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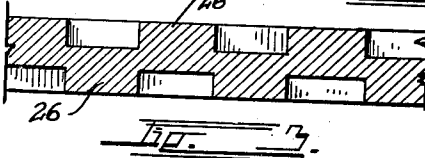
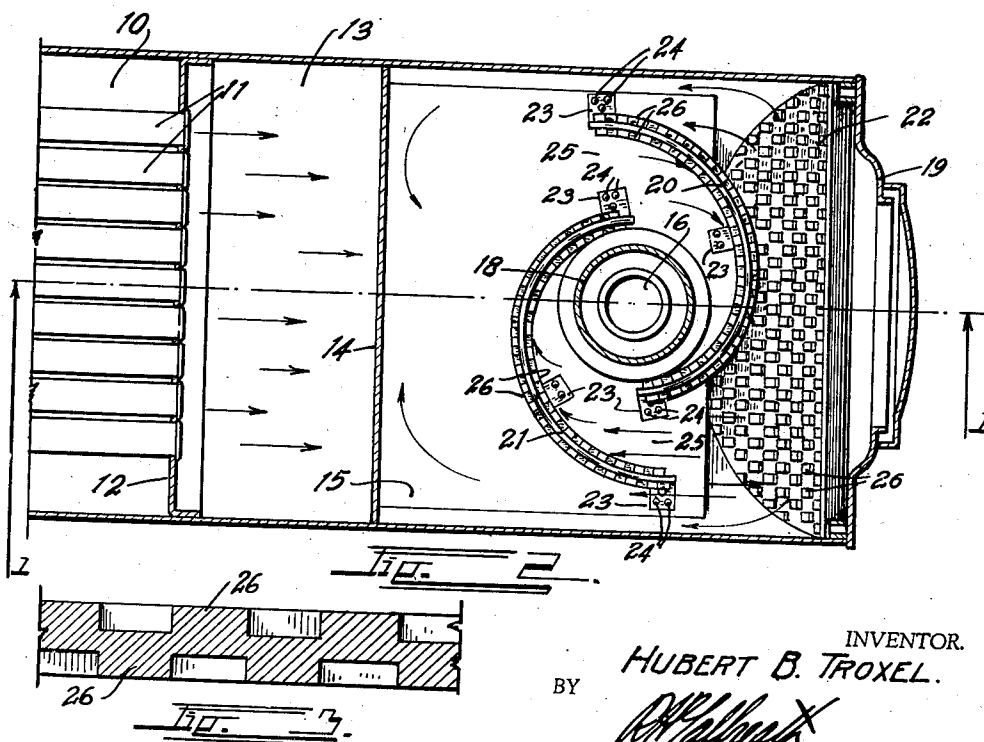
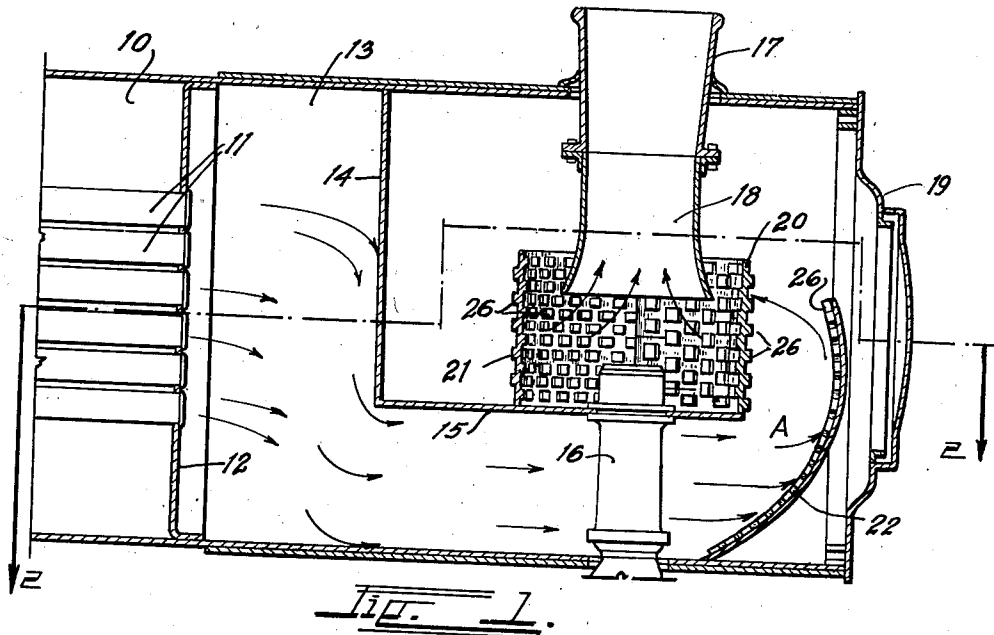
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2,259,360

