Nov. 11, 1952 E. C. ADDISON 2,617,690

ASH HANDLING APPARATUS

Filed March 9, 1950 3 Sheets-Sheet 1

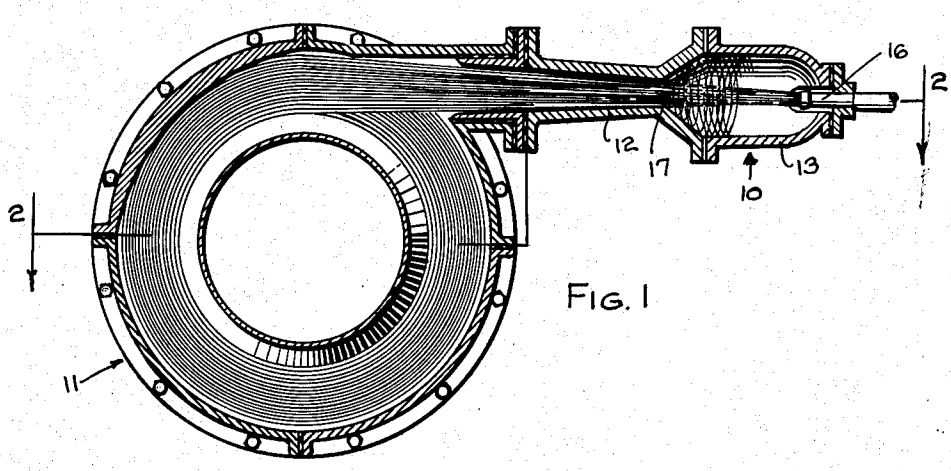


FIG. 1

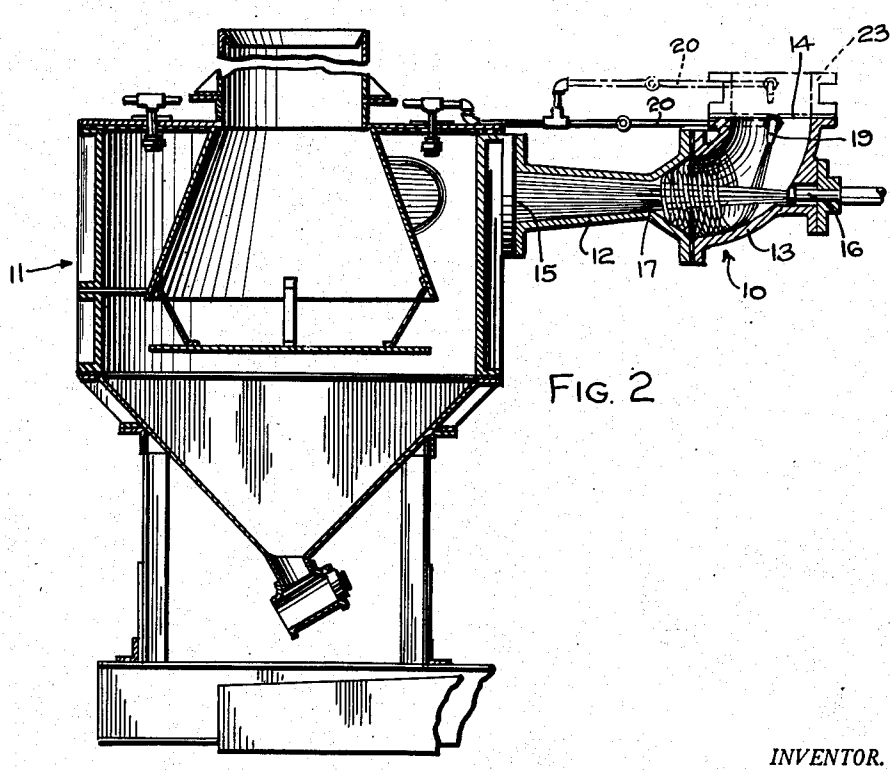


FIG. 2

INVENTOR.
EDWARD C. ADDISON
BY Leon Edelson,
ATTORNEY.

