

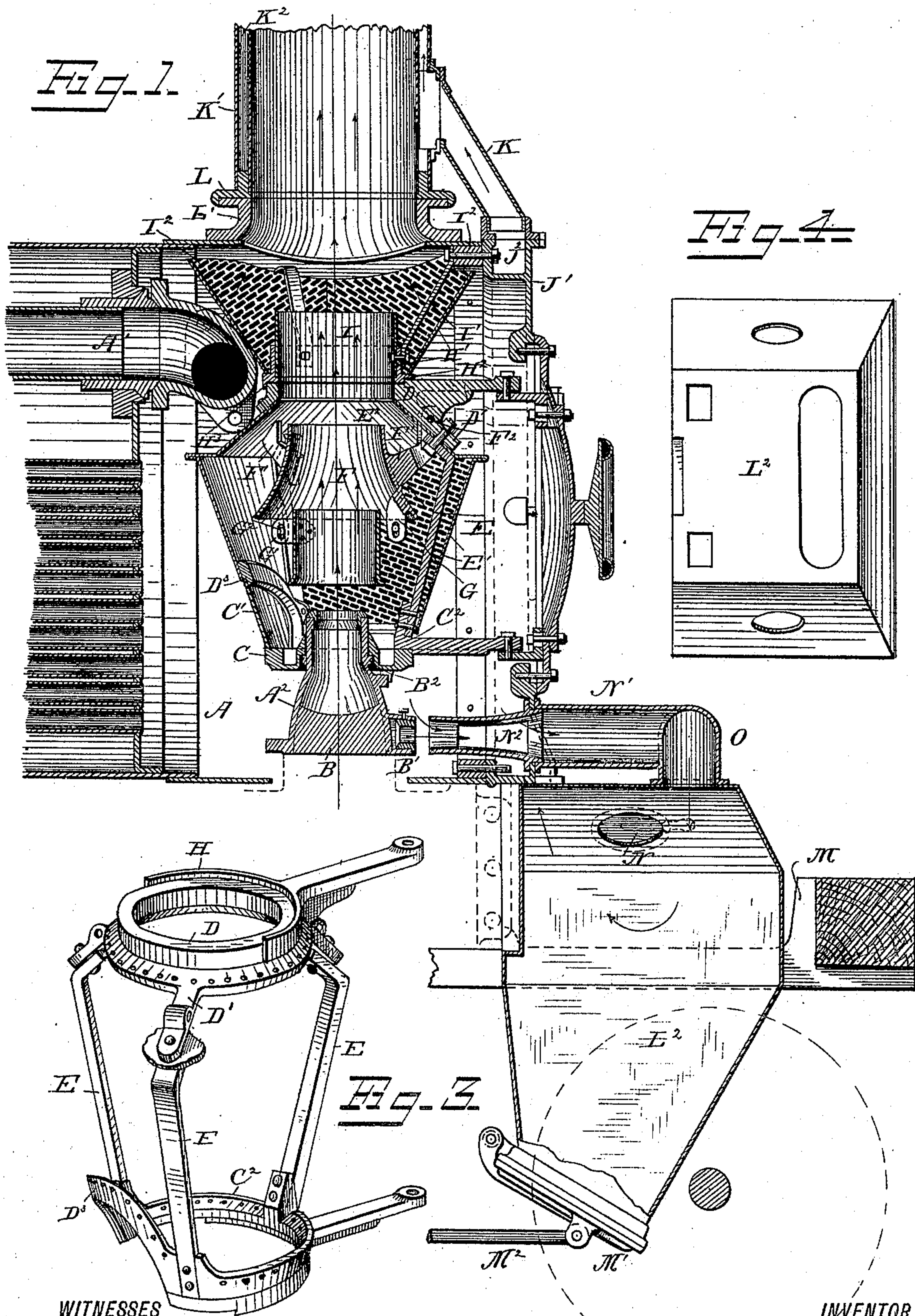
(No Model.)

2 Sheets—Sheet 1.

G. D. HUNTER.
SPARK ARRESTER.

No. 285,899.

Patented Oct. 2, 1883.



