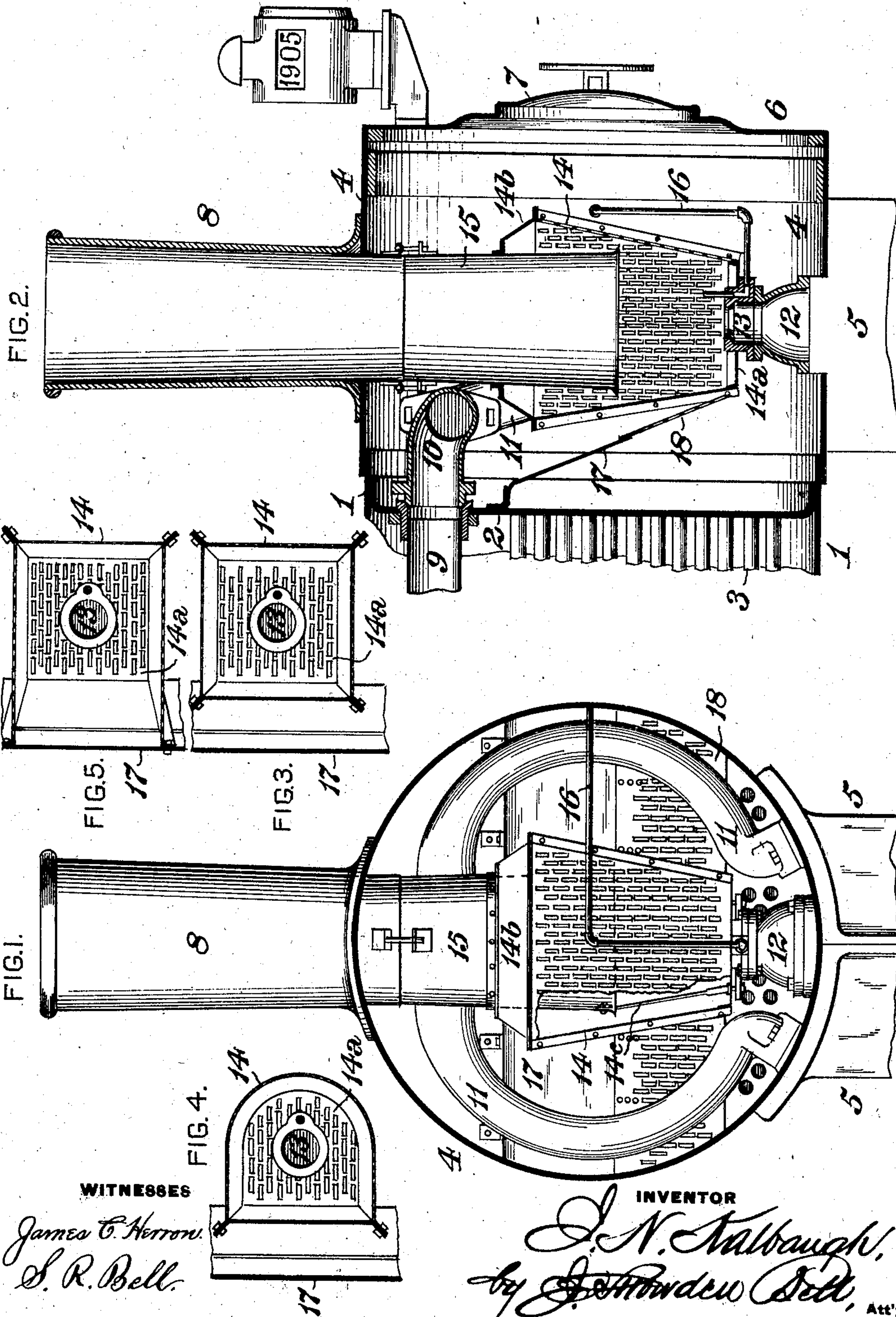


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I. N. KALBAUGH.
SPARK ARRESTER.

APPLICATION FILED FEB. 20, 1905.



WITNESSES

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ISAAC N. KALBAUGH, OF ELKINS, WEST VIRGINIA.

SPARK-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 791,699, dated June 6, 1905.

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To all whom it may concern:

Be it known that I, ISAAC N. KALBAUGH, of Elkins, in the county of Randolph and State of West Virginia, have invented a certain new and useful Improvement in Spark-Arresters, of which improvement the following is a specification.

