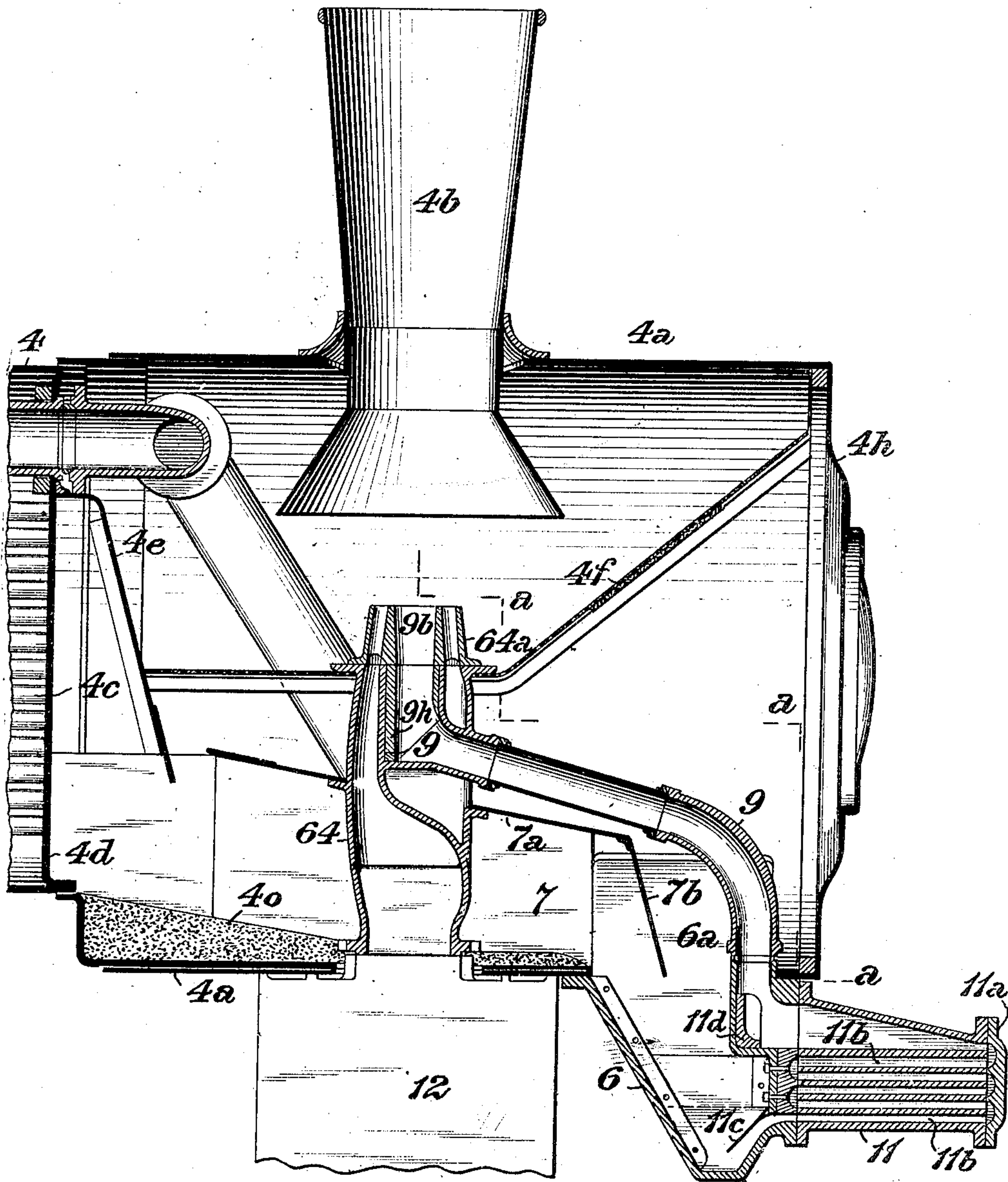


W. DALTON.  
SPARK ARRESTING APPLIANCE FOR LIGNITE BURNING LOCOMOTIVES.  
APPLICATION FILED MAR. 29, 1909.

934.795.

Patented Sept. 21, 1909  
2 SHEETS—SHEET 1.

FIG. 1. | a



WITNESSES  
*James C. Herron.*  
*S. R. Bell.*

INVENTOR  
*Wm. Dalton*  
*by J. M. Allen*  
Att'y

W. DALTON.

SPARK ARRESTING APPLIANCE FOR LIGNITE BURNING LOCOMOTIVES.

APPLICATION FILED MAR. 29, 1909.