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ASH HANDLING APPARATUS

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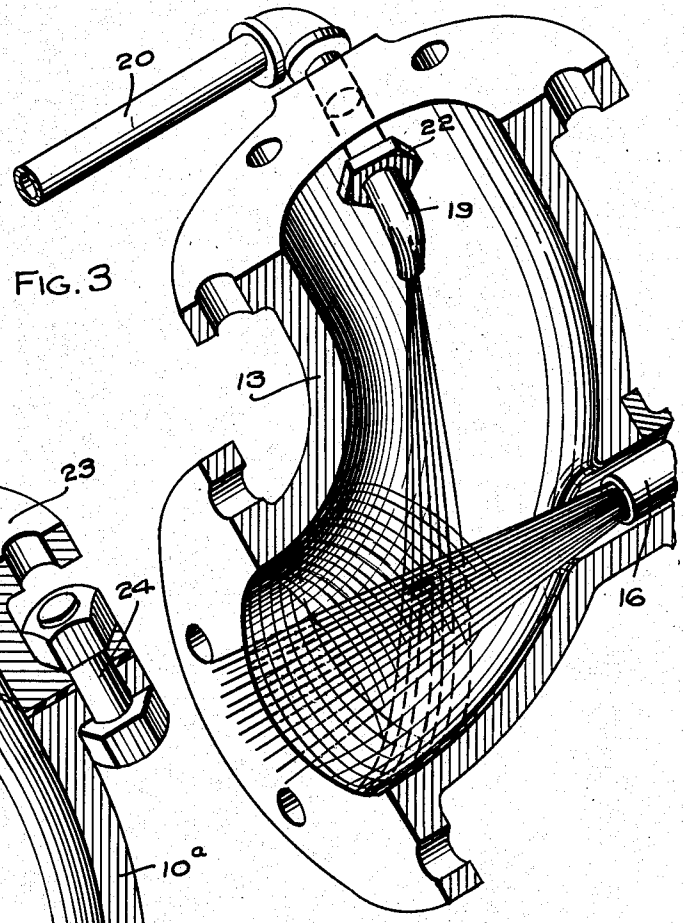


