

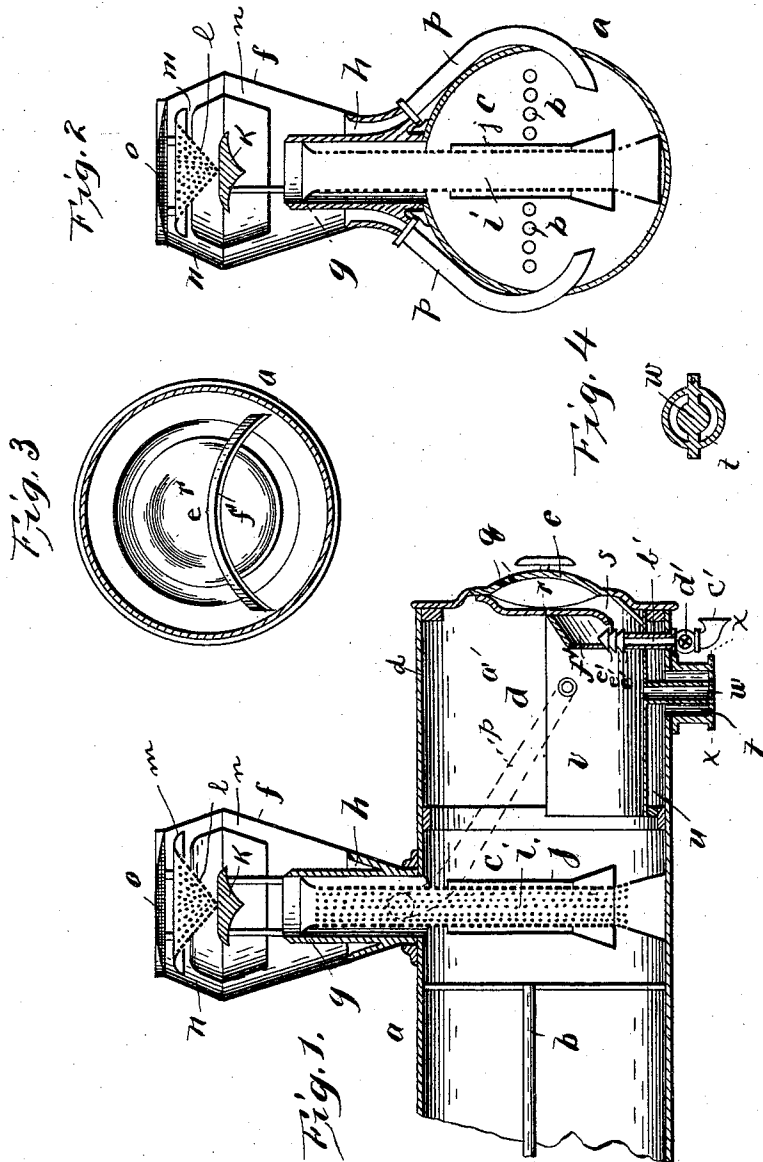
(No Model.)

2 Sheets—Sheet 1.

J. W. CURRAN.
SPARK ARRESTER.

No. 477,995.

Patented June 28, 1892.



WITNESSES:

O. E. Duff
Chas. M. Wells

INVENTOR

J. W. Curran
BY *O. E. Duff*

ATTORNEY.

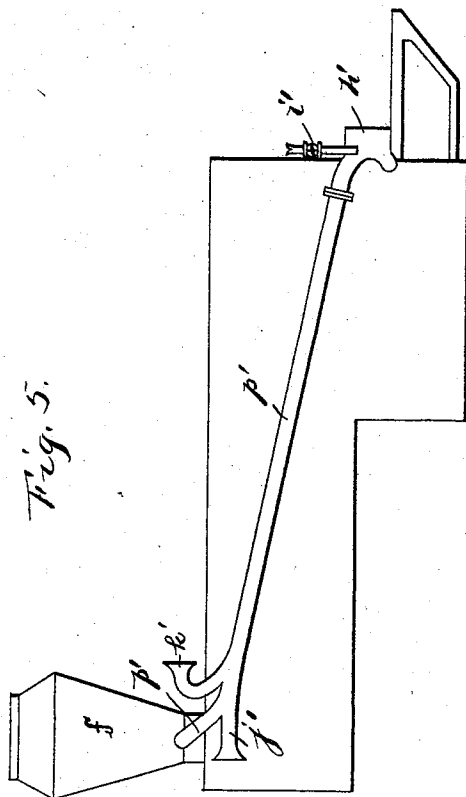
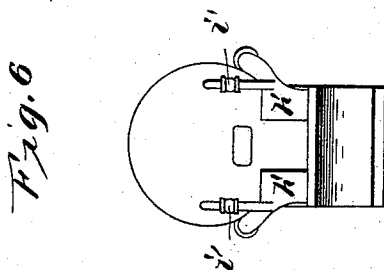
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UNITED STATES PATENT OFFICE.

