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SPARK EXTINGUISHER AND ARRESTER.


Fig. 2.
Fig. 3.

Fig. 4.

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Milk & Rouzee.

Inventor:
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per

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Fig. 4.

Fig. 5.

Fig. 6.

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SPARK EXTINGUISHER AND ARRESTER.

Fig. 7.

Fig. 8.

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SPARK EXTINGUISHER AND ARRESTER.

Application filed August 13, 1888. Serial No. 229,802. (No model.)

To all whom it may concern:

Be it known that I, QUINTON J. HOKE, a citizen of the United States, residing at Yorkville, in the county of York and State of South Carolina, have invented certain new and useful Improvements in Spark Extinguishers and Arresters; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

In the drawings, Figure 1 is a sectional elevation of so much of a steam-boiler as is necessary to illustrate my invention. Figs. 2, 3, and 4 are vertical sections of a portion of the upper end of the exhaust-pipe carrying my improved spark arrester and extinguisher. Fig. 5 is a top plan view of the form of injector shown in Figs. 3 and 4. Fig. 6 is a cross-section of one of the tubular radial arms shown in Figs. 3, 4, and 5. Figs. 7 and 8 are diagrams illustrating the action of the spark-extinguisher.

This invention relates more especially to that class of devices known as “spark-extinguishers” in contradistinction to those known as “spark-arresters.” In the former class the sparks passing through the stack of a steam-boiler are extinguished before they reach the atmosphere, or they are extinguished by impact with the stack and precipitated into the smoke-box. In the latter class the sparks are arrested on their way to the upper end of the stack or prior to their escape therefrom, this class of devices being chiefly applied to, on, or within the upper end of the smoke-stack.

The devices for carrying out the method that forms the subject-matter of this invention pertain in a manner to both of the classes of devices referred to in that they not only operate to extinguish the sparks before they issue from the stack, but in that they also operate in a morsure to arrest the sparks, and more especially the heavier incandescent particles carried along with the products of combustion, which, when brought in contact with the stack, are arrested in their upward flight and precipitated into the smoke-box.

This invention is an improvement on the method of and devices for which I obtained Letters Patent of the United States under date of April 6, 1880, No. 339,553; and it has for its object to increase the efficiency of the spark extinguisher and arrester.

This invention consists, essentially, in the method of arresting and extinguishing sparks, the means for carrying out the same being applied at or near the base of the smoke-stack of a steam-boiler for projecting the exhaust-steam into the stack in such a manner as to produce a spiral rotary or whirling motion in the draft, the greatest velocity of movement being on the “periphery,” if I may so call it, of a column of steam, as in the case of a whirlwind or cyclonic column, said periphery being limited by the stack itself, and for gradually increasing the volume or density of the column of steam from its axis to its periphery, whereby the effect of the column of steam upon the incandescent matter, as well as upon the draft, is very materially enhanced.

The invention further consists in the method of imparting to the column of steam a gyrating motion on its own axis to still further enhance its effect or action upon the incandescent matter and upon the draft.