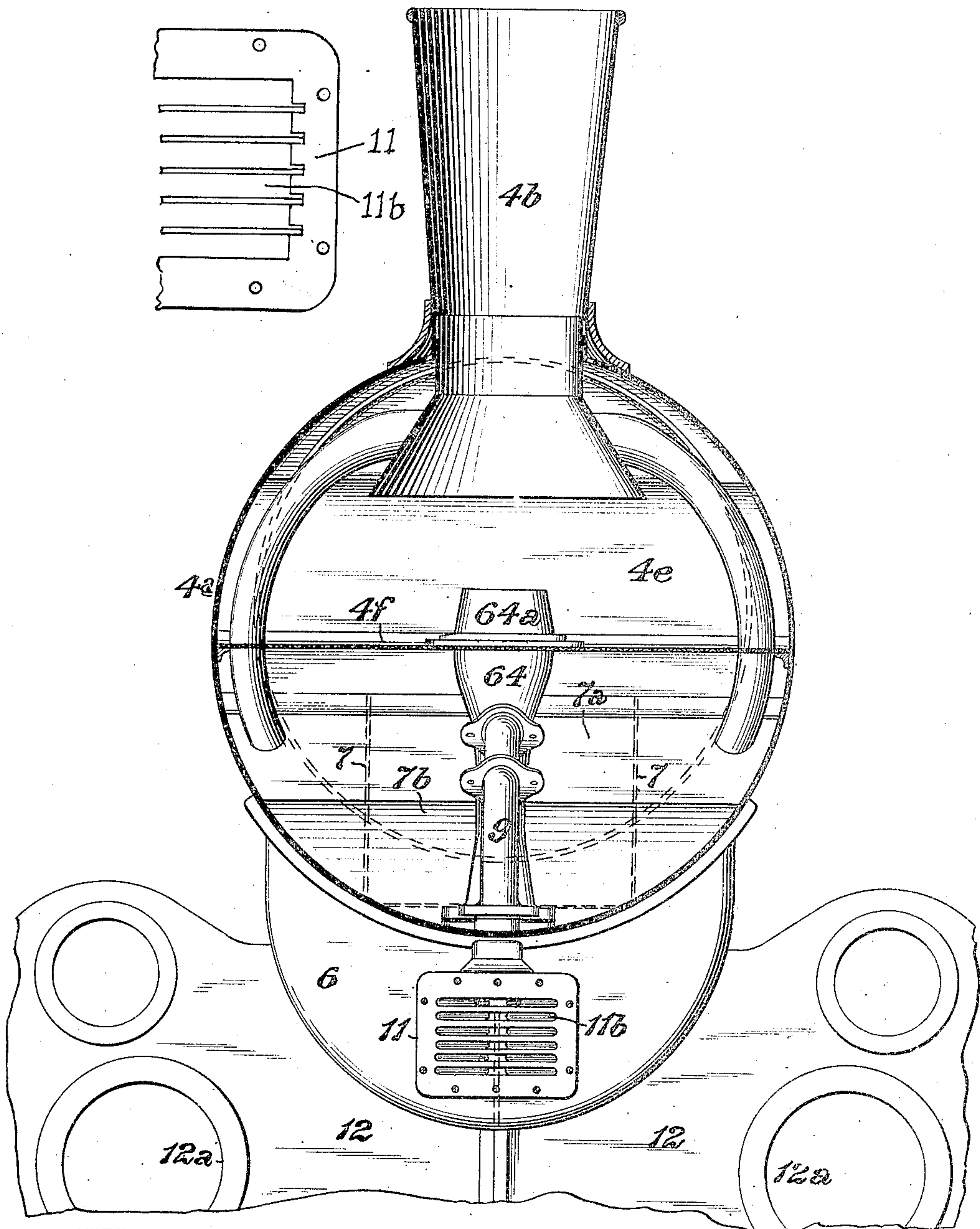
934,795.

Patented Sept. 21, 1909.

2 SHEETS—SHEET 2

FIG. 3.

FIG. 2.



WITNESSES

James C. Herron.  
S. R. Bell.

INVENTOR

Wm. Dalton,  
by J. H. Brownell, Att'y.



# UNITED STATES PATENT OFFICE.

WILLIAM DALTON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO AMERICAN LOCOMOTIVE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

SPARK-ARRESTING APPLIANCE FOR LIGNITE-BURNING LOCOMOTIVES.

924,795.

Specification of Letters Patent. Patented Sept. 21, 1909.

Application filed March 29, 1908. Serial No. 486,211.

