

No. 746,522.

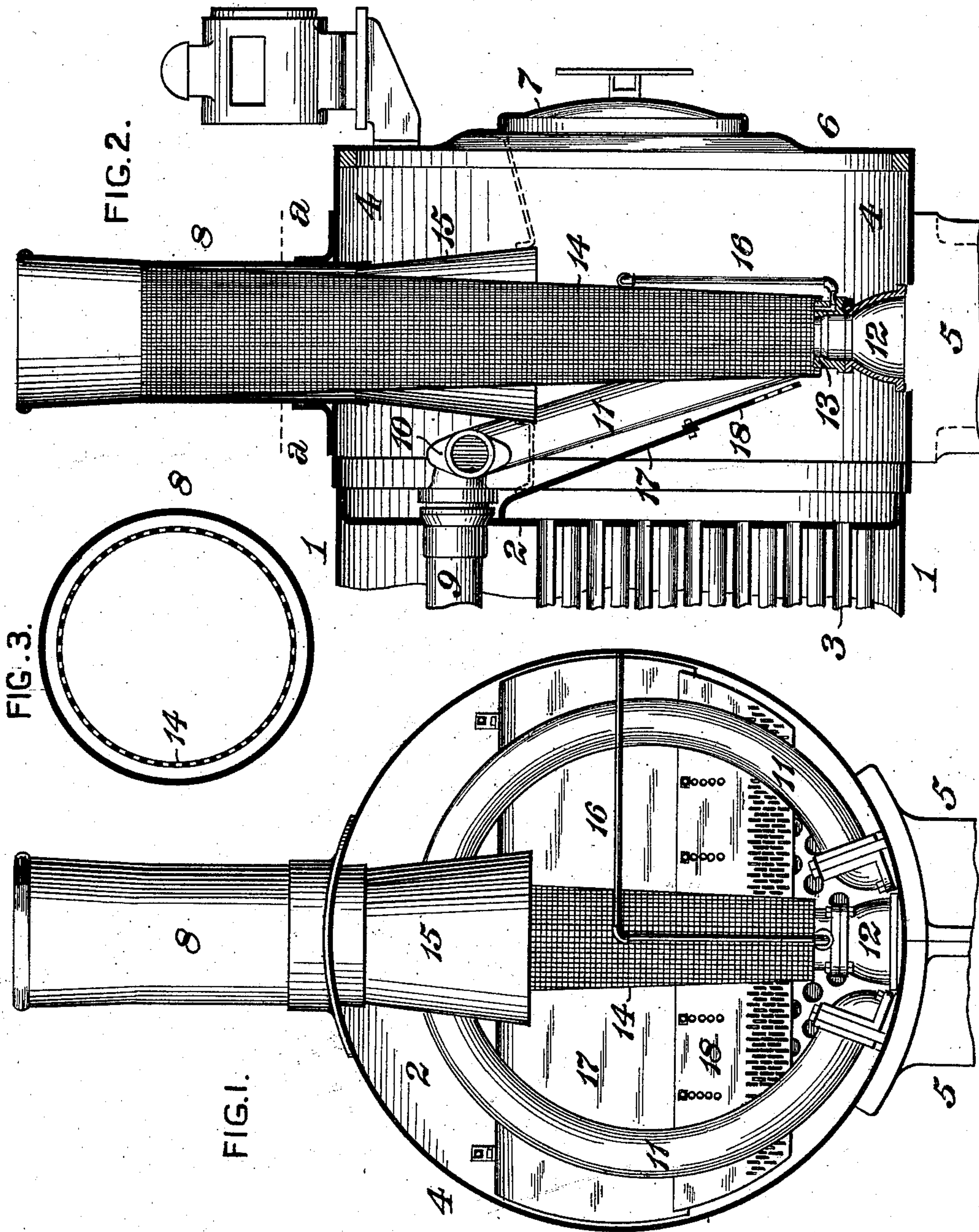
PATENTED DEC. 8, 1903.

I. N. KALBAUGH.
SPARK ARRESTER.

APPLICATION FILED JULY 28, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES

James C. Heron.
S. R. Bell.

INVENTOR

I. N. Kalbaugh,
by J. W. Bell.

Att'y.