By the devices described in the patent hereinbefore referred to the exhaust-steam is projected on lines tangential to a circle, thereby producing by impact with the smoke-stack a whirling column of steam, ascending the stack on spiral lines. It is obvious, however, that when a gyrating motion is imparted to the jets themselves the point of impact with the stack is a continuously changing one for each jet, thereby producing what I may call a “grinding” or “rubbing” action, since there is not only impact by projection, but friction due to the gyrating motion of the jets, which here produce a hollow gyrating column of steam, which acts more powerfully than the ordinary exhaust-steam nozzle to produce a vacuum, and at the same time arrests and projects the incandescent particles against the stack, where they are subjected to a grind-
ing action by the steam. It is further obvi-
ous that where the column of steam is a sub-
stantially solid column, whether said column
has a gyrotory motion imparted to it or not,
when the steam is admitted in the form of
a sheet, increasing in thickness from the axis
toward the periphery of the smoke-stack and
projected thereunto on lines tangential to a
circle, it will be impossible for any incandes-
cent matter to pass beyond the lines of pro-
jection, since the projected sheets of steam
overlap one another. If, now, a gyrotory
motion be imparted to said projected sheets of
steam, the effect will be still greater, both
upon the incandescent matter and the draft.
In practice, and with a view to economize
steam, I apply the devices to the steam-ex-
haust-pipe, but do not desire to limit myself
to this arrangement, as live steam from the
boiler may be used, if desired, or the latter
and exhaust-steam, in which case the exhaust-
pipe is connected with the steam-space of the
boiler by a suitably-valved pipe, so that live
steam may be admitted to the exhaust-pipe
whenever desired. Under ordinary circum-
stances it will, however, be found that the
exhaust-steam alone will suffice to produce
the desired result.
Another advantage derived from the de-
scribed mode of preventing incandescent
particles carried along with the products of
combustion from being carried out of the
stack is in an increased and more steady
draft.
The invention is more especially designed
for use in portable or stationary engines em-
ployed in proximity to inflammable materi-
als—as, for instance, in engines for driving
cotton-gins, thrashing-machines, and other
like machines, or in locomotives in general
with engine-boilers operated or located in
proximity to inflammable materials liable to
be set on fire by incandescent particles car-
ried along with the products of combustion
and escaping from the smoke-stack.
For the purpose of carrying out my inven-
tion I have shown in the accompanying draw-
ings convenient and efficient means, and in
said drawings—
\( B \) is the boiler; \( s \), the smoke-box; \( S \), the
smoke-stack; and \( P \) the exhaust-pipe from the
cylinder or cylinders. The arrangement of
these devices is so well known as not to need
any particular detailed description, more es-
specially as they form no part of this inven-
tion and as they vary to some extent, accord-
ing to the description of the boiler or engine
to which my improvements are or can be ap-
plied. The exhaust-pipe terminates in or ap-
proximately in the axis of the stack at its
base, and in Fig. 2 I have shown the device
described in my patent herebefore referred to
(to the head \( A \), with its bent tubes \( a \), herein-
after termed the "spark-extinguisher") as
pivotally connected with the exhaust-pipe, so
that the impact of the steam upon the curved
ends of the tubes \( a \) will impart a gyrating mo-
tion to the extinguisher in a manner similar
to that of water upon the bent tubes of a lawn-
sprinkler.
The connection between the extinguisher
and the exhaust-pipe, so as to cause the for-
mer to revolve on the latter, may be of any
usual, well-known, or of any preferred con-
struction, which forms no part of this inven-
tion, as any construction that will allow the
spark-extinguisher to revolve on the exhaust-
pipe will answer the purposes. In this form
of spark-extinguisher the jets of steam are
projected from points on a circle common
to all the jets and on lines tangential to such
circle, said jets intersecting one another, as
shown in the diagram Fig. 7, a hollow gyra-
ting column of steam being produced that has
a spiral vertical movement due to the inclina-
tion of the jets relatively to the vertical or
inclined walls of the stack; said column of
steam exerting a grinding action upon such
walls that will more effectually extinguish the
incandescent matter carried into the stack
with the products of combustion by the draft,
and that will also materially increase said
draft.
In respect of a stationary spark-extin-
guisher, as shown in my former patent, its
effect may be materially increased by con-
verting the annular jet into a sheet of steam
projected from the tubes \( a \) on lines tangential
to a circle and at an inclination to the ver-
tical axis of the stack, as shown in Fig. 3, and
I have found that by varying the thickness of
the "sheet of steam," if such term may be used
in this connection, the effect will be better
than when such sheet is of uniform thickness.
To this end I form a single port, \( a' \), longitu-
dinally of the tube, which port is preferably of
gradually-increasing width from a point near
the head to a point near the outer end of the
tube.
The initials \( a' \) of the ports \( a' \) of the tubes
are on a common circle and equidistant from
one another, the terminals or outer ends, \( c' \),
said ports being arranged likewise on a com-
mon circle, both circles having as center the
axis of the head \( A \). In this manner the steam
is projected in sheets that overlap one an-
other, thus forming a solid wall of steam at
the base of the stack, as shown in the diagram
Fig. 8, which wall increases in thickness from
the initial \( a' \) to the terminal \( a' \) of the extin-
guisher-ports or from the axis to the inner
periphery of the stack.
The inclination of the sheets of steam to
the vertical imparts to the column a spiral
upward motion that materially increases the
draft and more effectually arresting incan-
descent matter, as there is no possibility of
such matter passing through the column of
steam. If now a gyrotory motion is imparted
to the head \( A \) by pivoting the same to the ex-
hause-pipe \( P \), which gyrotory motion may be
increased by forming turbine blades \( B \) in said
head, as shown in Fig. 4, a spirally-gyrating
column of steam increasing gradually in den-
sity from its axis to its periphery, which is the stack, is obtained. The effect of this last arrangement of spark-extinguisher will be readily understood.