*To all whom it may concern:*

Be it known that I, WILLIAM DALTON, of Schenectady, in the county of Schenectady and State of New York, have invented a certain new and useful Improvement in Spark-Arresting Appliances for Lignite-Burning Locomotives, of which improvement the following is a specification.

My present invention is of the same class or type, and has the same general object, as that set forth in the application of William P. Steele, John Player, and Carl J. Mellin, filed January 8, 1909, Ser. No. 471,262, and is, more particularly, designed to simplify and economize the structural features disclosed in said application, by dispensing with a specially formed cylinder saddle and a rearwardly extending cinder conduit or passage, and providing a radiator casing attached directly to the front of the cinder hopper, and containing a plurality of return bend channels separated by plates of material of such hardness as to more effectively withstand the abrasion of the cinders; a direct and readily renewable connection from such radiator casing to the exhaust pipe; and a renewable bushing in the exhaust pipe protecting the latter from wear by the impact of the cinders discharged through it.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a vertical central section through a locomotive smoke box and stack, illustrating an application of my invention; Fig. 2, a vertical transverse section through the same, on the line *aa* of Fig. 1; and, Fig. 3, a partial outer end view of the radiator casing, showing the application of removable plates.

My invention is herein exemplified as applied in connection with a locomotive boiler, 4, of the ordinary type, having a plurality of fire tubes, 4<sup>c</sup>, extending from a firebox at its rear end, which is not shown, to a smoke box, 4<sup>a</sup>, at its front end, which is provided with an open stack, 4<sup>b</sup>, and is fixed to cylinder saddles, 12; secured to the side frames of the locomotive and carrying the cylinders, 12<sup>a</sup>.

In the practice of my invention, an inclined deflecting plate or diaphragm, 4<sup>e</sup>, is located, as in ordinary practice, forward of the front flue sheet, 4<sup>d</sup>, and projects downwardly and forwardly from a level above the top row of tubes, across the smoke box,

4<sup>a</sup>. An exhaust pipe, 64, of any suitable known form, is fixed to the cylinder saddles, 12, and communicates, in the usual manner, with the exhaust passages of the cylinders, 12<sup>a</sup>, which are formed therein, the exhaust pipe being provided, at its top, with an exhaust nozzle, 64<sup>a</sup>. A spark arrester, of any known and preferred construction, surrounds the exhaust pipe, the form selected for illustration, which is one well adapted to the requirements of practical service, consisting of a sheet of netting or perforated plate, 4<sup>f</sup>, which extends from the deflecting plate, 4<sup>e</sup>, to or near the front, 4<sup>b</sup>, of the smoke box, the netting or perforated plate being, as shown, upwardly inclined forward of the exhaust pipe. The bottom of the smoke box is protected by a lining of refractory material, 4<sup>o</sup>.

The smoke box is extended for a short distance in advance of the cylinder saddles, 12, and an open topped cinder hopper, 6, which forms a receptacle for the sparks and cinders that are downwardly deflected by the deflecting plate, 4<sup>e</sup>, is connected to the bottom of the smoke box, in front of the cylinder saddles and around an opening, 6<sup>a</sup>, formed transversely in the bottom of the smoke box and of a length equal to about one-half the diameter thereof, or such as may be sufficient to provide an ample area for the delivery of cinders into the hopper, 6. Vertical dividing plates, 7, are fixed to the bottom of the smoke box, on each side of the exhaust pipe, said plates extending from a plane a short distance in rear of the exhaust pipe to or near the cinder delivery opening, 6<sup>a</sup>, the function of said plates being to separate or keep apart the currents of cinders which strike the curved sides of the smoke box on opposite sides of the exhaust nozzle, and which would otherwise be deflected from each side toward the central plane thereof, and would there form whirling currents which would tend to lift and carry them directly to the spark arrester. An upper partition plate, 7<sup>a</sup>, extends across the smoke box above the dividing plates, 7, the spaces below said partition plate and between it and the refractory lining, 4<sup>o</sup>, forming channels through which the cinders which are thrown downwardly toward the refractory lining, and separated from the gases by their velocity in their discharge from the boiler tubes, pass toward the cinder



delivery opening, 6<sup>a</sup>, into which and into the subjacent cinder hopper, 6, they are diverted by an inclined cinder hopper deflector, 7<sup>b</sup>, extending across the smoke box above the cinder delivery opening.