JOHN WILLIAM CURRAN, OF MARSHALL, TEXAS.

SPARK-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 477,995, dated June 28, 1892.

Application filed February 18, 1892. Serial No. 422,032. (No model.)

To all whom it may concern:

Be it known that I, JOHN WILLIAM CURRAN, of Marshall, in the county of Harrison and State of Texas, have invented certain new and useful Improvements in Spark-Arresters; and I do hereby declare that the following is a full, clear, and exact description of the invention, which 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 of reference marked thereon, which form part of this specification.

This invention relates to certain improvements in spark-arresters or smoke-stacks for locomotives.

The object of the invention is to provide certain improvements whereby the sparks from a locomotive will be passed directly from the flues through the stack and the outer air will be admitted, which will keep the cinders in motion and force them through fine perforations and against the hard surfaces until they are thoroughly pulverized and all the fire therein is extinguished, and which will thereby prevent the danger to combustible products by fire thrown from an engine and which will not in any way decrease or interfere with the efficient work of the locomotive.

These and other objects are accomplished by and my invention consists in certain novel features of construction and in combinations of parts more fully described hereinafter, and particularly pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a vertical longitudinal section through the front end and smoke-stack of an extension-front locomotive. Fig. 2 is a vertical cross-section through the smoke-stack and smoke-box of the locomotive. Fig. 3 is a front elevation of the extension of front end of smoke-box. Fig. 4 is a cross-section on the line *x x*, Fig. 1. Fig. 5 is a skeleton side elevation of the top of the locomotive not provided with the extension front end, showing means for conveying off the cinders. Fig. 6 is a rear end elevation.

In the drawings reference-letter *a* indicates the shell of the locomotive.

b indicates the fire-flues opening into the smoke-box *c*.

d indicates the front extension of the smoke-

box, closed at its front end by a suitable head provided with the door *e*.

f indicates the smoke-stack, preferably provided with the reversely oppositely-tapered shell or casing, as shown.

g indicates the smoke-stack barrel, suitably secured and extending from the smoke-box upwardly into the interior of the smoke-stack and surrounded near its lower portion by the exterior downwardly-tapered annular pocket *h*, forming the bottom of the smoke-stack, the smoke-stack being secured to and carried by this barrel and pocket. A perforated cylinder *i* extends from the floor of the smoke-box, where it is secured, upwardly throughout the height of the smoke-box and up into the stack-barrel to the upper portion thereof. This perforated cylinder is smaller in diameter than the interior of the stack-barrel, except at its upper end, where it is flared out within the stack-barrel to close the same, so that the smoke, cinders, &c., will have to pass through the perforated cylinder when passing through into the smoke-stack. The perforated cylinder within the smoke-box is surrounded by a lift-pipe *j*, open at the top and bottom, so as to form a passage around the perforated cylinder, flared outwardly at the lower end to catch the products of combustion. This lift-pipe is suitably supported above the floor of the smoke-box and does not extend completely to the top thereof.

A solid inverted cone or deflector *k* is suitably secured in the upper part of the smoke-stack directly and centrally and a distance above the upper open end of the stack-barrel, and the end face of this deflector is so concaved or curved as to deflect the products of combustion passing up from the stack-barrel outwardly. This deflector is circular and preferably about the same in diameter or very little greater in diameter than the stack-barrel, so as to leave plenty of room around it within the smoke-stack. A finely-perforated inverted metal cone *l* is located in the stack above said deflector *k*, preferably with its apex resting on the deflector. The edges of this deflector are preferably turned or curved down, as shown, so as to leave an annular passage *m* around the edges of the perforated steel cone for the purposes hereinafter set forth. An annular downwardly-extending

passage *n* is formed from the passage *m* downwardly next to the shell of the stack and around the space surrounding the deflector and perforated cone, and the upper end of this passage opens into the space around the perforated cone and into the passage *n*.