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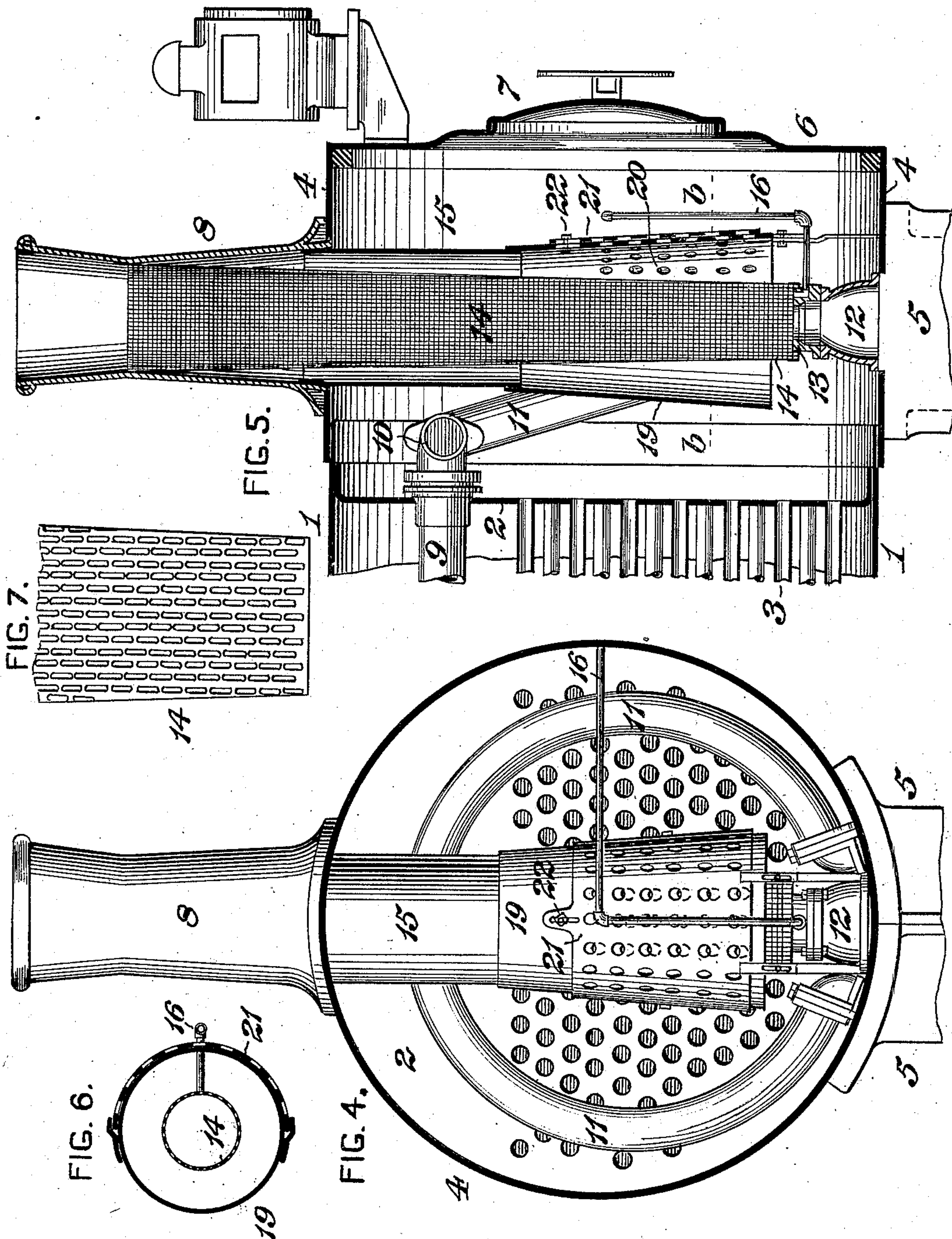
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UNITED STATES PATENT OFFICE.

ISAAC N. KALBAUGH, OF ELKINS, WEST VIRGINIA.

SPARK-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 746,522, dated December 8, 1903.

Application filed July 28, 1903. Serial No. 167,253. (No model.)

