(No Model.)

J. S. BELL.

SPARK ARRESTER.

No. 427,955. Patented May 13, 1890.

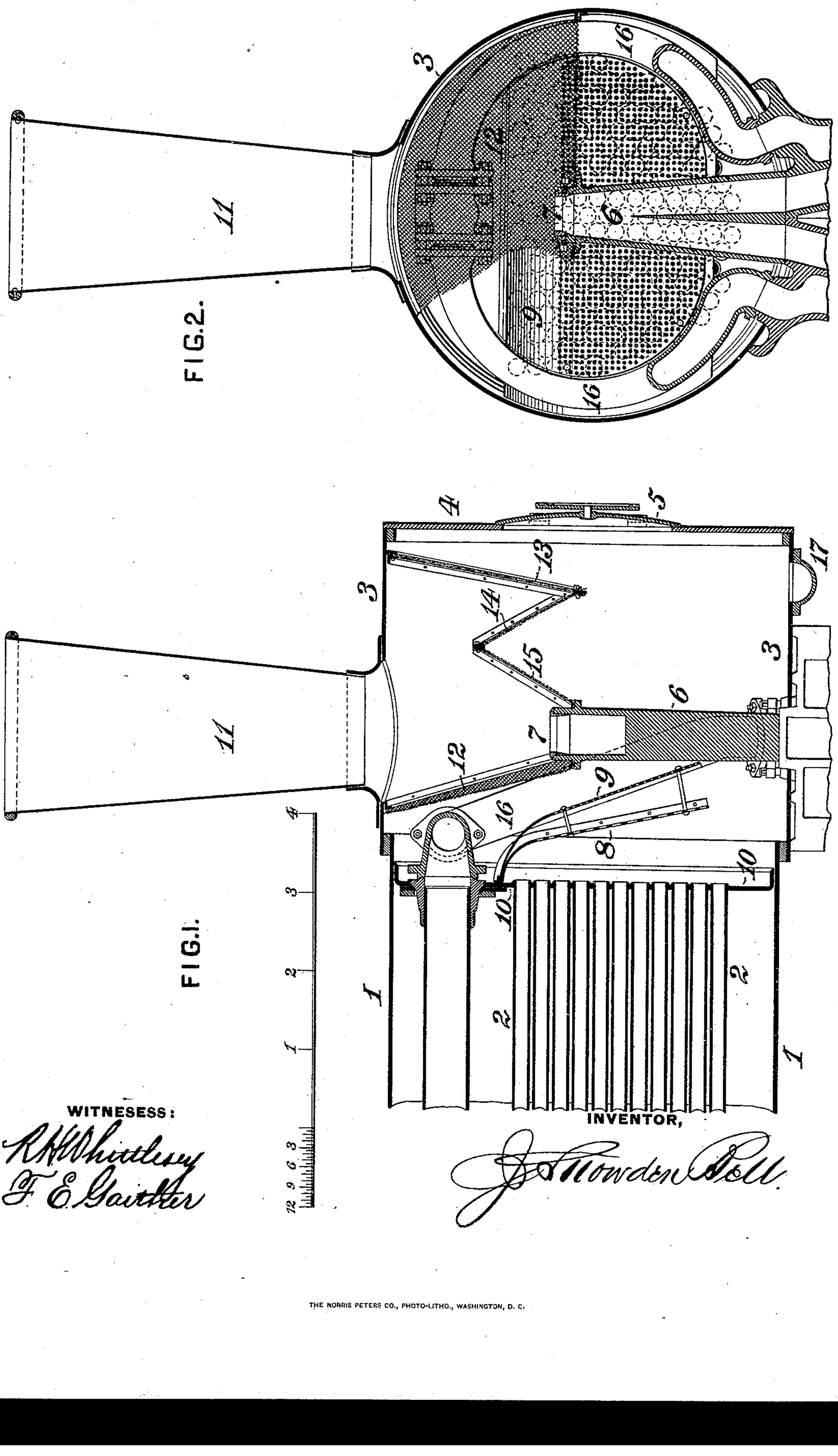

FIG. 2.

FIG. 1.

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SPARK-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 427,955, dated May 13, 1890.

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To all whom it may concern:

Be it known that I, JOSEPH SNOWDEN BELL, of Allegheny, in the county of Allegheny and State of Pennsylvania, (office and address Bakewell Law Building, Pittsburg, Pennsylvania,) have invented a certain new and useful Improvements in Spark-Arresters, of which improvement the following is a specification.