A netting *o* covers the extreme top of the stack.

Two pipes *p* extend from the lowest portions of the annular pocket *h* downwardly and forwardly, so that their lower open ends are located in about the lower central portion of the forward extension *d* of the smoke-box. The front door *e* of this extension *d* is preferably provided with a series of front openings *q*, through which the air passes when the locomotive is traveling, and is carried downwardly by plate *r* to the lower portion of the front end of said extension, where it escapes through passage *s*, forming a steady and strong current of air rearwardly through the lower portion of the said extension into the smoke-box *c*.

t indicates an opening at the bottom of the smoke-box extension into the space *u*, formed by curved plate *v*, extending about half-way around the lower portion of the smoke-box extension, so that the air passes through said opening *t* into the space *u* beneath said plate *v*, which forms the bottom of the smoke-box, and is discharged into opposite sides of the smoke-box near its upper portion, and thereby prevents cinders from accumulating in the upper part of the smoke-box. As the currents of air passing in over the top edges of plate *v* will be drawn downwardly and rearwardly by the stronger current of air passing in through the opening *s* in the lower part of the smoke-box extension, the opening *t* around the pipe *w* extends down from the bottom of the smoke-box extension and is provided with the suitable cap, so that the cinders which may remain on said bottom can be drawn off through this pipe.

A small pipe *b'* extends up from the exterior of the smoke-box into the interior thereof just in rear of the opening *s* and slightly above or in the same horizontal plane thereof, and this pipe at its outer end is provided with the forwardly-extending funnel *c'* and with the regulating-valve *d'*. The upper end of this pipe is provided with deflectors to admit air at *e' e' e'* and deflect it outwardly. Above the upper end of this air-pipe *b'* an arc-shaped rearwardly-extending deflector *f'* is located and secured to the rear side of the plate *r*, as shown in Figs. 1 and 3. A portion of the current from the openings *e'* of pipe *b'* will strike against this deflecting-plate, producing circulation that will further agitate and whirl around the cinders.

The cinders after being drawn through the flues of the boiler by the draft caused by the exhaust are drawn by said exhaust from the flues upwardly at the top and bottom of the lift-pipe and through the perforations of the reticulated or perforated pipe *i* and through

the stack-barrel forcibly against the solid deflector *k*, which directs them downwardly into the pocket *h*. The cinders are broken by being forced through the perforated cylinder *i* and are again reduced in size by being forcibly struck against the deflector *k*. Some of the cinders which are fine and light enough are carried up around the edges of deflector *k* against the perforated cone *l*, through which they will pass if thoroughly pulverized, so as to contain no fire, and they will also pass out through the netting *o*. Cinders which will pass through the cone *l* or netting *o* are so fine and thoroughly pulverized that they cannot contain a spark of fire. Cinders which are too large to pass through the finely-perforated cone *l* will pass beneath the upper edges thereof and will be drawn or dropped down the outer passage *n* to the pocket *h*. The annular passage *m* is formed around the exterior of the cone *l* to prevent what we term "backlash" when the engine is doing full duty and is working to its full capacity. This passage *m* forms an additional outlet when all of the steam, smoke, &c., cannot pass through the cone *l* because of insufficient area.

The cinders from the pocket *h* are conveyed forwardly into the extension of the smoke-box, and as they are dropped out of the front ends of this pipe they are carried back toward the lifting-pipe and through the perforated pipe before described. This operation is repeated until the cinders are thoroughly pulverized, so as to have comparatively no weight, when they will pass out, as before described, the object being to forcibly carry the cinders against rigid surfaces and through fine perforations, so that all fire will be extinguished and knocked out and the cinders will be so finely pulverized that they cannot convey a spark, and when in this condition they are discharged and cannot endanger adjacent combustible property.

The various currents of air caused to move within the extension of the smoke-box serve to whirl and agitate the cinders therein and prevent them settling in the smoke-box and to carry them back to the smoke-box proper and up the lift-pipe.