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
5 new and useful Improvement in Spark-Arresters, of which improvement the following is a specification.

The object of my invention is to provide a spark-arresting appliance for locomotive and
10 other steam boilers which are operated under forced draft which in construction shall be simple and inexpensive and readily applicable in boilers of the ordinary type without necessitating an extension of the smoke-box
15 and which in operation will effectively prevent the discharge of sparks and cinders from the stack of such character and size as would set out fires on or adjacent to the right of way without impairing the free steaming
20 of the engine.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical transverse section through the
25 smoke-box of a locomotive-boiler, illustrating an application of my invention; Fig. 2, a vertical longitudinal section through the same; Fig. 3, a horizontal section, on an enlarged scale, upon the line *a a* of Fig. 2; Figs.
30 4 and 5, vertical transverse and longitudinal sections, respectively, through the smoke-box of a locomotive-boiler, illustrating a structural modification; Fig. 6, a horizontal section on the line *b b* of Fig. 5; and Fig. 7, a
35 side view in elevation and on an enlarged scale of the lower portion of the separating-pipe.

My invention is herein exemplified as applied in connection with a locomotive-boiler
40 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
45 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
50 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-
55 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
60 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
65 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 grated or perforated separating-pipe 14,
70 which is in the form of a frustum of a cone and extends from the exhaust-pot 12 to the stack 8, against the inside of which its upper end abuts and is secured by a bolt in a horizontal plane located some distance above the
75 top of the smoke-box. The separating-pipe is preferably formed of perforated sheet or plate metal, as shown in Figs. 3, 6, and 7, its openings or perforations, through which only,
80 as will be seen, passage is afforded for products of combustion to the stack, being longitudinal, as shown in Fig. 7, and of such small dimensions as to prevent the passage through
85 them of particles of unconsumed fuel which are large enough to tend to do damage by setting fire to objects on or near the right of way over which the locomotive runs. The
separating-pipe may, if preferred, be made of wire-netting; but perforated plate is considered by me to be more practical and desirable,
90 both as to durability and for other reasons.

The separating-pipe is surrounded and separated from the interior of the smoke-box throughout that portion of its length which
95 extends from the top of the smoke-box to or near the level of the upper row of tubes 3 by an open-ended stack extension-pipe 15, which is secured to the inner end of the stack or to the smoke-box, as may be most convenient,
and constitutes an inward extension of the
100 stack, as access thereto for products of combustion from the smoke-box is afforded only through the open lower end of the pipe 15, there being no avenue at the top of the smoke-

box for the escape of products of combustion, as is provided in all prior constructions within my knowledge or information. If desired, the volume of the smoke-box may be reduced
5 by cutting off its upper portion by a plate extending across it at or near the bottom of the pipe 15, as indicated in dotted lines in Fig. 2.

The access of products of combustion to the separating-pipe is controlled by a suitable mechanical appliance for substantially
10 equalizing the draft through the upper and lower rows of tubes of the boiler, which appliance is shown in Figs. 1 and 2 as consisting of an inclined diaphragm-plate or deflector 17, secured to the flue-head at its top
15 and having an adjustable section 18, which may be raised and lowered as desired, connected to its lower end and extending to a level slightly above the top of the exhaust-
20 pot. The products of combustion which pass through the upper rows of tubes are checked and downwardly deflected by the diaphragm-plate, while those passing through the lower
25 rows, in which the draft is less strong, are not correspondingly impeded, and a substantial equalization of draft is thus attained. After leaving the diaphragm-plate the course of
30 the products of combustion is changed to a vertical direction, and they strike the separating-pipe at such an angle that the passage of solid matter through the perforations of
the pipe is effectively resisted, while the gases and comparatively light particles of solid
35 matter pass freely through the perforations. The larger particles are broken up in their traverse through the smoke-box and by their impact against the separating-pipe and finally escape in such small portions as not to be a
40 source of danger from fire.

