adjustably secured to the lugs *f* on the section *b*, but only about one-half the length of said pipe E, the purpose of this pipe F being to deflect the sparks and cause them to be thrown up higher against the arrester, thus distributing them more evenly over its whole surface and causing the wear thereon to be fairly distributed.

To place the spark-arrester in position the several sections are suitably joined together and form one continuous pipe or tube. The same is now let down into the stack. The pipes or bases E F, having been first placed in position at the bottom of the smoke-box, are adjustably secured and fixed in relation to the said continuous pipe or tube. As the exhaust-steam escapes from the nozzles C it blows the air and smoke in the arrester and stack out at the top of the latter, leaving a vacuum, which first commences around the nozzles and extends up throughout the said arrester and stack. The smoke-box being air-tight, the air rushes in from the fire through the grate and flues to where the vacuum exists, carrying with it large quantities of sparks and lumps of burning coal. As these arrive in the smoke-box the current of air or smoke passes under the bottom of the base or petticoat pipe E, dashing the sparks against the rough surface of the section *a* of the arrester, the base or pipe F causing them to be carried up and evenly distributed over said section's whole surface. As the exhaust-steam passes the perforated section *c*, and the current extends that far up, said current takes the direction of the openings therein, and dashes the sparks against this portion of the arrester, causing them to break in pieces small enough to pass the perforation or slots, the same operation being repeated at the section *e*. The sparks not broken up under the base or petticoat pipe E are carried up and strike the pins or studs, this operation being repeated with each successive exhaust, thereby breaking the sparks into small particles as fast as they enter the smoke-box sufficient to pass through the several perforated sections until they escape from the stack, and by the use of a straight open

stack they are thrown so high as not to fall on the engine.

By the use of a spark-arrester such as I have described I am enabled to use a larger exhaust nozzle or nozzles than those usually employed, thereby effecting a saving in fuel, and at the same time the sparks are thoroughly carried up and thrown from the stack, leaving the smoke-box free from their accumulation, thereby preventing the obstruction of the draft or hinderance to the generation of the steam.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is--

1. A spark-arrester for locomotive-engines, consisting of a suitable pipe formed alternately of perforated and non-perforated sections, its lower section adapted to fit over the exhaust-nozzles, the whole extending up through the smoke-box and stack, and provided at its lower portion upon the outside with adjustable bases or pipes, substantially as and for the purpose set forth.

2. A spark-arrester for locomotive-engines, consisting of a series of perforated and non-perforated sections, alternately united to form a continuous pipe extending from the bottom of the smoke-box up into the stack, and provided with supplemental bases or pipes secured to its lower portion, said bases or pipes being similar in construction to the frustum of a cone, and placed one within another, substantially as and for the purpose specified.

3. The herein-described spark-arrester pipe or tube, constructed from alternate perforated and non-perforated sections *a b c d e*, the lower one, *a*, adapted to fit over the exhaust-nozzles at the bottom of the smoke-box, and, in common with the ones *c e*, so perforated as to present a rough surface upon their outsides, and the ones *b d* tapered upwardly, substantially as and for the purpose set forth.

4. The spark-arrester for locomotive-engines herein described, consisting of a pipe or tube formed of sections *a b c d e*, suitably united and extending upwardly from the bottom of the smoke-box into the stack, the lower section, *a*, being perforated and presenting a roughened outside surface, the ones *c e* similarly constructed, but flaring or funnel-shaped, the ones *b d* non-perforated and tapering upwardly, and the adjustable bases or pipes E F, secured to lugs *f* upon the section *b*, said base or pipe E having its upper circumference provided with inwardly-projecting pins or studs, all constructed and arranged to operate substantially as and for the purpose described.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

WILLIAM A. MALONEY.

Witnesses:
MICHAEL HAYES,
JAMES MALONEY.