

H. R. Gillingham,

Spark Arrester,

N^o 39,727.

Patented Sep. 1, 1863.

Fig. 1

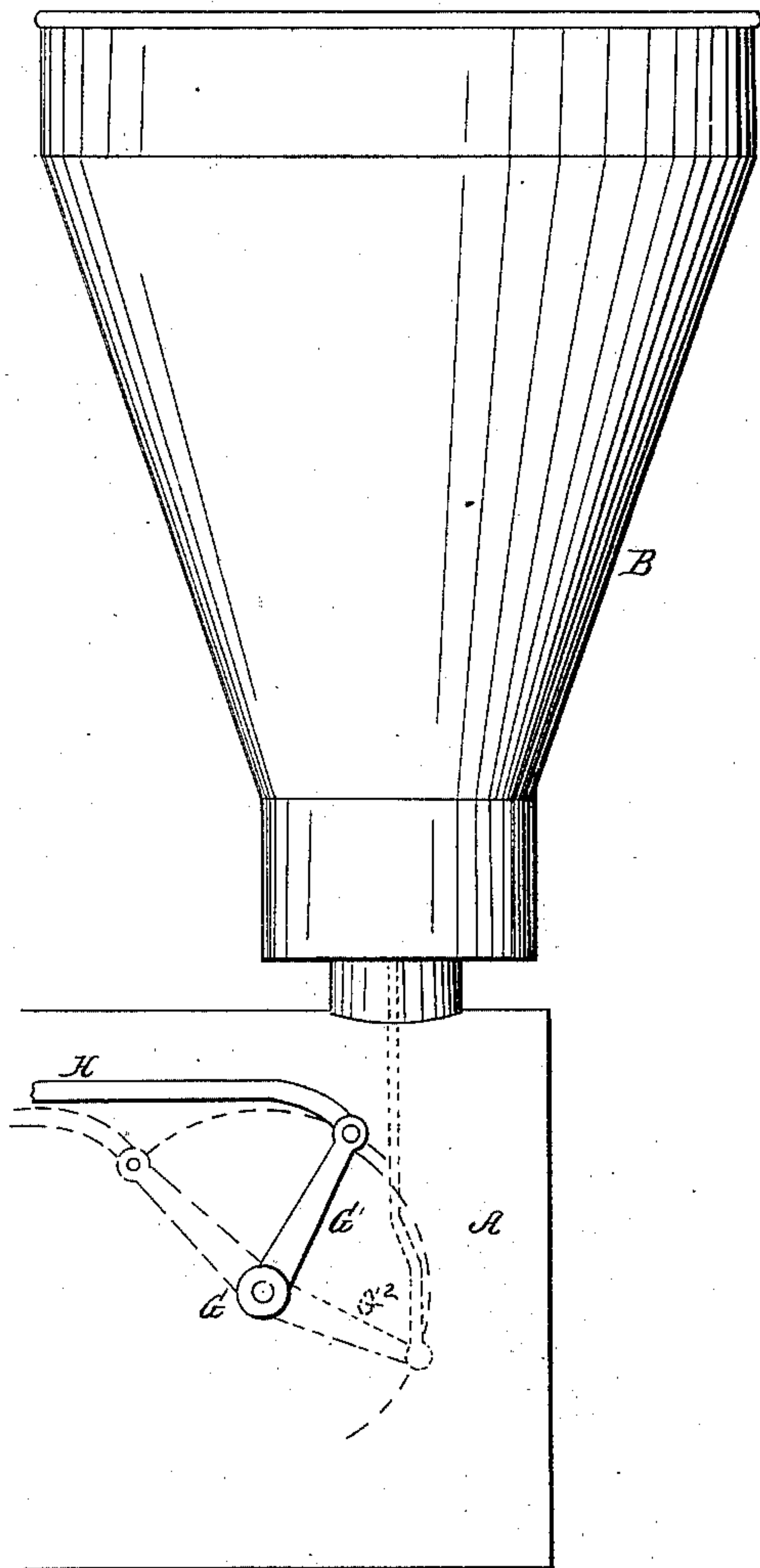