The cinders which are deposited in the cinder hopper, 6, are discharged therefrom by the suction induced by the exhaust blast, by which they are drawn into and through a cinder cooling conduit and ejected therefrom through the exhaust nozzle, 64<sup>a</sup>. In lieu of using, as a cinder conduit, a pipe of considerable length, extending first rearwardly from the cinder hopper and thereafter forwardly to the exhaust pipe and nozzle, as in the application Ser. No. 471,262 aforesaid, I provide said conduit in the form of a plurality of return bend, or alternately reversely extending, passages or channels, 11<sup>b</sup>, which communicate at alternately opposite ends, so as to form a continuous conduit. Said passages are preferably of rectangular section, and are formed in a radiator casing, 11, which is secured detachably to the cinder hopper, 6, over an opening in the vertical front wall thereof. The radiator casing, 11, is a box or chest of cast or wrought metal, of substantially rectangular transverse section, and having openings in its ends, the rear opening registering with a corresponding opening in the front of the cinder hopper, and the front opening being closed by a removable cap or cover, 11<sup>a</sup>. The bottom of the radiator casing is located a short distance above that of the cinder hopper, and a deflecting plate, 11<sup>c</sup>, projects downwardly and rearwardly from the top of the lowest of the channels, 11<sup>b</sup>, so as to cause the current of cinders to be drawn below said channel and reversed in direction before entering it.

The plates or partitions between the alternately forwardly and rearwardly extending channels, 11<sup>b</sup>, are, for convenience and simplicity of illustration, indicated in Figs. 1 and 2 as being formed integral with the body of the casing, but they may, as shown in Fig. 3, be made separate therefrom, either individually or in one or more sets or sections, so as to be renewable when sufficiently worn by the abrading action of the cinders to render renewal necessary or advisable. To more effectually resist this abrading action, the plates or partitions, as well as the body of the radiator casing, may, with advantage, be made of special material possessing a high degree of hardness, as, for example, chilled cast iron or manganese steel.

Among the advantages of the formation of the cinder cooling conduit in a register casing, as above described, may be enumerated economy and compactness in the construction of the apparatus; the avoidance of an additional passage in a cylinder saddle or saddles; facility of renewal of worn or

damaged parts; more effective action in the disintegration of the cinders by the presentation of a greater number of sharp turns in the repeated reversals of their direction of traverse through the plurality of channels; and the location of the conduit in position where it is exposed to the fullest extent to the cooling action of the air when the locomotive is running.

The space within the radiator casing above the uppermost of the return bend channels, 11<sup>b</sup>, therein, which constitutes the avenue for the discharge of cinders from the casing, is connected by pipes, 9, passing through the cinder hopper, 6, the cinder delivery opening, 6<sup>a</sup>, and the smoke box, with a discharge nozzle, 9<sup>b</sup>, located within, and preferably concentric with, the exhaust nozzle, 64<sup>a</sup>. The pipes, 9, are made in separate and connected sections, so as to be readily renewable when required, and to protect the discharge section from the abrading action of the cinders, a removable bushing, 9<sup>a</sup>, is fitted in the said section, at and above the junction of the inclined portions of the pipe, 9, therein. To the same end, a removable protecting facing, 11<sup>a</sup>, may be located at the angle of the lowest of the pipe sections, 9, with the discharge passage from the radiator casing.

It will be seen that by reason of the relative location and co-action of the nozzles, 9<sup>b</sup> and 64<sup>a</sup>, the cinder hopper, 6, the radiator casing, 11, and the connecting pipes, 9, the suction of the exhaust blast will draw the cinders from the hopper, 6, through the channels, 11<sup>b</sup>, of the radiator casing, and thence through the pipes, 9, and eject them, mingled with the exhaust steam, through the stack, 4<sup>b</sup>. In and by their traverse through the channels of the radiator casing, the aggregate length of which is considerable, and their admixture with the exhaust steam, the cinders will be disintegrated, reduced in temperature, and extinguished when they are discharged from the stack, and, consequently, risk of fire damage to property adjoining the right of way, which has heretofore always obtained to a substantial extent will be eliminated.

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

1. The combination, with a locomotive boiler, of means for separating the solid and gaseous products of combustion escaping from the boiler tubes, a cooling conduit composed of a plurality of communicating alternately reversely extending channels or passages located in advance of the forward support of the boiler, said conduit being open at one end to the smoke box of the boiler, a discharge nozzle in the smoke box in which said conduit terminates, and a cylinder exhaust pipe inclosing said discharge nozzle.

2. The combination, with a locomotive boiler, of means for separating the solid and



gaseous products of combustion escaping from the boiler tubes, a receptacle for the separated solid products, a cooling conduit composed of a plurality of communicating alternately reversely extending channels or passages located in advance of said receptacle, said conduit being open at one end to said receptacle, a discharge nozzle in the smoke box of the boiler in which said conduit terminates, and a cylinder exhaust pipe inclosing said discharge nozzle.