CINDER BREAKER FOR LOCOMOTIVE BOILERS

Filed Aug. 12, 1940

2 Sheets-Sheet 1



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CINDER BREAKER FOR LOCOMOTIVE BOILERS

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2 Sheets-Sheet 2

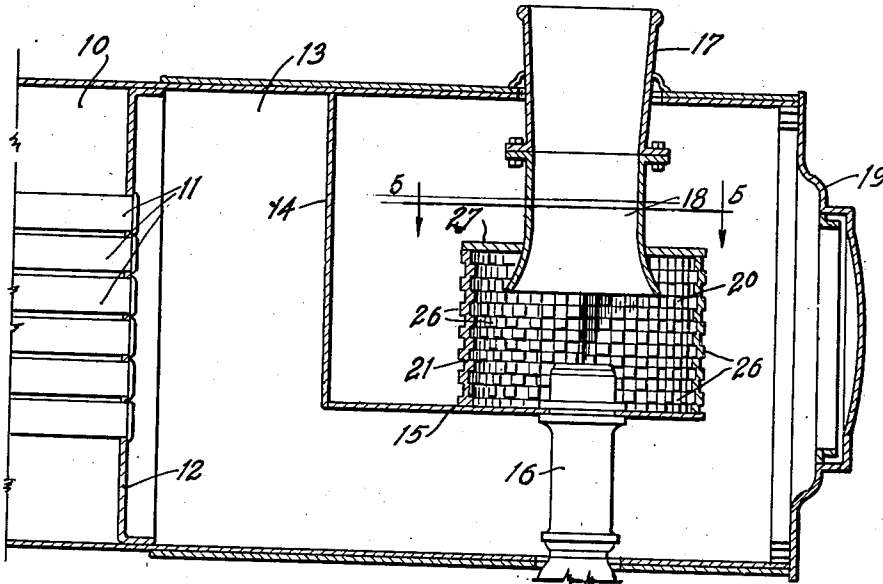


Fig. 4.

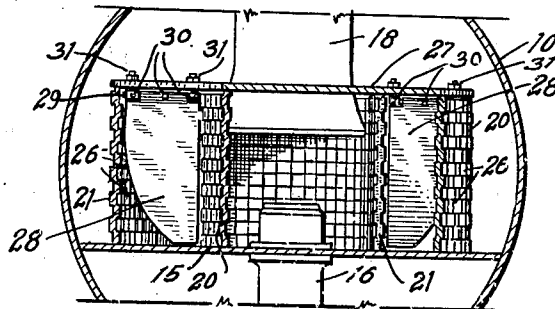
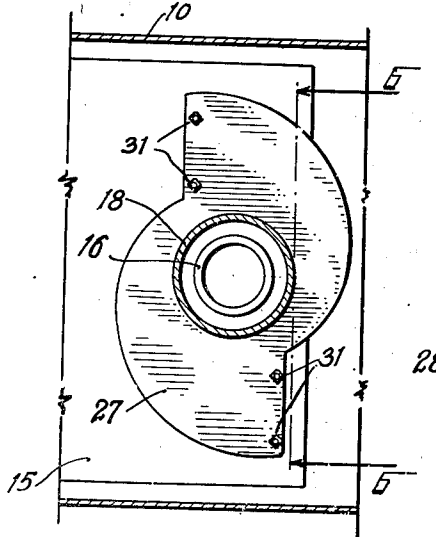


Fig. 6.