5 The extinguisher, whether stationary or revolving on the exhaust-pipe, is provided with a nozzle, the axis of which is coincident with the axis of the stack and on lines tangential to the said circle and imparting a gyrationary motion to the jets, substantially as and for the purposes specified.

10 Having described my invention, I claim—

1. The herein-described method of extinguishing and arresting incandescent particles carried along with the products of combustion through the smoke-stack of a steam-engine, which consists in injecting jets of steam in the form of sheets into the base of the stack from points on a circle concentric with the axis of said stack and on lines tangential to the said circle and imparting a gyrationary motion to the jets, substantially as and for the purposes specified.

2. The herein-described method of extinguishing and arresting incandescent particles carried along with the products of combustion through the smoke-stack of a steam-engine, which consists in injecting jets of steam at an inclination to a vertical into the base of the stack from points on a circle concentric with the axis of said stack and on lines tangential to the said circle and imparting a gyrationary motion to said jets, substantially as and for the purposes specified.

3. The herein-described method of extinguishing and arresting incandescent particles carried along with the products of combustion through the smoke-stack of a steam-engine, which consists in injecting jets of steam in the form of sheets into the base of the stack from points on a circle concentric with the axis of the stack and on lines tangential to the said circle, substantially as and for the purposes specified.

4. The herein-described method of extinguishing and arresting incandescent particles carried along with the products of combustion through the smoke-stack of a steam-engine, which consists in injecting jets of steam in the form of sheets increasing in volume or density in a radial direction into the base of the stack from points on a circle concentric with the axis of said stack and on lines tangential to the said circle, substantially as and for the purposes specified.

5. The herein-described method of extinguishing and arresting incandescent particles carried along with the products of combustion through the smoke-stack of a steam-engine, which consists in injecting jets of steam in the form of sheets into the base of the stack from points on a circle concentric with the axis of said stack and on lines tangential to the said circle and imparting a gyrationary motion to the jets, substantially as and for the purposes specified.

6. The herein-described method of extinguishing and arresting incandescent particles carried along with the products of combustion through the smoke-stack of a steam-engine, which consists in injecting jets of steam in the form of a sheet and at an inclination to the vertical into the base of the stack from points on a circle concentric with the axis of said stack and on lines tangential to the said circle, substantially as and for the purposes specified.

7. The herein-described method of extinguishing and arresting incandescent particles carried along with the products of combustion through the smoke-stack of a steam-engine, which consists in injecting jets of steam at an inclination to a vertical and in the form of a sheet increasing in volume or density in a radial direction into the base of the stack from points on a circle concentric with the axis of the stack and on lines tangential to the said circle, substantially as and for the purposes specified.

8. The herein-described method of extinguishing and arresting incandescent particles carried along with the products of combustion through the smoke-stack of a steam-engine, which consists in injecting jets of steam at an inclination to a vertical and in the form of a sheet increasing in volume or density in a radial direction into the base of the stack from points on a circle concentric with the axis of said stack and on lines tangential to the said circle and imparting a gyrationary motion to the jets, substantially as and for the purposes specified.

In testimony whereof I affix my signature in presence of two witnesses.

QUINTON J. HOKE.

Witnesses:

J. D. ANDREW,

his

D. B. BROWN.

mark.