My invention relates to that class of locomotive spark-arresters which are located in the smoke-box and are employed with an open or unobstructed stack, and its object is to enable an area of screen-surface amply sufficient for the effective separation of the solid matters which may be drawn through the tubes from the gaseous products of combustion to be provided without impairing the proper draft on the fire or necessitating the abnormal and objectionable increase of smoke-box volume, weight, and cost, which is a necessary accompaniment of the smoke-box extensions that have within the last ten years been generally applied with spark-arresters of the class above referred to.

To this end my invention, generally stated, consists in the combination, with a locomotive smoke-box, of a continuous connected series of inclined screens extending from the exhaust-nozzle to the upper portion of a smoke-box, and a rearwardly-extending transverse partition, and also in the combination, with a locomotive smoke-box, of a deflector or check-plate imperforate at and near its top and perforated below the same, said plate being secured at top to the flue-head and downwardly and forwardly inclined therefrom, a supplemental deflector located in front of the first deflector and correspondingly inclined, and a screen interposed between the exhaust-pipe and the stack-opening beyond and independent of the deflectors.

The improvement claimed is hereinafter fully set forth.

The essential elements of spark-arresters of the class to which my invention relates, as heretofore generally constructed and adopted in standard constructions, are an imperforate deflector or check-plate secured at its top to the flue-head, and thence extending downwardly and forwardly to a point about one foot above the bottom of the smoke-box, and a screen or netting extending from the deflector and below the top of the exhaust-nozzle to the top of the smoke-box near its forward end. In some instances an imperforate plate extends from the deflector to the exhaust-pipe, and in others the portion of the screen in rear of the exhaust-pipe is upwardly inclined, in the manner shown in the drawings, such construction, which is not, *per se*, claimed as of my invention, presenting the advantages of increased area, and the avoidance of joints around the steam-pipes. In all spark-arresters of this type, however, so far as my knowledge and information extend, the major portion of the screen or netting is horizontal, and such location renders it liable to frequently become clogged up to a greater or less extent with an aggregation of small particles of coal and tarry matter, and also fails to afford as great an area of screen-surface as is ordinarily deemed necessary or desirable, to remedy which latter objection, as well as those of defectiveness or insufficiency in the construction and operation of the fire-box, the smoke-box has been longitudinally extended at its front end, in some cases to more than twice its normal length, notwithstanding the well-recognized error of principle and objections in practice which are inherent in such extension. The deflectors heretofore used also fail to exert any substantial disintegrating action on the larger particles of unconsumed fuel which are drawn through the tubes, many of which pass through the netting and escape as large sparks from the stack.

My improvement is designed to provide a spark-arrester which will be readily and economically applicable, and by which the objections above stated may be largely, if not altogether, obviated.

In the acompanying drawings, Figure 1 is a vertical longitudinal central section through the smoke-box and portion of the waist of a locomotive-boiler with my improvement applied, and Fig. 2 a vertical transverse section at the center of the exhaust-pipe and stack.

My improvement is illustrated as applied in a locomotive-boiler of the ordinary standard construction, in which a series of fire-tubes 2 extends through the waist or shell 1 from the fire-box or combustion-chamber to

the flue-head 10 and delivers the products of combustion of the fire-box into the smoke-box 3, which is closed at its forward end by a front 4, having a suitable door 5, and is provided at top with an open stack 11. I employ, as heretofore, a deflector or check-plate 8, secured at its top to the flue-head 11 and inclined forwardly and downwardly to a proper level above the bottom of the smoke-box; but in lieu of forming the same, as usual, of an entirely imperforate plate, it is plain or imperforate from its top to a level somewhat below the upper row of tubes, and from such level to its lower portion is grated or perforated with a series of openings of, say, one-half an inch or more in diameter, and a supplemental deflector 9, which is also downwardly and forwardly inclined, is secured to the flue-head at or near the line of attachment of the deflector 8, or may be equivalently connected to said deflector. The deflector 9 is preferably, as shown, perforated with a series of openings of smaller diameter than those of the deflector 8, the upper row of perforations being at a lower level than the corresponding row of the deflector-8; but, if deemed desirable, they may be dispensed with, either wholly or partially, and the whole or part of the deflector 9 be correspondingly formed of an imperforate plate. The provision of a perforated deflector next the tubes and a supplemental deflector in front thereof, as above described, is made for the purpose of facilitating the disintegration and extinguishment of large pieces of unconsumed fuel or cinder which may be drawn through the tubes before they reach the screen or netting, and thus promoting the effectiveness of the latter in preventing the ejection of ignited solid matter from the stack by subjecting such matter to a preliminary retardation and disintegration, the deflectors further serving to check the undue draft through the upper tubes by their closed and imperforate upper portions.