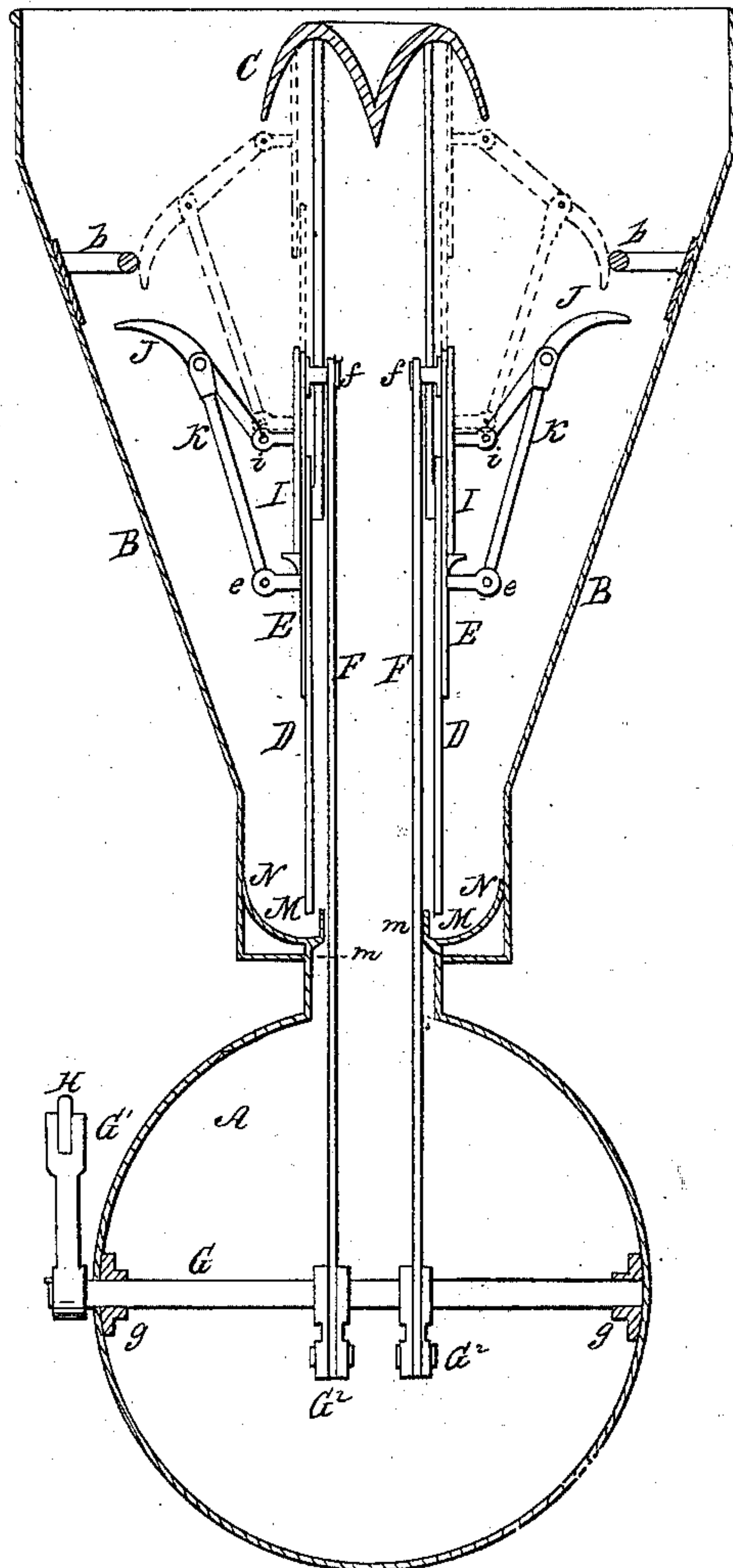


Fig. 2



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IMPROVEMENT IN SMOKE-STACKS.