FIG. 3

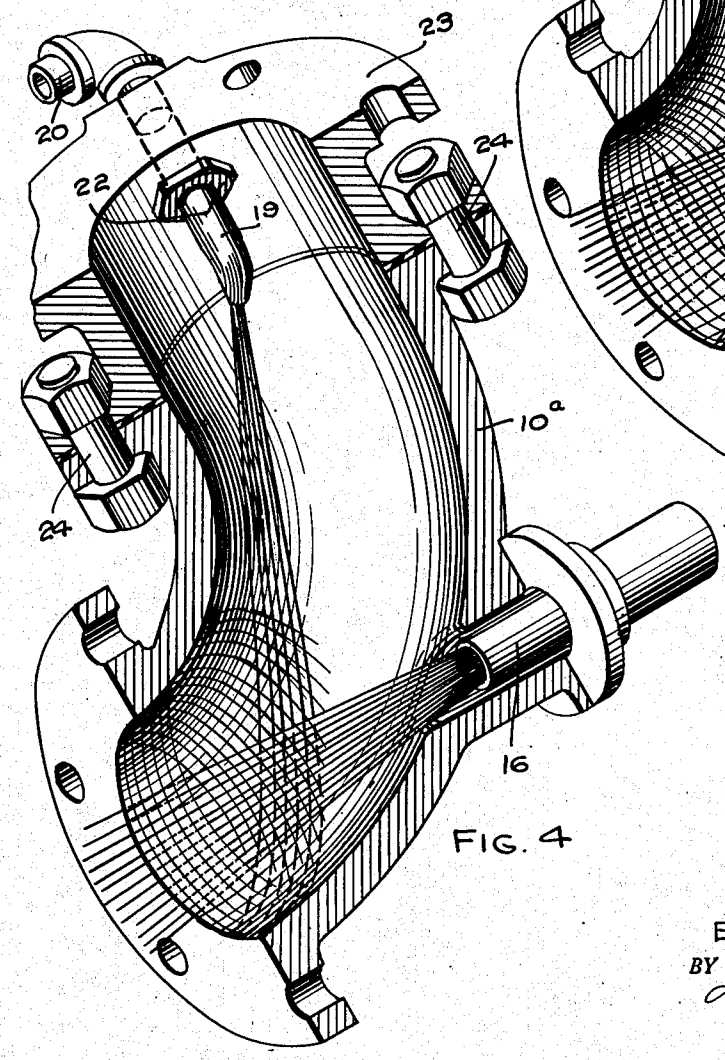


FIG. 4

INVENTOR.
EDWARD C. ADDISON
BY Leon Edelson
ATTORNEY

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ASH HANDLING APPARATUS

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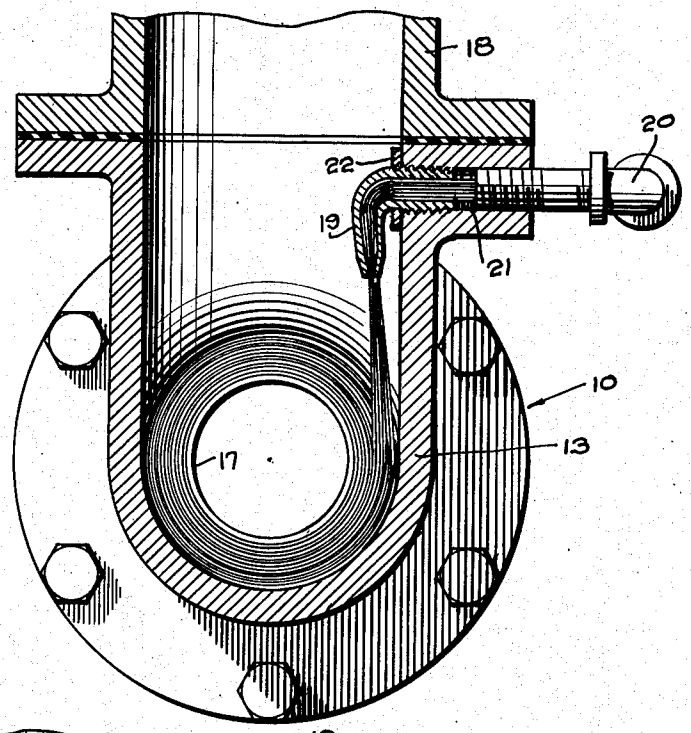


FIG. 5

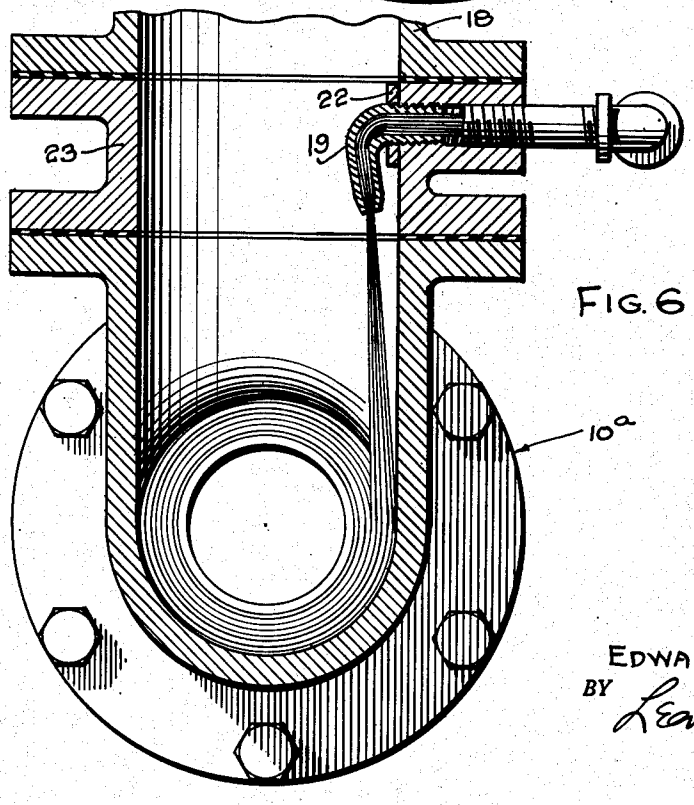


FIG. 6

INVENTOR.
EDWARD C. ADDISON
BY Edward C. Addison
ATTORNEY

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UNITED STATES PATENT OFFICE

2,617,690

ASH HANDLING APPARATUS

Edward C. Addison, Westville, N. J., assignor to Beaumont Birch Company, Philadelphia, Pa., a corporation of Pennsylvania

Application March 9, 1950, Serial No. 148,563

9 Claims. (Cl. 302—25)

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This invention relates to ash handling apparatus and more particularly to certain improvements in the design and construction of steam exhausters which utilize the kinetic energy of steam to create a vacuum in a conduit system for the movement of ashes therethrough.