In the structural modification shown in Figs. 4, 5, and 6 the diaphragm-plate draft-equalizing appliance above described is dispensed with, and its function is performed by
45 a draft-pipe 19, which is in the form of a frustum of a cone, connected at its top, which is its smaller end, to the lower end of the stack extension-pipe 15 and extending downwardly and outwardly therefrom to a level slightly
50 above the top of the exhaust-pot 12. The draft-pipe is perforated on its forward side—that is to say, throughout about the half of its periphery which is forward of its axis—by a plurality of openings 20, the area of which is
55 about equal to that of the boiler-tubes. The area of the openings 20 may be regulated as desired by an adjustable segmental plate 21, which fits on the draft-pipe and is provided with openings which normally register with those of the latter. The plate 21 may be
60 moved up or down upon the draft-pipe, so as to decrease or increase, as the case may be, the aggregate area of the openings 20, and is secured in any adjusted position by a bolt 22.

The products of combustion, which pass out
65 of the upper rows of tubes, are downwardly deflected by the closed rear side of the draft-pipe, as in the case of the diaphragm-plate

first described, and, as in the former case, their course is changed, and they strike the separating-pipe at an angle such as will pro- 70 mote the arrest of large particles of solid matter and the free escape of the gases and small and light particles.

As will be obvious to those familiar with locomotive-engine construction and practice, 75 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 construc- 80 tion, 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 the combi- 85 nation 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 attained and the discharge of large sparks and cinders satis- 90 factorily 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 objec- 95 tionable and injurious results of the 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- 100 boiler, of a perforated separating-pipe extending from the exhaust-pot to the stack, a stack extension-pipe surrounding the separating-pipe from the base of the stack to or near the level of the upper row of boiler-tubes, 105 and providing, throughout its length, an avenue for the access of products of combustion to the separating-pipe, and also forming a partition between the top portion of the smoke-box and the stack, and means for downwardly 110 deflecting the products of combustion which pass out of the upper rows of tubes, prior to their access to the separating-pipe.

2. The combination, with a locomotive- 115 boiler, of a perforated separating-pipe extending from the exhaust-pot to the stack, a stack extension-pipe surrounding the separating-pipe from the base of the stack to or near the level of the upper row of boiler-tubes, 120 and providing, throughout its length, an avenue for the access of products of combustion to the separating-pipe and also forming a partition between the top portion of the smoke-box and the stack, and a draft-regulating appliance which interposes a deflecting-wall be- 125 tween the separating-pipe and the tubes.

3. The combination, with a locomotive- 130 boiler, of a perforated separating-pipe in the form of a frustum of a cone, extending and outwardly tapering from the exhaust-pot to the stack, an outwardly-tapering stack extension-pipe surrounding the separating-pipe from the base of the stack to or near the level of the upper row of boiler-tubes, and provid-

ing, throughout its length, an avenue for the access of products of combustion to the separating-pipe, and also forming a partition between the top portion of the smoke-box and the stack, and a draft-regulating appliance which interposes a deflecting-wall between the separating-pipe and the tubes.

4. The combination, with a locomotive-boiler, of a perforated separating-pipe, extending from the exhaust-pot to the stack, a stack extension-pipe surrounding the separating-pipe from the base of the stack to or near the level of the upper row of boiler-tubes, and an outwardly-tapering draft-pipe extending from the stack extension to a level adjacent to the top of the exhaust-pot and provided with perforations on its forward side.

5. The combination, with a locomotive-boiler, of a perforated separating-pipe extending from the exhaust-pot to the stack, a stack extension-pipe surrounding the separating-pipe from the base of the stack to or

near the level of the upper row of boiler-tubes, an outwardly-tapering draft-pipe extending from the stack extension to a level adjacent to the top of the exhaust-pot and provided with perforations on its forward side, and means for varying the degree of opening of the perforations of the draft-pipe.

6. The combination, with a locomotive-boiler, of a perforated separating-pipe extending from the exhaust-pot to the stack, a stack extension-pipe surrounding the separating-pipe from the base of the stack to or near the level of the upper row of boiler-tubes, an outwardly-tapering draft-pipe extending from the stack extension to a level adjacent to the top of the exhaust-pot and provided with perforations on its forward side, and a correspondingly-perforated plate fitted adjustably on the draft-pipe.

ISAAC N. KALBAUGH.

Witnesses:

E. A. BOWERS,
J. P. GARSMAN.