Specification forming part of Letters Patent No. 39,727, dated September 1, 1863.

To all whom it may concern:

Be it known that I, HOWARD R. GILLINGHAM, of Jersey City, in the county of Hudson, in the State of New Jersey, have invented certain new and useful Improvements in Smoke-Stacks for Locomotive-Engines; and I do hereby declare that the following is a full and exact description thereof.

The accompanying drawings form a part of this specification.

Figure 1 is a side view, and Fig. 2 a vertical transverse section, of such portions of a locomotive as are necessary to exhibit my improvement.

Similar letters of reference indicate like parts in both figures.

Tints are employed merely to designate and distinguish parts, and do not indicate the material of which the parts are composed.

My invention is suitable for either wood-burning or coal-burning locomotives; but coal-burners may often be successfully used with only a portion of my invention applied.

The drawings exhibit the invention as applied to a wood-burning locomotive. The bonnet or screen of wire-gauze, and the exhaust-nozzles, tubes, and all the other parts necessary to the locomotive will be understood to be in their proper places.

My invention provides for the suppression of the combustion in the furnace, either temporarily or permanently, when such a proceeding becomes for any reason desirable. It accomplishes this by very simple means, which are also useful to graduate the heat of the fire very nicely while the combustion is allowed to proceed, and it overcomes difficulties incident to the means herein employed for disposing of the sparks. The changes in the draft of the fire, and consequently in the fierceness of the combustion, are produced by a shortening and lengthening of the inner chimney according to laws which are well known. I provide for increasing this length to such an extent as to actually meet and make a tight contact with the cone, thus stopping the escape of the products of combustion and of the exhaust-steam through the chimney entirely, and compelling the exhaust-steam to flow backward through the tubes and fire and to escape through the ash-pan, and a very brief period working in this condition will so much deaden the fire as to remove all danger of injuring the tubes by heat in any sudden emergency.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation by the aid of the drawings and of the letters of reference marked thereon.

A is the front end of a boiler, and B the exterior of the stack or smoke-pipe of a locomotive, both of the ordinary form and construction.

C is an ordinary deflecting-cone fixed in the center of the latter at the top; and D is an internal fixed chimney of about the usual diameter, but less than the ordinary height.

E is an extension-pipe, fitted upon and around D, so as to slide up and down; and *ff* are internal projections, which are connected by the rods F F to the arms G² on the shaft G. This shaft G is free to turn in the bearings *g g*, and extends out through the sides of the smoke-box. On its outer end is fitted an arm, G', which is operated by the engineer through the aid of a suitable connection, H, or otherwise, so as to raise and support the part E, and consequently to lengthen practically the internal smoke pipe at will. The exhaust-steam is ejected upward from the nozzles, (not represented,) and induces an intensely violent motion of the products of combustion, the same shooting upward through D and being deflected by the cone C in the ordinary manner, so as to throw down the dense sparks in the space between D and B, while the purely gaseous products of combustion and the exhaust-steam ascend and escape through the screen. (Not represented.) The extension-pipe E is provided with lugs, as represented, and upon these ordinarily rests the lower edge of a still further extension-pipe, I. This pipe I is free to slide up and down upon E with the same freedom as E slides up and down upon D. In all ordinary positions of E the pipe I is simply carried thereon in the manner represented, and performs no function; but when E is by an extreme movement of the arm G' lifted to its fullest possible extent, the lifting of E through the last part of its movement causes the pipe I to slide upward thereon, and consequently to be elevated still faster. This is effected by the additional parts represented.

e e are external lugs on E, and *i i* external lugs on I.