A serious problem encountered in the pneumatic handling of certain ashes having a high percentage of clay content, such as lignite ash, is that such ash quickly forms as a brick-like deposit upon the internal wall surfaces of the steam exhauster, particularly in the immediate region of the Venturi throat of the exhauster, with the result that the throat opening is materially reduced in its effective diameter, if not entirely closed, thereby not only seriously impairing the vacuum pull through the ash conveying conduit system, but also decreasing the volume of ash-laden air which may be handled by the system.

This brick-like deposit of the clay content of the ash is undoubtedly formed by the heat of the vacuum-inducing jet of steam projected to and through the Venturi throat of the steam exhauster. Prior to the present invention the only practical solution of the problem has been to periodically dismantle the exhauster and then chip away the clogging deposit of clay from internal walls thereof. However, this has been quite unsatisfactory not only because of the time, labor and expense involved in so periodically removing the clay deposit but also because it necessitated shut down of the ash handling system for the periods required either to replace the clogged steam exhauster or free it of its clay deposit.

Having in mind the foregoing, the present invention provides a means for and method of maintaining the steam exhausters of pneumatic ash handling system completely free of any internal accumulation of clay or other such clogging deposits during the entire period of operation of the exhauster.

More specifically, it is an object of the present invention to inject a stream or spray of cooling water into the exhauster in such manner as to constantly wet the internal walls of the exhauster, particularly in the region thereof immediately adjoining the Venturi throat, the arrangement being such that the water so embraces or encircles the suction-inducing jet of steam as to insure constant wetting of the internal walls of the exhauster without at the same time impairing the effectiveness of the steam jet for creation of the required vacuum in the ash conveying conduit system.

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Still another object of the present invention is to provide an arrangement for wetting the internal walls of a steam exhauster which is effective to prevent the formation in the exhauster of brick-like deposits of the clay content of ash; which is simple and inexpensive to incorporate in the steam exhauster proper or in an adapter therefor; which wets the ash particles as they traverse the steam exhauster and so weights the ash particles as to cause them to readily discharge by gravity flow into an ash collector operatively associated with the exhauster, the water injected into the exhauster thus serving to supplement that of the air washer conventionally employed in pneumatic ash handling systems and in certain cases eliminating completely the need for such air washers; and which provides a water envelop for the suction-inducing steam jet which supplements the latter to improve the suction seal at the Venturi throat.

Other objects and advantages of the invention will appear more fully hereinafter, it being understood that the present invention consists substantially in the combination, construction, location and relative arrangement of parts, all as appears more fully from the detailed description which follows, as shown in the accompanying drawings and as finally pointed out in the appended claims.

In the accompanying drawings, which are illustrative of certain preferred embodiments of the present invention,

Figure 1 is a horizontal sectional view of the ash collecting part of a pneumatic ash handling system including the steam exhauster constructed in accordance with the principles of the present invention;

Figure 2 is a vertical sectional view of the apparatus as taken on the line 2—2 of Figure 1;

Figure 3 is a perspective view, partially in section, of the steam exhauster of the present invention;

Figure 4 is a perspective view, also partially in section, showing the steam exhauster fitted with an adapter for operation of the exhauster in accordance with the present invention.

Figure 5 is a vertical section of the steam exhauster as shown in Figure 3; and

Figure 6 is a vertical sectional view of the adapter-fitted exhauster as shown in Figure 4.

Referring now to the drawings and more particularly to Figures 1 and 2 thereof, it will be observed that the present invention is shown incorporated in the steam exhauster unit 10 which is normally included in the ash conveying conduit of a pneumatic ash handling system, the steam

exhauster being operative in a manner well known in the art to produce a suction pull in the conduit for transfer therethrough of the ash from its point of accumulation to a receiver and separator wherein the ash is separated from the air in which it was entrained. Figures 1 and 2 show a form of air-receiver and separator unit, designated generally by the reference numeral 11, of the type having incorporated therein means for washing the air as it is freed of its entrained ash, it being observed that the steam exhauster is so operatively associated with the unit 11 as to discharge ash-laden air into said unit.