My present invention relates to spark-arresters of the class adapted to use in "self-cleaning" front ends of locomotive-engines, an instance of which is exemplified in Letters Patent of the United States No. 746,522, granted and issued to me under date of December 8, 1903.

The object of my invention is to provide a spark-arresting appliance of the above class in the operation of which the discharge of sparks and cinders of such character as would be capable of setting fires will be prevented without impairment to the draft or free steaming capacity of the boiler and which may be constructed, applied, and maintained at slight cost and without necessitating changes in the smoke-box or in the ordinary disposition of the steam and exhaust pipes therein.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical transverse section through the smoke-box of a locomotive-boiler, illustrating an application of my invention; Fig. 2, a vertical longitudinal central section through the same; Fig. 3, a horizontal section through the spark-arresting casing and the diaphragm-plate, and Figs. 4 and 5 similar sections illustrating modifications in structural detail.

My invention is herein, as in Letters Patent No. 746,522 aforesaid, exemplified as applied in connection with a locomotive-boiler of the present standard type, in which the waist or shell 1 of the boiler is, as usual, closed at its forward end by a flue-head 2 and is provided with a plurality of fire-tubes 3, through which the products of combustion pass from the fire-box into the smoke-box 4, which is connected to the forward end of the boiler-shell. The smoke-box is supported on cylinder-saddles 5 and is closed at its forward end by a front 6, provided with a door 7 and an open stack 8, which may be either of the straight or taper

type, is connected to its top for the escape of the products of combustion to the atmosphere. The main steam-pipe or dry pipe 9 passes through the flue-head 2 and is connected, through a T-head 10, with steam-pipes 11, which extend along the sides of the smoke-box to lower end connections with steam-supply passages in the cylinder-saddles. The usual exhaust-passages are formed in the saddles and lead into an exhaust-pot 12, which is comparatively low or short and secured centrally thereto and terminates at its top in an exhaust-nozzle or discharge-passage 13 for the exhaust-steam, which may be either integral with or separate from the body of the exhaust-pot. A blower-pipe 16 leads into the exhaust-pot at or near the level of the exhaust-nozzle.

In the practice of my invention I provide a stack extension-pipe 15, which is connected to the lower end of the stack 8 and forms a prolongation thereof which extends downwardly into the smoke-box 4 to or somewhat below the axial line thereof. The extension-pipe 15 may be either cylindrical or outwardly-tapered toward its lower end, so as to provide a "choke" or minimum transverse section at any desired level in the discretion of the constructor. A spark-arresting casing 14, which for convenience of construction is preferably of rectangular horizontal section, as shown in Figs. 3 and 5, and in the form of a frustum of an inverted pyramid, extends from a plane slightly below the top of the exhaust-nozzle 13, which it surrounds at its bottom, to a plane above the lower end of the stack extension-pipe 15, which it surrounds at its top. The front and sides of the casing 14, as well as its bottom 14^a, are formed of perforated plates, the openings in which are sufficiently small to prevent the passage of sparks and cinders which would be large enough to involve liability to set out fires after being discharged from the stack. The back of the casing 14 is formed of a solid or imperforate plate in order that the products of combustion shall be compelled to pass in advance of it and toward the forward portion of the smoke-box on their way to the stack. In the instance shown the space between the top of the casing and the stack extension-pipe 15 is closed by a cap or

cover plate 14^b, which, while not absolutely essential, is of advantage as a further safeguard against liability to set out fires, as it prevents the possibility of any large particles
 5 of ignited fuel from obtaining access to the stack through what would otherwise be an open top of the casing.

The casing 14 may be supported and held in position in any suitable and preferred man-
 10 ner—as, for example, by bolts 14^c passing through its bottom plate, said bolts being secured to lugs on the exhaust-pot or exhaust-nozzle and on the stack extension-pipe, respectively, or its bottom plate may be fitted
 15 to rest on a shoulder on the exhaust-pot and its top plate secured to the stack extension-pipe.

A diaphragm plate or deflector 17, having a lower perforated section 18, is secured at its
 20 top to the flue-head 2 above the upper rows of tubes and projects downwardly and forwardly to a plane slightly above the bottom of the casing 14. The diaphragm-plate serves to equalize the draft through the upper and lower
 25 rows of tubes and to downwardly deflect the products of combustion, so that in their subsequent upward traverse in the smoke-box the entire and large aggregate area of separating-surface in the perforated bottom, front, and
 30 sides of the spark-arresting casing 14 is presented to them and provides a plurality of small openings for their discharge to and out of the stack.