The deflectors above described may be used in connection with any suitable screen or netting interposed between the exhaust-pipe and the stack, various forms of which are known and applied in practice.

A construction desirably adapted to such use, and which I provide in order to obtain such increase of area of separating-surface as will admit of the employment of a smoke-box of substantially normal length, and present, as far as practicable, inclined separating-surfaces to the escaping products of combustion, is shown in the drawings, and consists of a connected series of inclined transverse screen-sections or nettings 12, 13, 14, and 15, which may be either of perforated sheet metal or of wire-netting, as preferred. The screens 12 and 13 are of segmental and the screen 14 and 15 of zone form, the screen 12 being located in inclined position between the steam-pipes 16 and exhaust-pipe 6 in rear of the stack-opening and extending downwardly to the top of the exhaust-pipe, and the screen 13 being located at a short distance from the front ring of the smoke-box and backwardly inclined, extending downwardly to about the same level as the screen 12. The screens 14 and 15 are connected at top and inclined in **A** form, the screen 14 being connected at bottom to the forward screen 13 and the screen 15 extending to the top and front of the exhaust-pipe. The screens 12 and 15 are separated at bottom by a space about equal to the diameter of the exhaust-pipe, this space being bridged on each side of the exhaust-pipe by a suitable connecting-piece, which may be either perforated or imperforate, as preferred. The outer surfaces of all the screen-sections conform to the curvature of the smoke-box, and they are connected thereto by angle-irons in the usual manner, as shown. While I prefer to employ a segmental screen, as shown, as the partition in rear of the exhaust-pipe, the same is not essential to my improvement, and any other suitable transverse partition, either perforated or imperforate, provided with an opening for the passage of the exhaust-pipe, may be extended from the lower and rear end of the screen 15 to the front deflector 9, or to the flue-head to prevent the passage of sparks to the stack in rear of said screen.

It will be seen that by the above construction a material increase of screen or separating area within any determined length of smoke-box is attained relatively to that which is obtainable in the ordinary constructions, and there being no horizontal portion other than the narrow connecting-pieces which unite the screens 12 and 15 at bottom nearly all of this area is presented in inclined position, which more effectually resists the tendency of solid matter to pass through the screens and renders a larger mesh or perforations admissible.

The smoke-box projects in front of the saddle only sufficiently to admit of the attachment of a cinder-discharge chamber 17, and where the conditions of fuel or operation are such as to render a spark-receptacle desirable a small separate chamber below and in front of the smoke-box, as in the patent of A. Mitchell, No. 280,064, dated June 26, 1883, may be connected to the discharge-chamber, or the spark-discharging appliance of W. Wilson, Patent No. 361,738, dated April 26, 1887, may be employed, my improvement being readily adaptable for use with a device of such character or with any suitable receiver for unconsumed fuel and cinders.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, with a locomotive smoke-box, of a segmental perforated screen or netting extending across the smoke-box near its front, two inclined perforated screens interposed between said segmental screen and the front of the exhaust-pipe, said screens being connected at their ends to the sides of the smoke-box and the bottom of the forward one being connected to the bottom of the seg-

mental screen, and a transverse partition extending rearwardly from the bottom of the rear inclined screen, substantially as set forth.

2. The combination, with a locomotive smoke-box, of a grated or perforated deflector or check-plate secured at its top to the flue-head and extending outwardly and downwardly therefrom across the smoke-box, and a supplemental deflector perforated with openings which are smaller than those of the first deflector and extending across the smoke-box in front of the latter, substantially as set forth.

3. The combination, with a locomotive smoke-box, of a rear deflector or check-plate secured at its top to the flue-head and extending outwardly and downwardly therefrom across the smoke-box to a level above the bottom thereof, so that a free space shall be left below it, said deflector being imperforate at and for some distance below its top and grated or perforated on the remaining portion, and a supplemental deflector extending across the smoke-box in front of the rear deflector and to or near the bottom line thereof only, substantially as set forth.

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