WITNESSES
F. L. Ourand,

Edwin L. Bradford

INVENTOR

George D. Hunter
By *Carlin & Fenner*
his Attorneys

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

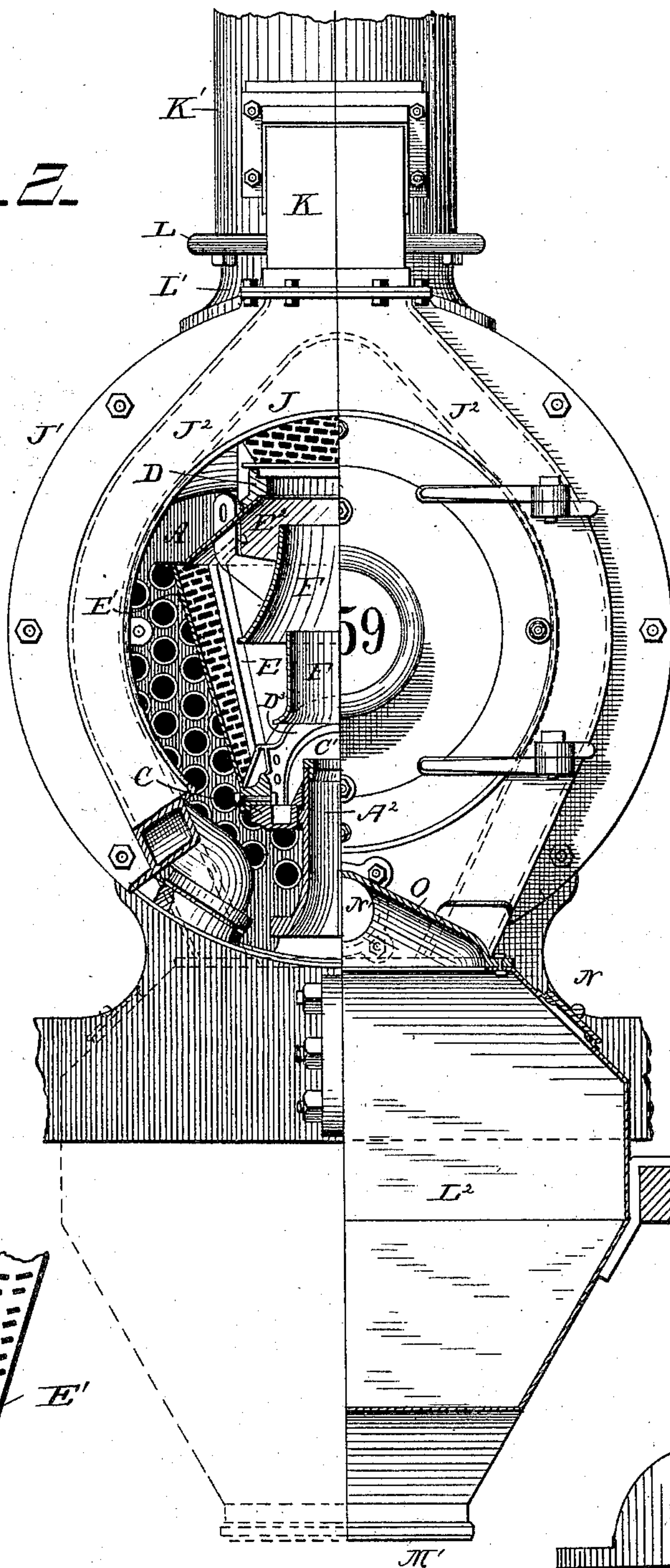


Fig. 6.