It will be noted that the steam exhauster 10 is preferably of the type having a Venturi section 12 and a 90° elbow section 13 which are suitably secured together to provide an inlet 14 for the ash-laden air at one end of the exhauster and a discharge opening 15 at its opposite end, the discharge opening being disposed at right angles to the inlet 14. Fitted in the outer wall of the elbow section 13 is a steam nozzle 16 through which is projected from a suitable source of supply a high velocity jet of steam, the axis of this steam jet being in such alinement with the throat 17 of the Venturi section as to produce a suction in the steam exhauster 10 sufficient to draw the ash-laden air through the conduit system 18 (see Figure 5) into and through the steam exhauster for final discharge into the receiver and separator unit 11.

In one form of the present invention, as illustrated in Figures 1, 2, 3 and 5, the steam exhauster 10 is itself fitted with a water nozzle 19 of such design and location as to direct a jet of water more or less tangentially against the inner wall of the steam exhauster in the region immediately in advance of the Venturi throat 17. The water is supplied to the nozzle 19 by a pipe 20 connected to any suitable supply thereof under pressure, the pressure of the water being sufficient to insure its projection from the nozzle 19 in the form of a high velocity jet which whirls about the internal wall surface of the steam exhauster, as illustrated, to constantly wet such surfaces. As is most clearly shown in Figure 5, the water nozzle 19 is suitably threaded, as at 20, into the inner end of a laterally extending bore 21 formed in one side of the steam exhauster at a point immediately adjacent its intake opening 14, the nozzle 19 being thereby adjustable angularly relatively to the axis of the bore 21 so as to insure projection of the water jet in the desired direction against the internal wall of the steam exhauster.

As shown in Figure 3, it is preferable to so direct the water jet that it initially impinges against the circular wall of the steam exhauster at a point spaced substantially in advance of the Venturi throat 17, the jet being further so directed as to tangentially impinge against the circular inner wall of the steam exhauster to produce therein a whirling tube of water in more or less surrounding relation to the suction-inducing steam jet. Preferably, a locking nut 22 threaded upon the supporting stem of the nozzle 19 may be employed to secure the nozzle 19 in its proper angularly adjusted position.

It has been found in practice that with use of the steam exhauster having incorporated therein the auxiliary water nozzle 19, there is eliminated all tendency for the clay content of ash or dust passing through the steam exhauster to become caked or baked into the form of a hard liner internally of the steam exhauster. As was pointed out hereinbefore, in use of steam exhausters without having incorporated therein any water nozzle in accordance with the present invention for the handling of ash or dust having a substantial content of clay, it has been found that the clay very quickly builds up as a hard, solid mass within the interior of the steam exhauster, particularly in the region immediately adjoining its Venturi throat, with the result that the effective area of the Venturi throat opening is reduced with consequent loss of suction through the ash-conveying system. By constantly maintaining a film of water upon the internal surface of the steam exhauster, especially in the region thereof immediately in advance of the Venturi throat, this tendency of the clay content of the ash or dust to solidify as a vitreous mass due to the heat of the steam passing through the steam exhauster is completely eliminated. In addition to this, it has been found that the introduction into the steam exhauster of a tubular stream of water which embraces the suction-inducing steam jet serves as a seal between the peripheral surface of the steam jet and the internal surface of the Venturi throat, thereby improving considerably the suction pull of the steam jet on the ash-laden air passing through the ash-conveying conduit in communication with the intake opening 14 of the steam exhauster.

A still further and important advantage of the present invention is that the water introduced into the steam exhauster by way of the nozzle 19 wets the ash and dust particles preliminarily to discharge thereof from the steam exhauster 10 into the receiver and separator unit 11. By so wetting the ash and dust particles they are individually weighted and caused to drop by gravity into the collector at the bottom of the unit 11 for subsequent discharge therefrom in the form of a sludge. Thus, in certain instances the preliminary wetting of the ash and dust particles as they traverse the steam exhauster 10 may dispense entirely with the need for employing air washing means in the receiver and separator unit 11.

The present invention may very readily be incorporated, with minimum expense, even in existing ash-handling systems in which is incorporated a conventional construction of steam exhauster. In such existing systems, the water may be introduced into the steam exhauster in embracing relation with respect to its suction-inducing steam jet by means of a nozzle 19, which is fitted in the side wall of an adapter 23 designed to be connected to the intake end of the steam exhauster as an extension thereof, this adapter arrangement being shown in dotted lines in Figure 2 and in full lines in Figures 4 and 6.