J J are bent levers, jointed to *i i*; and K K are hinged parts or link-bars, connected to both *e e* and J J. Two stout stops, *b b*, being

fixed on the interior of the outer smoke-pipe, B, in the position represented, the action of the parts will be evident. When G' is thrown forward, the work in the stack sinks and the fire is urged intensely. As the arm G' is drawn back, it may be secured by the use of suitable rectangular notches in the rod H, resting on a suitable fixture of corresponding form, or by other well known means, at any position desired, and the arms $G^2 G^2$, the rods F F, lugs $f f$, and movable pipe E will be correspondingly elevated. This adjustment may be made as nice as may be desired, because a given movement of the arm G' produces only about an equal change of position of the pipe E. This continues until by the raising of E and its attachments the outer portion of the levers J J meet the stops $b b$. The further elevation of the outer portion, each of these levers being prevented by these stops, the continued elevation of E, thrusting upward on the link-bars K, compels the outer pipe, I, to ascend rapidly and soon to meet and fit tightly to the under face of the deflector. In this position of the parts the exhaust-steam ejected upward into D returns upon itself, and flows backward into and through the furnace, with the effect before explained.

Certain provision for perfecting the disposal of the solid matter thrown up as sparks remains to be described.

M M are holes in the sides of the inner pipe or chimney, through which the sparks, as soon as they are thrown down and settle in the space between B and D, may, by moving with a strong current, which there obtains, again find access to the interior of B, and may repeat the operation until they are destroyed by the violence of the repeated concussions and the friction to which they are subject. When steam is discharged vigorously up the axis of the chimney, this circulating current is very strong, and the sparks move in this manner very satisfactorily through simple holes, M M; but when steam is nearly shut off the current slackens, and the steam is liable to strike against the inner surface of the pipe at this point, so as to retard or absolutely prevent the sparks from circulating. I avoid this evil by the use of the shields $m m$, arranged as represented. These shields $m m$ aid the continuance of the current when the jets of exhaust-steam are feeble and much spread, and also fulfill another end, which is important under some circumstances. This additional end is the preventing of the fall of sparks by gravity from the holes M M into the bottom of the smoke-box.

NN are curved plates, which afford a smooth way for the sparks in their passage to the holes M M.

I have tested my invention practically on the New York and Erie Railroad, and find that the fire can be suppressed very thoroughly in a few seconds when burning at its

most rapid rate. I also find that the condition induced by the passage of nothing but steam through it in this manner for a brief period is a very highly desirable one, by reason of the facts that if when thus deadened the engine is allowed to stand still with the pipes E I up to their highest positions, and the damper closed, no steam will accumulate for a long period—say an hour or more. The fire is still ready to increase very rapidly, and on lowering the pipes E I, opening the damper, and starting the machine, the fire loses almost no time in rising to its highest state of efficiency. When a fire is deadened with water, a considerable time is required to bring it up again when wanted.

Some of the advantages due to separate features of my invention may be separately enumerated, as follows: First, by my tight closing of the top of the inside chimney, B, and compelling a flow of exhaust steam backward through the fire, I am able to check very effectually and instantaneously the development of heat, and am thus able without difficulty to save my tubes and the whole structure in case of difficulty, such as an unexpected stoppage when working at full power and with water low; second, by my arrangement of the two movable pipes E I, and of the connected parts represented, I am able to graduate very nicely the position of the pipes for different conditions of working, and to also shut the escape of the steam and gas entirely by a moderate movement of a single part, H; third, by my shields $m m$, I am able to aid the circulation of the current and the destruction of the sparks in moderately-working conditions of the machine, and to prevent any sparks which may have accumulated in the stack under any circumstances from falling into the smoke-box and obstructing the levers $G^2 G^2$ or causing any other difficulty there.

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

1. In the locomotive, providing for the checking or extinguishment of fire by the exhaust-steam by discharging it backward through the furnace, substantially in the manner herein set forth.

2. The lever J, link-bar K, and stop b , or their respective equivalents, arranged, as described, on one or more sides of the duplicate movable internal pipes, E and I, of a smoke-stack, for the purpose herein set forth.

3. In the stacks of locomotives, the use of the shields $m m$, arranged, as described, relatively to the holes M M, for the purpose herein set forth.

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