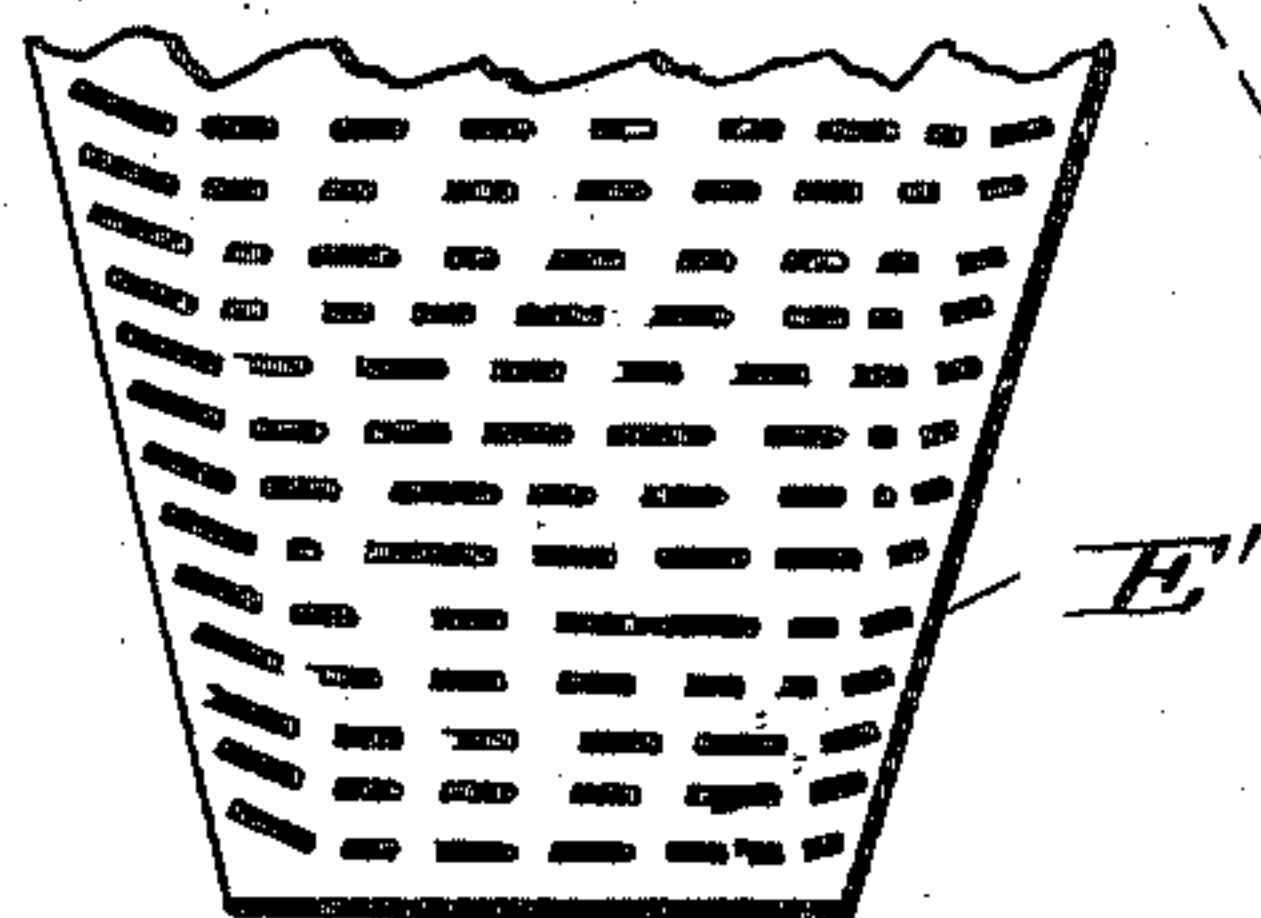
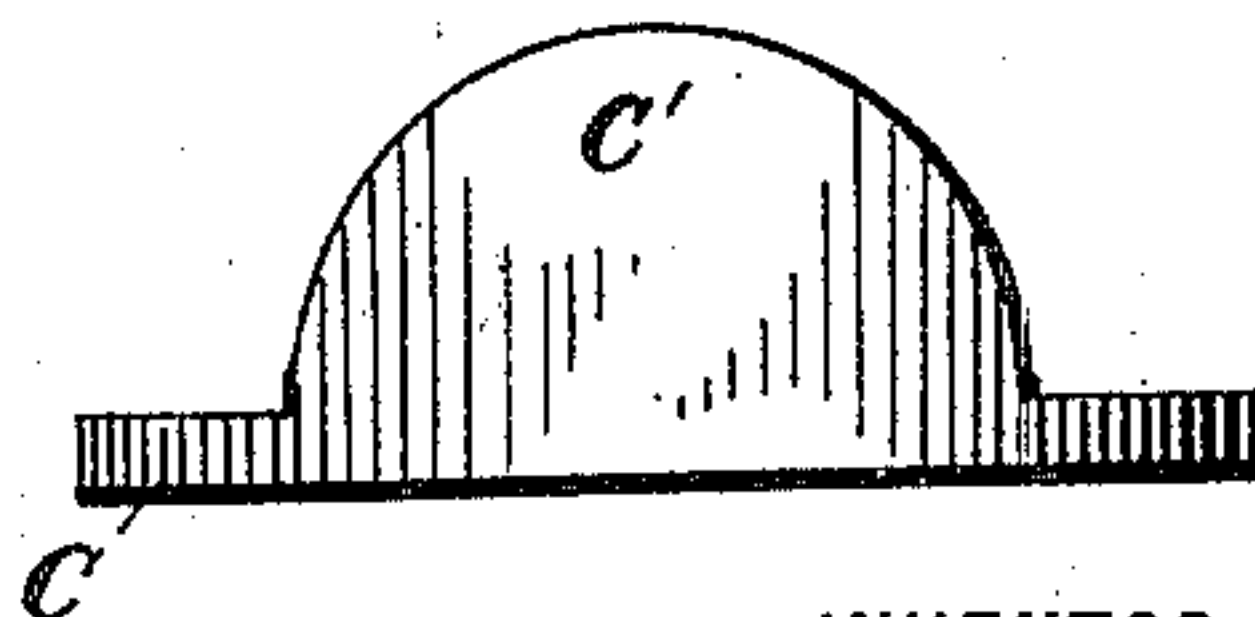


Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE D. HUNTER, OF TERRE HAUTE, INDIANA.

SPARK-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 285,899, dated October 2, 1833.

Application filed August 7, 1833. (No model.)

To all whom it may concern:

Be it known that I, GEORGE D. HUNTER, a citizen of the United States, residing at Terre Haute, in the county of Vigo and State of Indiana, have invented certain new and useful Improvements in Spark-Arresters, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to certain new and useful improvements in spark-arresters; and it has for its object, first, to provide means for separating the smoke and gaseous products of combustion from the cinders, sparks, and
15 more solid particles of fuel escaping from the furnace; second, to provide means for allowing of the free and unobstructed escape of the smoke and gaseous products, and for causing the descent or gravitation of the cinders,
20 whereby the latter are prevented from escaping out of the stack; third, to provide means for admitting of the ready withdrawal of part of the devices which accomplish the separation of the smoke, gaseous products, and cinders, whereby access may be had to the smoke-box and to the flues; and with these ends in view my invention consists in the employment of a suitable drum or screen provided with
30 tubes or sections of tubes for confining and directing the exhaust to the stack, and of a further screen which prevents the escape of the cinders through the stack, the said devices being located within the smoke-stack and interposed between the exhaust nozzle or nozzles and the
35 smoke-stack; and it further consists in attaching the said perforated drum and its connected devices to the door of the smoke-box by an improved means, whereby they may be withdrawn when the door is opened and returned
40 to place when it is closed, and in certain other devices for continuously taking up and transmitting the cinders to a suitable receptacle for extinguishment, the peculiarities of which will more fully appear in another application
45 filed by me, even date herewith.

In the accompanying drawings, forming a part of this specification, and on which like letters of reference indicate corresponding features, Figure 1 represents a vertical sectional
50 view of a portion of a locomotive-boiler and its smoke-box, showing my improvements applied thereto, the same being also shown in

vertical section. Fig. 2 represents a front elevation of a locomotive-boiler and a portion of a smoke-stack, having a portion of the smoke-box front and door removed, whereby
55 the parts constituting my invention are shown in vertical cross-section within the box; Fig. 3, a detached perspective view of the frames and their connections, which support the perforated drum, its attached devices, and the
60 deflecting-screen; Fig. 4, a detached plan view of the cinder-receptacle. Fig. 5 is a detached view of a ring and an upwardly-extending sheet secured thereto, and Fig. 6 a detached
65 front elevation of a portion of the drum.

The letter A indicates the smoke-box of an ordinary locomotive, and the letter A' the steam-pipe which conducts the steam to the steam-chests. Located in the usual place at
70 the bottom of the smoke-box is the exhaust-nozzle A², which in the present instance may be termed, by reason of its construction, a "double acting central discharge-nozzle," the
75 same being provided with a partition, B, which terminates some distance below the mouth, whereby the discharge of the steam issues in a single volume, and to one side extends a branch,
B', which communicates with the interior of the nozzle on each side of a partition, the said
80 branch having a thimble, if desired, to contract its mouth. The neck of the exhaust-nozzle is provided with an annular flange, B², upon which is fitted a ring, C, having an upwardly-extending sheet, C', extending partially
85 around the same.