As shown in Figure 4, the adapter 23 is preferably secured to the intake end of the steam exhauster unit 10a by means of suitable bolts 24—24, the water nozzle 21 thereof being then angularly adjusted and locked in fixed position by its locking nut 22 exactly as in the previously described arrangement wherein the nozzle is incorporated directly within the steam exhauster itself. In all functional respects the adapter arrangement of the present invention, as shown in Figures 4 and 6, is similar to that shown in Figures 3 and 5, its primary function being to constantly maintain a film of water upon the internal surface of the steam exhauster in the immediate region of its Venturi throat to prevent any tendency for the steam-heated walls of

the exhauster to cause the clay content of the ash or dust passing through the exhauster to solidify therein in the form of a hard, more or less vitreous mass.

It will be understood that the present invention is susceptible of various changes and modifications which may be made from time to time without departing from the general principles or real spirit thereof, and it is accordingly intended to claim the invention broadly, as well as specifically, as indicated in the appended claims.

What is claimed as new and useful is:

1. In an apparatus for pneumatic handling of ash, dust and like material, a steam exhauster unit for inducing a suction pull through a conduit system for conveyance therethrough of air laden with said material, said exhauster having a material intake opening at one end thereof, a material discharge opening at its opposite end and a Venturi throat intermediate said intake and discharge openings, means for injecting a suction-inducing high velocity jet of steam into said Venturi throat, and means for wetting with water the internal wall surface of said steam exhauster in the region thereof immediately in advance of said Venturi throat.

2. In a steam exhauster unit of the character described, a Venturi section having a reduced diameter throat intermediate its opposite ends, a conduit section having a through bore of circular cross-section in communication with the rear end of said Venturi section, means for injecting a high velocity jet of steam axially to and through said throat of the Venturi section to induce a suction pull through said conduit sections for pneumatic conveyance of ash and like particles of matter through said steam exhauster, and means for wetting with water the internal wall surface of said steam exhauster in the region thereof immediately in advance of said Venturi throat.

3. In a steam exhauster unit as defined in claim 2 wherein said last-mentioned means includes a nozzle disposed with its discharge orifice so oriented as to project a stream of water tangentially against the circular internal wall surface of the steam exhauster to one side of the steam jet.

4. In a steam exhauster unit as defined in claim 2 wherein said last-mentioned means includes a nozzle disposed with its discharge orifice so oriented as to project a high velocity stream of water tangentially against the circular internal wall surface of the steam exhauster to one side of and at an angle to the axis of said steam jet whereby to create within said steam exhauster a whirling tube of water in embracing relation

to the steam jet just prior to its entry into the Venturi throat.

5. In a steam exhauster unit of the character described, a Venturi section having a reduced throat portion intermediate its opposite ends, an elbow section of circular cross-section extending from the rear end and in communication with the bore of said Venturi section, said elbow section having an intake opening disposed in a plane laterally offset from the longitudinal axis of said Venturi member, nozzle means carried by said elbow section for injecting a high velocity jet of steam axially toward and through said throat portion of the Venturi section, and auxiliary nozzle means also carried by said elbow section adjacent the intake opening thereof for injecting a high velocity stream of water into the steam exhauster in whirling, tangential relation to the outer envelop of said steam jet in the region immediately in advance of the Venturi throat.

6. In a steam exhauster as defined in claim 5 wherein said elbow section of the steam exhauster includes as an extension thereof a separable adapter which carries said auxiliary water injecting nozzle.

7. In a steam exhauster as defined in claim 5 wherein said auxiliary nozzle means is disposed with its discharge orifice located within said elbow section and closely adjacent to a wall surface thereof spaced laterally from the axis of the steam jet, whereby said water stream tangentially impinges and whirls about the internal wall surface of the steam exhauster in concentric relation to the steam jet.

8. In a steam exhauster as defined in claim 5 wherein said auxiliary nozzle means is positionally adjusted to project the water stream into the steam exhauster at such angle as to impart to the whirling water stream a movement in the direction of the steam jet.

9. In a steam exhauster as defined in claim 5 wherein said auxiliary nozzle means is positionally adjustable in a plane spaced laterally to one side of the axis of the steam jet.

EDWARD C. ADDISON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,454,277	Girtanner	May 8, 1923
2,420,388	Thomas	May 13, 1947
2,430,278	Daniels	Nov. 4, 1947