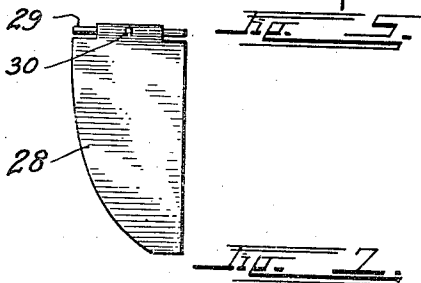


Fig. 7.

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UNITED STATES PATENT OFFICE

2,259,360

CINDER BREAKER FOR LOCOMOTIVE BOILERS

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Application August 12, 1940, Serial No. 352,323

12 Claims. (Cl. 230—97)

This invention relates to a cinder breaker for locomotive boilers.

The principal object of the invention is to provide a device which will reduce all cinders and coal particles to an impalpable powder so that they will float away with the discharging smoke without danger of igniting fires or causing other damage to passengers and equipment.

Another object of the invention is to provide an efficient cinder breaker which will not interfere in any way with the normal draft of a locomotive boiler.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

Fig. 1 is a vertical, longitudinal section through the smokebox or "front end" of a typical locomotive boiler, taken on the line 1—1, Fig. 2.

Fig. 2 is a horizontal section, taken on the line 2—2, Fig. 1.

Fig. 3 is an enlarged detail section illustrating the type of plate used in the improved cinder breaker.

Fig. 4 is a view similar to Fig. 1, illustrating an alternate method of installing the invention.

Fig. 5 is a cross section through the alternate form, taken on the line 5—5, Fig. 4.

Fig. 6 is a detail plan view of the top plate used in the alternate form.

Fig. 7 is a detail view of the adjustable damper plate employed in the invention.

Typical parts of a locomotive boiler have been designated by numerals on the drawings as follows: boiler 10, flues 11, flue sheet 12, smokebox 13, diaphragm 14, table plate 15, exhaust pipe 16, stack 17, petticoat 18, and front 19.

The improved cinder breaker consists of three parts, to wit: two vertical spiral plates 20 and 21 and a deflector plate 22. The plates 20 and 21 are similar and each consists of a curved vertical plate. The plates 20 and 21 are placed on the table plate 15 on opposite sides of the exhaust pipe 16, as shown in Fig. 2. The plates are rolled on a substantially involute curve extending from a large radius at the extremity away from the exhaust pipe 16 to a relatively short radius adjacent the pipe 16. In actual practice, 55

these two radii are twenty-five inches and fifteen inches, respectively, in the average boiler but will vary of course depending upon the type and size of boiler.

Each plate is provided with means for securing it to the table plate 15. As illustrated, they are formed with angle feet 23 which may be welded to the table plate or attached thereto by means of suitable screws 24. The plates are so positioned that their convex faces face forwardly and backwardly in the smokebox 13 and are positioned in overlapping relation to form smoke passages 25 at the opposite sides of the exhaust pipe 16. The combustion gases can enter through these passages. The gases entering through the passages 25 cause a whirling vortex effect above the pipe 16 and at the entrance to the petticoat 18.

A deflector plate 22 is positioned immediately inside of the front 19 and extends from a position at the floor of the smokebox forwardly and upwardly ahead of the foremost plate 20. Its upper extremity is preferably curved rearwardly as illustrated.

It can be readily seen that cinders drawn from the flues 11 will first strike the smokebox diaphragm 14, which naturally will have some breaking effect, they will then strike the deflector plate 22 where they will be subjected to additional breaking action and during their travel across the plate 22 will be subjected to abrasion. From thence, they are thrown into the upper chamber of the smokebox and against the outer faces of the curved plates 20 and 21 which serve to still further break up the cinders and coal particles. From thence, they are drawn into the violently whirling gases within the enclosure of the plates 20 and 21 where they are subjected to a final beating and breaking against the inner faces of the plates before they discharge in a whirling stream from the stack 17.