The letter C² indicates a metallic circular frame, having an arm extending from one side, which is attached to a lug secured to the door by bolts or otherwise. The rear of said frame
90 is arched upwardly and recessed, as seen at D³, for the reception of the edge of the sheet C', the object of the arched portion being to allow the frame to clear the nozzle when the door is opened.

The letter D indicates another circular frame, the same being provided with an arm which connects with a bracket or lug secured to a portion of the door, and with radially-extending
95 arms D', to each of which are bolted the connecting-bars E, the lower ends of the latter being bolted to the frame C², whereby the two frames are rigidly connected together.

The letter E' refers to a conical drum, the

rear third or approximately rear third of which is imperforated, while the remaining forward portion is provided with a series of elongated slots, the said drum being secured to the upper edge of the frame C² by means of bolts or rivets, the said ring being bored for this purpose, as seen in Fig. 3. The perforations in the drum are made with their longest direction in line with the length of the sheet before it is bent, and, by reason of the conical form of the drum, the slots in the perforated portions thereof on each side assume an angular position, while those which are in the forward part or segment of the drum are in a horizontal position, their longest diameter being in line with the circumference. The advantage of this form of construction is that such of the cinders as come in contact with the drum strike crosswise the slots, which prevents the clogging up of the latter. The rear lower portion of the drum is cut away to fit the plate C'. Secured to the upper edge of the said drum, and to the lower side of the frame D is an imperforated conical crown-sheet, E², the upper end of which is provided with an opening equal to that in the frame D. Located within the said drum are the cylindrical and conical exhaust confining-tube sections F, the upper of which is provided with radial arms F', which pass through slots in the sheet E², and are secured to the radial arms of the frame D by means of bolts F², the lower of said tubes being connected to the upper by means of the lugs G G' and the pins G². The upper forward half of the ring D is provided with a flange, H, forming, in connection with the body of the ring, a seat in which an annular collar, H', is adapted to fit, the said collar being provided with a horizontal annular flange, H², on its external portion, and a semi-annular depending flange, H³, on its rear portion, against the latter of which the upper rear edge of the frame D abuts when the door is closed, thus forming a connection between the collar and the said frame. Fitting within the said collar is the upper section, I, of the exhaust confining-tube. To the annular collar H' and the tube I are secured a suitable number—preferably three—of inclined braces I', by means of bolts, the upper ends of which are secured to the shell of the smoke-box, and to the annular internal ring, I², fitting within the smoke-box and held by means of bolts or rivets, as seen in Fig. 1.

Fitting upon the annular flange of the collar H' is the conical deflecting-screen I², the same extending upwardly to near the foot of the smoke-stack. The slots in this screen are formed in like manner as those in the drum E', and, being perforated over its entire surface, the slots of each respective half are inclined in opposite directions. The forward end of this smoke-box is composed of an annular cap, J', which is bolted to the ring I², above alluded to. Near the edges of the said cap, and on the outer side thereof, are formed (being preferably cast therewith) two curved con-

duits, J², the upper ends of which unite, as seen in Fig. 2, and are connected by a hollow leg or pipe, K, with the outer casing, K', of the smoke-stack.

The smoke-stack, as seen in Fig. 1, is constructed of two independent casings, an annular space, K², being left between said casings, and at their lower ends they are secured to a flange projecting upwardly from an annular ring, L, the latter being connected to the collar L', which is secured to the smoke-box, and forms a basis of the stack; or any other approved construction for forming a double-walled stack may be adopted.

The lower termini of the curved conduits J² open into and communicate with a metallic box or spark-receiving receptacle, L², by means of openings in the top of the box. The box L² may be of any desired form, but is preferably of that indicated in the drawings, and is fastened to the frame M in any suitable manner.

The lower end of the cinder-receiving receptacle L² is provided with a hinged door, M', to which is connected a rod, M², which, by preference, runs back to the cab and is connected therewith by a lever or other means by which it may be operated in order to open and close the door. The box is also provided with a hand-hole, N, having a cover fitted thereon, by means of which access may be had, if desired, to the upper portion of the box.

The cap J' is provided with an aperture near its lower end, through which extends a pipe, N', the inner end of which is tapering, preferably, and terminates within a few inches of the branch B' of the nozzle. This portion of the pipe N' is provided with slots N², through which the cinders are sucked, as will presently appear. The outer end of the pipe connects with an elbow or T-head, O, of flaring form, which in turn is bolted to the cinder-box L², as seen in Fig. 2, an opening being formed in the upper end of the box coincident with the mouth of the elbow.