The device has been described as applicable to locomotives having extension front ends. However, Figs. 5 and 6 show my improved smoke-stack and spark-arrester applied to locomotives not having an extension front end. In this construction the pipes *p*, instead of carrying the cinders forwardly into the smoke-box extension, are extended rearwardly, as shown, by pipe *p'*, Figs. 5 and 6, and the box-shaped receptacle *h'* at the rear end of the boiler, from whence they are drawn through the exhaust into the fire-box and are consumed. This box or receptacle is provided with pipe *i'*, entering its upper portion and provided with the valve, so that if the cinders do not freely empty into the fire-box the valve in this pipe can be opened and the exhaust can freely draw air from the box and

into the fire-box, thereby carrying the cinders into said box. The front ends of the pipes p' are provided with oppositely-facing funnels j' and k' , as shown, so that air can be drawn into each pipe p' , whichever way the locomotive is traveling. Caps are provided to close the oppositely-facing funnels when the locomotive is traveling in either direction.

The many advantages and great utility of this invention are obvious without further explanation.

It is evident that various changes might be made in the form, constructions, and arrangement of the parts described without departing from the spirit and scope of my invention. Hence I do not wish to limit myself to the construction herein shown.

What I claim is—

1. A smoke-stack having the barrel and cinder-pocket around the barrel, the pipes for conveying said cinders from said pockets, the deflector arranged above the barrel to deflect the cinders downwardly, the inverted finely-perforated cone above the deflector, having the downwardly-curved upper edges to deflect the cinders downwardly which do not pass through the cone and form a passage around the cone, and the passage for conveying the cinders down from said cone.

2. In a locomotive, in combination, the smoke-box having the front extension, the lift-pipe in the smoke-box, the stack having the perforated and deflecting surfaces to prevent escape of cinders which are not pulverized and having a cinder-pocket into which said cinders are thrown, and one or more pipes to convey the cinders from said pocket into the said end extension, whereby the cinders are kept agitated and are carried back to the lift-pipe in the smoke-box, substantially as set forth.

3. In combination, a smoke-box having a front end extension, the stack having a cinder-pocket, the lift-pipe, means to prevent passage of cinders from said stack and to deflect the same to said pocket, pipes from said pocket to discharge the cinders into the front end extension, and openings and a passage in the front end of said extension, whereby air is admitted which will carry the cinders from said front end back to the lift-pipe.

4. A locomotive provided with the front end extension of the smoke-box, means to convey the cinders from the smoke-stack into said extension, air-passages from the exterior into said extension, whereby currents of air are maintained which will carry the cinders rear-

wardly and will prevent them from congregating in the upper portion of the extension and will prevent them from remaining within the extension.

5. A locomotive having the front end extension, wherein the cinders from the smoke-stack are deposited, the front openings and air-passages into said extension, whereby a rearward current of air in the lower portion of the extension is maintained, passages from the exterior, whereby a current of air is discharged into opposite sides of the front end extension, and the pipe from the exterior, whereby air is discharged within the extension a distance from the bottom and sides thereof, substantially as and for the purposes set forth.

6. In a locomotive, the combination of the stack-barrel, the perforated pipe extending from the bottom of the smoke-box up into said barrel, so that the sparks, &c., are forced through the same, the lift-pipe around said pipe, a stack-shell forming a spark-pocket around said barrel, discharge-pipes from said pocket, the solid deflector above said barrel, the inverted perforated cone directly above said deflector, and the annular down passage within the shell from the outer edge of said inverted cone, substantially as described.

7. A locomotive having the forward extension, means for discharging cinders therein, a double bottom therefor forming an air-space opening into the outer air and discharging into the extension at the sides thereof, and an air-inlet into the front portion of the extension above said bottom, substantially as described.

8. A locomotive having the forward extension, means for discharging cinders therein, openings in the front end of said extension, and a downwardly-extending passage therefrom into said extension, substantially as described.

9. A locomotive having a forward extension, means for discharging cinders therein, means for discharging air into the sides of said extension, and the air-pipe having a funnel at its outer end and extending up within the extension and provided with deflectors, substantially as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOHN WILLIAM CURRAN.

Witnesses:

WALKER D. ECTOR,
JOHN H. HUDSON.