As shown in Figs. 1, 2, and 3, the spark-
 35 arresting casing 14 is a structure which is complete in itself, composed of a set of plates connected by bolts, so as to be readily assembled and taken apart and capable of being easily and quickly fixed in operative position
 40 and removed therefrom as may from time to time be required. It will, however, be obvious that, if desired, the independent imperforate back plate of the casing may be dispensed with and the side sheets thereof be ex-
 45 tended rearwardly and connected to the diaphragm-plate, which then constitutes the rear imperforate wall of the casing, as shown in Fig. 5. In such case the lower section 18 of the diaphragm-plate is made imperforate
 50 throughout the portion of it which is included between the side plates of the casing. It will also be seen that it is not essential that the spark-arresting casing should be of rectangular horizontal section, as its forward portion
 55 may, if preferred, be formed by two inclined and abutting perforated plates or be curved in section, as shown in Fig. 4.

In the operation of the appliance the products of combustion which pass through the
 60 upper rows of tubes are checked and downwardly deflected by the diaphragm-plate, while those passing through the lower rows, in which the draft is less strong, are not correspondingly impeded, and a substantial equali-
 65 zation of draft is thus attained. After leav-

ing the diaphragm-plate the course of the products of combustion is changed to a vertical direction, and they strike the spark-arresting casing at such an angle that the pas-
 sage of solid matter through the perforations 70 of the casing is effectively resisted, while the gases and comparatively light particles of solid matter pass freely through the perforations. The larger particles are broken up in
 75 their traverse through the smoke-box and by their impact against the spark-arresting casing and finally escape in such small portions as not to be a source of danger from fire.

As will be obvious to those familiar with locomotive-engine construction and practice, 80 my improvement is applicable at comparatively slight cost and without involving the use of members which are complicated or liable to breakage or derangement in operation in locomotive-boilers of the standard con- 85 struction, and it may be applied without interference with or change in the smoke-box appliances which are now employed. A special feature of advantage is afforded in the capability of utilizing a low-exhaust nozzle by 90 the combination therewith of a spark-arresting medium and draft-regulating appliance which have been shown in practice to be so applied that free steaming of the boiler is at- 95 tained and the discharge of large sparks and cinders satisfactorily prevented. A further advantage is presented by the adaptability of the improvement to use without an extended smoke-box and the consequent avoidance of the objectionable and injurious results of the 100 latter in its increase of smoke-box volume, cost, and weight on truck.

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

1. The combination, with a locomotive- 105 boiler, of a stack extension-pipe extending downwardly into the smoke-box, an upwardly and outwardly tapering perforated spark-arresting casing extending from the exhaust-
 110 pot to a plane above the bottom of the stack extension-pipe and surrounding and spaced outwardly from said pipe at its upper end, and a diaphragm-plate extending downwardly and forwardly between the flue-head and the casing. 115

2. The combination, with a locomotive- 120 boiler, of a stack extension-pipe extending downwardly into the smoke-box, a spark-arresting casing extending from the exhaust-pot to a plane above the bottom of the stack extension-pipe, and surrounding and spaced outwardly from said pipe at its upper end, said casing having an imperforate rear wall and perforated side, front, and bottom walls, and a diaphragm-plate extending downwardly 125 and forwardly between the flue-head and the casing.

3. The combination, with a locomotive- 130 boiler, of a stack extension-pipe extending downwardly into the smoke-box, a spark-ar-

resting casing extending from the exhaust-
pot to a plane above the bottom of the stack
extension-pipe, and surrounding and spaced
outwardly from said pipe at its upper end,
5 said casing having an imperforate rear wall
and perforated side, front, and bottom walls,
a cap or cover plate closing the space between
the top of the casing and the stack extension-
pipe, and a diaphragm-plate extending down-
10 wardly and forwardly between the flue-head
and the casing.

4. The combination, with a locomotive-
boiler, of a stack extension-pipe extending
downwardly into the smoke-box, a spark-ar-

resting casing comprising a perforated bot- 15
tom plate surrounding the exhaust-pot, an im-
perforate back plate and perforated side and
front plates connected at their edges and ex-
tending from the bottom plate to a plane above
the bottom of the stack extension-pipe, in and 20
below which plane they are spaced outwardly
from said pipe, and a diaphragm-plate ex-
tending downwardly and forwardly between
the flue-head and the casing.

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Witnesses:

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