The box L², the cap J', having the conduits J², and the several devices immediately connected therewith, form the subject-matter for another application, as above stated, and need not, therefore, be further described.

The operation of my invention will be readily understood when taken in connection with the above description, and is as follows: After the engine is fired up and put in motion, the draft, as usual, causes the smoke and the gaseous products of combustion and the cinders or small particles of fuel, to pass through the flues on their way to the stack. As the cylinders exhaust the steam is discharged violently through the nozzle B' (or nozzles, if more than one is used) through its confining-pipe to the stack, and by reason of the broken joints between the mouth of the nozzle, and also between the sections of the steam-confining pipe, the exhaust-steam is allowed to act through the perforations in the forward portion of the drum E', thereby forming a partial vacuum in the forward end of the smoke-box, which has

the effect of inducing the products of combustion above alluded to to pass around the drum E' to that portion of the smoke-box, and the continued sucking action of the exhaust serves to draw a portion of the cinders abrasively against the surface of the drum, whence they rebound, and by gravity descend and give place for an incoming quantity of the cinders. It is to be understood, however, that the greater portion of the cinders, as well in quantity as in size, are drawn ahead toward the lower front end of the box, whence they are sucked into the pipe N', and driven ahead without having to come in contact with the drum. The smoke, &c., ascends with the exhaust through the stack, and the cinders are drawn through the slot N² and the inner end of the pipe N' as fast as they descend to the bottom of the smoke-box, by means of a branch current of the exhaust-steam issuing from the branch B' into the said pipe N'. The cinders and steam are conducted through the pipe N' and its elbow into the receptacle L², the cinders falling to the bottom, and the steam escaping from the receptacle through the conduits J², with which it connects, and thence, by the pipe K, into the annular space and into the open air. The function of the screen I² is to permit the escape of any smoke and gaseous products which may rise above the drum E', and to prevent the escape of any cinders which may be carried with them. This action is continued as long as the engine is in motion and using steam, and I have ascertained by actual trial that the smoke-box is virtually cleared of cinders, the ability of the engine to maintain the required pressure of steam preserved, and the consumption of fuel greatly reduced.

It is also to be observed, from the construction above described, that by opening the door of the smoke-box, the drum E' and the sections F of the steam-confining pipe are readily removed, which admits of access to the interior of the smoke-box, should it be desired.

It is further to be observed that by reason of the modified action of the exhaust-steam upon the fire, which results from the imperforated and perforated portions of the drum being, respectively, adjacent and away from the flues, much of the combustible matter in the fire-box is consumed before being drawn through the flues, which being in small particles would, by the otherwise violent action of the exhaust-steam, be carried in the smoke-box. This is a very important result of the use of my invention, and aids largely in the reduced consumption of fuel. The nozzle in this instance, it will be observed, has its walls contracted for a short distance above its seat, the object being to avoid any unnecessary area in the rim, and to direct the steam centrally therefrom through the confining-pipe. This nozzle, however, does not constitute a part of the present invention, as I contemplate making an application therefor hereafter.

I would further observe that the branch

which extends from the lower portion of the nozzle acts to discharge the accumulated condensation in the exhaust-steam pipes connecting the steam-chest, into the cinder-receptacle, instead of up through the stack, as with other nozzles, thereby obviating the serious inconvenience of having water thrown from the stack.

I would still further observe that, by reason of the modified action of the exhaust-steam upon the fire, as above stated, I find by actual experiment that the greater portion of the smoke is also consumed.

I do not herein lay claim, specifically, to the devices which form the subject-matter of my application for Letters Patent for improvements in spark-extinguishers, filed even date herewith, and bearing serial No. 103,082, the subject-matter in said application consisting, essentially, of the spark-receiving receptacle having communication with the smoke-box, the smoke-box head having steam-escaping conduits, and the double-walled stack.

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

1. In a spark-arrester, the combination, with the smoke-box and the exhaust-nozzle, of a conical drum having elongated perforations and an imperforated portion secured to frames attached to the door, and the exhaust-confining pipe located therein, substantially as described.

