

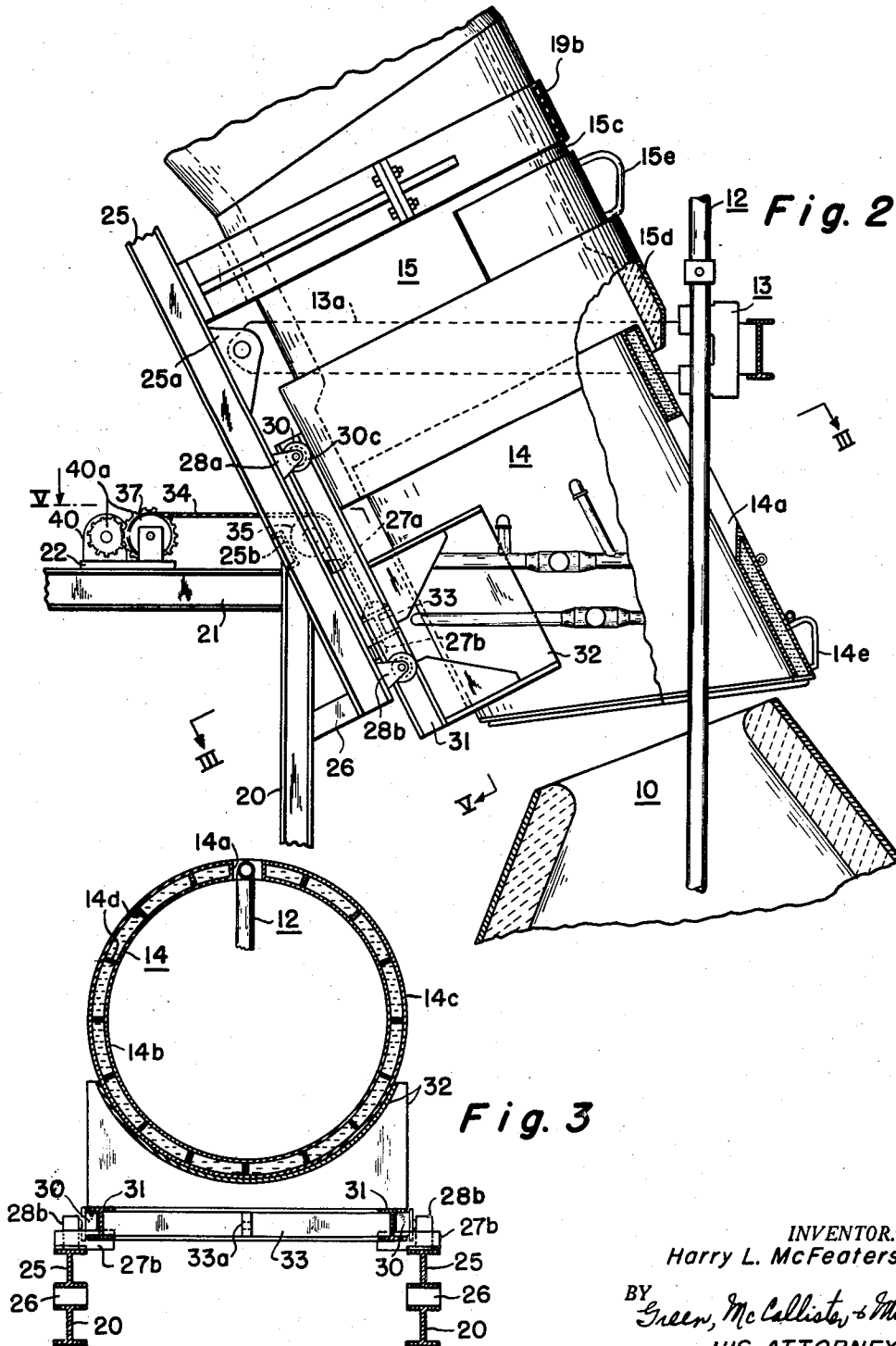
Dec. 2, 1958

H. L. McFEATERS
EXHAUSTING APPARATUS

2,862,701

Filed Aug. 29, 1955

4 Sheets-Sheet 2



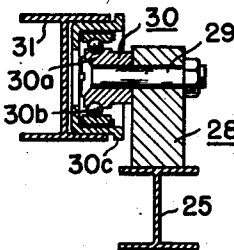
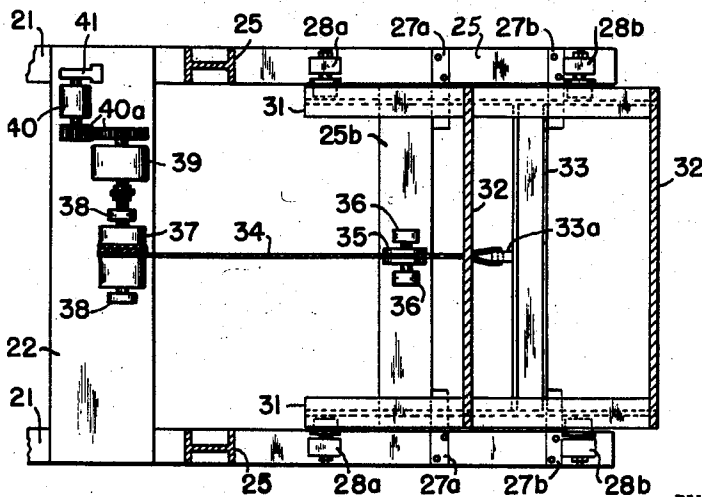
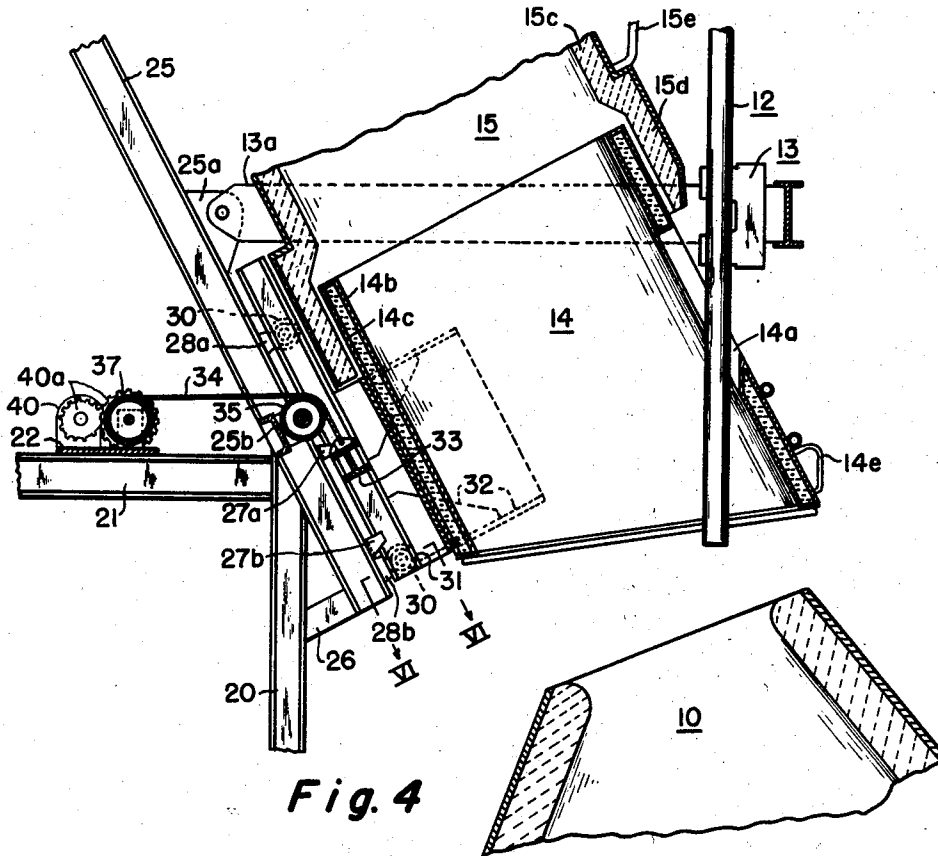