To still further increase the number of impacts and abrasions all plates are formed with square, projecting bosses 26 on their surfaces as shown in Fig. 3. These bosses are aligned in staggered relation so that there are no continuously free passages for flow along the surfaces. The cinders being carried therealong are constantly impinged against the flat sides of the multitudinous bosses so that they are subjected to an infinite number of impacts during their passage through the smokebox.

It is desired to call attention to the fact that no screens are employed to interfere with the free gas flow and yet actual tests of the inven-

tion have failed to locate a single unbroken cinder or coal particle in the stack gases.

The gas passages 25, and the passage between the table plate 15 and the deflector plate 22, indicated at A, Fig. 1, all have a cross sectional area far in excess of the stack area so that there is no restriction to gas flow or draft at any point.

The plates 20 and 21 are preferably formed with the bosses 26 on both faces whereas the plate 22 need have the bosses 26 only on its upper rearward face.

In actual use, plates with bosses one inch square spaced one inch from each other and $\frac{3}{8}$ of an inch high have been found to be highly satisfactory.

In some installations it has been found desirable to employ a top plate 27 extending between the plates 20 and 21 and sealing the top thereof. The plate contains a medial opening for the passage of the inner stack or petticoat 18.

Such a plate forces all of the gases, cinders, and burning embers to pass through the two opposite passages 25 between the two spiral plates. The amount of flow through these passages can be adjusted and pre-set by means of adjustable damper plates 28.

The damper plates 28 are preferably suspended from upper cross rods 29 and can be set in any desired position thereon by means of suitable set screws 30. By adjustment of the two plates 28, the inflow to the vortex can be balanced to obtain maximum results for each particular installation.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. In combination with a locomotive smoke box and its associated table plate, exhaust pipe, and smoke stack, a pair of vertically straight, horizontally curved plates secured to said table plate on opposite sides of said pipe, each of said plates having its concave face facing said pipe, said plates being positioned in offset relation to each other and each extending from a position adjacent one side of said pipe to a position diametrically opposite, spaced from said pipe and adjacent the opposite side of said smokebox.

2. In combination with a locomotive smoke box and its associated table plate, exhaust pipe, and smoke stack, a pair of horizontally elongated plates each being curved on a substantially involute curve along its major length, said plates being secured to said table plate on opposite sides of said pipe in offset relation with their minimum radii adjacent said pipe and their maximum radii adjacent the sides of said smokebox.

3. In combination with a locomotive smoke box and its associated table plate, exhaust pipe, and smoke stack, a pair of horizontally elongated plates each being curved on a substantially involute curve along its major length, said plates being secured to said table plate on opposite sides of said pipe in offset relation with their minimum radii adjacent said pipe and their maximum radii adjacent the sides of said smokebox, the major lengths of said plates extending transversely of the longitudinal axis of said smokebox.

4. In combination with a locomotive smoke box and its associated table plate, exhaust pipe, and smoke stack, a pair of vertically straight, horizontally curved plates secured to said table plate on opposite sides of said pipe, each of said plates having its concave face facing said pipe and being positioned in offset relation to each other; and projecting bosses on the faces of said plates.

5. In combination with a locomotive smoke box and its associated table plate, exhaust pipe, and smoke stack, a pair of vertically straight, horizontally curved plates secured to said table plate on opposite sides of said pipe, each of said plates having its concave face facing said pipe and being positioned in offset relation to each other; and projecting bosses on the faces of said plates, said bosses being rectangular in outline and positioned in staggered relation on said plates.

6. In combination with a locomotive smoke box and its associated table plate, exhaust pipe, and smoke stack, a pair of vertically straight, horizontally curved plates secured to said table plate on opposite sides of said pipe, each of said plates having its concave face facing said pipe, and being positioned in offset relation to each other; and a third deflector plate extending from a position below said first plates and upwardly to a position ahead thereof to direct material rearwardly against the first plates, all of said plates having rectangular bosses on their faces.