3. The combination, with a locomotive boiler, of means for separating the solid and gaseous products of combustion escaping from the boiler tubes, a receptacle for the separated solid products, a casing connected to, and projecting forwardly from, said receptacle and inclosing a cooling conduit composed of a plurality of communicating alternately reversely extending channels or passages separated by plates or partitions, said conduit being open at one end to said receptacle, a discharge nozzle in the smoke box of the boiler in which said conduit terminates, and a cylinder exhaust pipe inclosing said discharge nozzle.

4. The combination, with a locomotive boiler, of means for separating the solid and gaseous products of combustion escaping from the boiler tubes, a receptacle for the separated solid products, a casing connected to, and projecting forwardly from, said receptacle, a plurality of plates or partitions in said casing, forming communicating alternately reversely extending channels or passages which constitute a cooling conduit, one end of which communicates with the receptacle, a discharge nozzle in the smoke box of the boiler, connected pipe sections leading from the other end of the conduit to said discharge nozzle, and a cylinder exhaust pipe inclosing said discharge nozzle.

5. The combination, with a locomotive boiler, of means for separating the solid and gaseous products of combustion escaping from the boiler tubes, a receptacle for the separated solid products, a casing connected to, and projecting forwardly from, said receptacle and inclosing a cooling conduit composed of a plurality of communicating alternately reversely extending channels or passages, said conduit being open at one end to said receptacle, a discharge nozzle in the smoke box of the boiler in which said conduit terminates, a deflecting plate extending downwardly and rearwardly in the receptacle above the opening of the conduit thereto, and a cylinder exhaust pipe inclosing the discharge nozzle of the conduit.

6. The combination, with a locomotive boiler, of means for separating the solid and gaseous products of combustion escaping from the boiler tubes, a receptacle for the separated solid product, a casing connected to, and projecting forwardly from, said re-

ceptacle, a plurality of plates or partitions in said casing, forming communicating alternately reversely extending channels or passages, one end of which communicates with the receptacle, a discharge nozzle in the smoke box of the boiler, connected pipe sections leading from the other end of the cooling conduit to said discharge nozzle, a removable bushing located in one of said pipe sections at an angle thereof, and a cylinder exhaust pipe inclosing the discharge nozzle.

7. In an apparatus of the character described, a cooling conduit casing having a rear opening adapted to register with an opening in a cinder receptacle, a closed front end, an opening communicating with a discharge to a smoke stack, and a plurality of interposed plates or partitions which separate communicating alternately reversely extending channels or passages constituting a cooling conduit which communicates at one end with the cinder receptacle opening and at the other with the smoke stack discharge opening.

8. In an apparatus of the character described, a cooling conduit casing having a rear opening adapted to register with an opening in a cinder receptacle, a closed front end, an opening communicating with a discharge to a smoke stack, and a plurality of interposed plates or partitions of special material of a high degree of hardness, as chilled cast iron or manganese steel, said plates separating alternately reversely extending channels or passages constituting a cooling conduit which communicates at one end with the cinder receptacle opening and at the other with the smoke stack discharge opening.

9. In an apparatus of the character described, a cooling conduit casing having a rear opening adapted to register with an opening in a cinder receptacle, a closed front end, an opening communicating with a discharge to a smoke stack, and a plurality of interposed plates which are removable for purposes of renewal and which separate communicating alternately reversely extending channels or passages constituting a cooling conduit which communicates at one end with the cinder receptacle opening and at the other with the smoke stack discharge opening.

10. In an apparatus of the character described, the combination of a locomotive boiler smoke box, a lower cinder receptacle communicating therewith, and a casing connected to and communicating with, said receptacle and inclosing a cinder cooling conduit composed of a plurality of alternately reversely extending channels or passages communicating at one end with a discharge to the stack of the smoke box and at the other with the cinder receptacle.

11. In an apparatus of the character de-



scribed, the combination of a cinder receptacle, a casing connected thereto and inclosing a plurality of communicating alternately reversely extending channels or passages, forming a cooling conduit which communicates at one end with the cinder receptacle, a discharge nozzle in the smoke box of a locomotive boiler, connected pipe sections

leading from the other end of the cooling conduit to said discharge nozzle, and a cylinder exhaust pipe inclosing said discharge nozzle. 10

WILLIAM DALTON.

Witnesses:

M. A. GILMORE,

W. F. DRYSDALE.