2. In a spark-arrester, the combination, with the exhaust-nozzle having a partition and a branch communicating therewith, of the conical drum having elongated perforations and an imperforated portion, and secured to the door by upper and lower frames, the exhaust-confining pipe, and the upper screen having elongated oppositely-disposed perforations, substantially as described.

3. In a spark-arrester, the combination, with the divided nozzle having a branch communicating therewith, a steam-confining pipe, and the double-walled smoke-stack, of the perforated and imperforated drum secured by frames to the door, and the upper screen having oppositely-disposed elongated perforations.

4. In a spark-arrester, the combination, with the divided exhaust-nozzle having a branch communicating therewith on each side of the dividing-partition, and the screen having elongated oppositely-disposed perforations, of the receptacle communicating with the smoke-box, and adapted to receive cinders through the slotted pipe by the action of the exhaust-steam, and the smoke-box cap having conduits for the discharge of the steam from said receptacle, substantially as described.

5. In a spark-arrester, the combination, with the divided exhaust-nozzle having a branch communicating therewith and the partially-perforated drum and screen, of a receptacle to receive the cinders by the action

of exhaust-steam, and the smoke-box cap having conduits through which the steam escapes from said receptacle, substantially as described.

5 6. In a spark-arrester, the combination, with the exhaust-nozzle, the partially perforated drum supported by upper and lower brackets secured to the door, the screen and the steam-confining pipe, of the cinder receptacle adapted to receive the cinders by the ac-
10 tion of exhaust-steam, and the smoke box cap having conduits for the escape of the steam from the receptacle, substantially as described.

7. In a spark-arrester, the combination,
15 with the exhaust-nozzle and the steam-confining tube, of the upper and lower frames secured to the door, the partially-perforated drum and its crown sheet secured thereto, the lower frame and drum being arched, the plate
20 fitting in said arch, and a screen having oppositely-disposed elongated perforations secured to the upper part of the smoke-box, substantially as described.

8. In a spark-arrester, the combination,
25 with the door of the smoke-box, of the upper and lower frames having each an arm which connects with the door, the lower of said frames having an arch, and the bars secured to the lower frame, and to radial arms extend-
30 ing from the upper frame, whereby they are secured, substantially as described.

9. In a spark-arrester, the combination, with the door of the smoke-box, of the upper and lower brackets, the latter having an arch,
35 the drum having elongated perforations and an imperforated portion, and adapted to be swung in and out of the smoke-box by the action of the door, substantially as described.

10. In a spark-arrester, the combination,
40 with the nozzle and the door, of the upper and lower frames, the latter having an arch, the

drum having elongated perforations and im-
perforated and cut-away portions, and the lower sections of the steam-confining pipe connected together, the upper section being
45 provided with radial arms secured to the upper frame, substantially as described.

11. In a spark-arrester, the combination, with the smoke-box having a ring secured to its forward inner edge, of the upper section
50 of the steam-confining pipe secured thereto, and the screen having oppositely-disposed elongated perforations, substantially as described.

12. In a spark-arrester, the device for di-
55 viding the smoke from the more solid particles of combustion, having a perforated and an imperforated portion, substantially as described.

13. In a spark-arrester, the device for di-
60 viding the smoke from the more solid particles of combustion, having a perforated and an imperforated portion, said imperforated portion being placed opposite the flues, substantially
65 as described.

14. In a spark-arrester, the drum for di-
70 viding the smoke from the more solid particles of combustion, having an imperforated portion and a portion provided with oblique and horizontal perforations, substantially as
75 described.

15. In a spark-arrester, the screen for di-
viding the smoke from the more solid particles of combustion, having oppositely-dis-
posed elongated perforations, substantially as
75 described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE D. HUNTER.

Witnesses:

H. J. ENNIS,

EDWIN L. BRADFORD.

Correction in Letters Patent No. 285,899.

It is hereby certified that in Letters Patent No. 285,899, granted October 2, 1883, upon the application of George D. Hunter, of Terre Haute, Indiana, for an improvement in "Spark-Arresters," an error appears in line 33, page 1 of the printed specification, requiring the following correction, viz: the word "smoke-stack" should be read *smoke-box*; and that the patent should be read with this correction therein to make it conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 13th day of November, A. D. 1883.

[SEAL.]

M. L. JOSLYN,
Acting Secretary of the Interior.

Countersigned:

BENJ. BUTTERWORTH,
Commissioner of Patents.