7. In combination with a locomotive smoke box and its associated table plate, exhaust pipe and smoke stack, a first horizontally curved, vertically positioned deflector plate extending from a position closely adjacent one side of said exhaust pipe forwardly and around the front thereof to a diametrically opposite position closely adjacent the wall of said smoke box on the opposite side of said stack; a second similar deflector plate extending from a position closely adjacent the latter side of said stack rearwardly and around the back thereof to a diametrically opposite position closely adjacent the wall of the smoke box on the first said side of said stack; and means for fixedly securing said deflector plates on said table plate.

8. In combination with a locomotive smoke box and its associated table plate, exhaust pipe and smoke stack, a first horizontally curved, vertically positioned deflector plate extending from a position closely adjacent one side of said exhaust pipe forwardly and around the front thereof to a diametrically opposite position closely adjacent the wall of said smoke box on the opposite side of said stack, a second similar deflector plate extending from a position closely adjacent the latter side of said stack rearwardly and around the back thereof to a diametrically opposite position closely adjacent the wall of the smoke box on the first said side of said stack, and means for fixedly securing said deflector plates on said table plate, said deflector plates extending vertically from said table plate to a plane above the lower extremity of said stack.

9. In combination with a locomotive smoke box and its associated table plate, exhaust pipe and smoke stack, a first horizontally curved, vertically positioned deflector plate extending from a position closely adjacent one side of said exhaust pipe forwardly and around the front thereof to a diametrically opposite position closely adjacent the wall of said smoke box on the opposite side of said stack, a second similar deflector plate extending from a position closely adjacent the latter side of said stack rearwardly and around the back thereof to a diametrically opposite position closely adjacent the wall of the smoke box on the first said side of said stack, and means for fixedly securing said deflector plates on said table plate, said deflector plates extending vertically from said table plate to a plane above the lower extremity of said stack.

5 jacent the latter side of said stack rearwardly and around the back thereof to a diametrically opposite position closely adjacent the wall of the smoke box on the first said side of said stack, and means for fixedly securing said deflector plates on said table plate, said deflector plates extending vertically from said table plate to a plane above the lower extremity of said stack, the faces of the deflector plates which are directed toward the stack being covered with projecting bosses for cinder breaking purposes.

10 10. In combination with a locomotive smoke box and its associated table plate, exhaust pipe and smoke stack, a first horizontally curved, vertically positioned deflector plate extending from a position closely adjacent one side of said exhaust pipe forwardly and around the front thereof to a diametrically opposite position closely adjacent the wall of said smoke box on the opposite side of said stack, a second similar deflector plate extending from a position closely adjacent the latter side of stack rearwardly and around the back thereof to a diametrically opposite position closely adjacent the wall of the smoke box on the first said side of said stack, and means for fixedly securing said deflector plates on said table plate, said deflector plates extending vertically from said table plate to a plane above the lower extremity of said stack, both faces of both deflector plates being provided with projecting bosses for cinder breaking purposes.

15 11. In combination with a locomotive smoke box and its associated table plate, exhaust pipe and smoke stack, a first horizontally curved, vertically positioned deflector plate extending

from a position closely adjacent one side of said exhaust pipe forwardly and around the front thereof to a diametrically opposite position closely adjacent the wall of said smoke box on the opposite side of said stack; a second similar deflector plate extending from a position closely adjacent the latter side of said stack rearwardly and around the back thereof to a diametrically opposite position closely adjacent the wall of the smoke box on the first said side of said stack, means for fixedly securing said deflector plates on said table plate, and a horizontal top plate through which said stack passes, said top plate being secured over the upper edges of said deflector plates.

20 12. In combination with a locomotive smoke box and its associated table plate, exhaust pipe and smoke stack, a first horizontally curved, a vertically positioned deflector plate extending from a position closely adjacent one side of said exhaust pipe forwardly and around the front thereof to a diametrically opposite position closely adjacent the wall of said smoke box on the opposite side of said stack, a second similar deflector plate extending from a position closely adjacent the latter side of said stack rearwardly and around the back thereof to a diametrically opposite position closely adjacent the wall of the smoke box on the first said side of said stack; means for fixedly securing said deflector plates on said table plate, and pivoted damper plates positioned between the adjacent extremities of the two plates at each side of said exhaust pipe to regulate the flow of gas passing between the plates.

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