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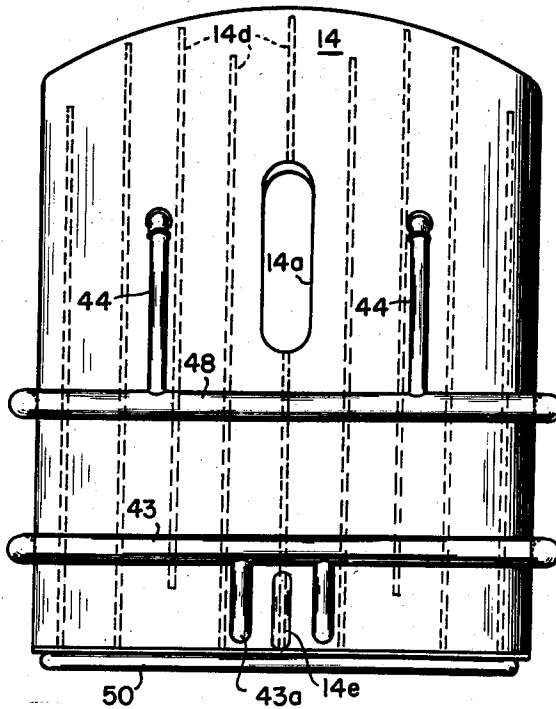
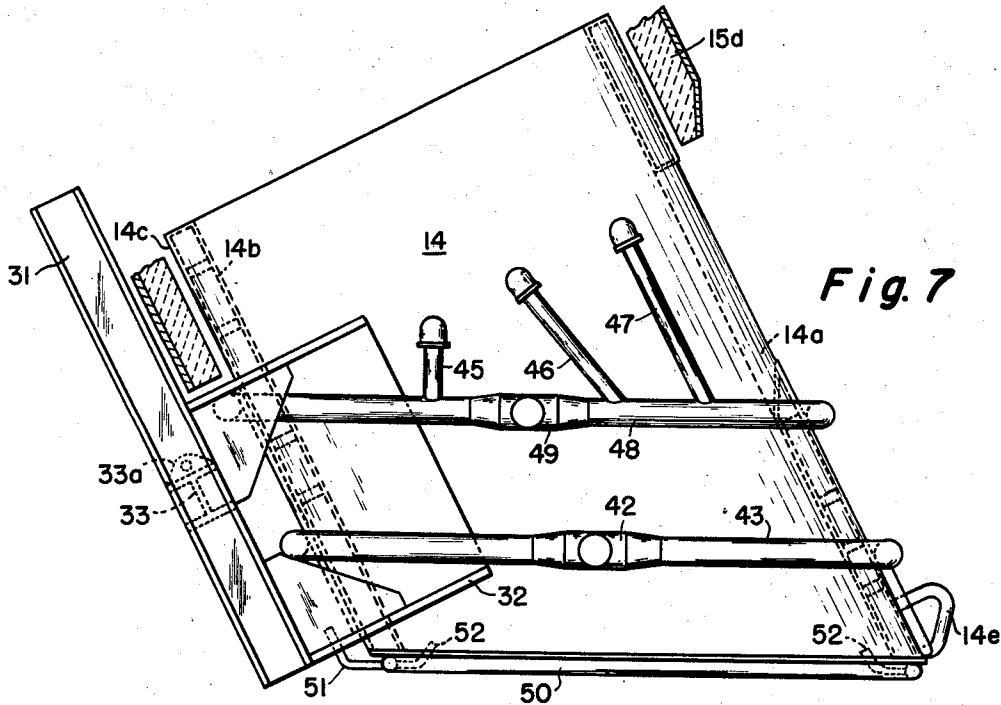
INVENTOR.
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EXHAUSTING APPARATUS

4 Sheets-Sheet 4



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2,862,701

EXHAUSTING APPARATUS

Harry L. McFeaters, New Castle, Pa., assignor to Pennsylvania Engineering Corporation, New Castle, Pa., a corporation of Pennsylvania

Application August 29, 1955, Serial No. 531,180

9 Claims. (Cl. 266—35)

This invention pertains to an exhaust receiving apparatus and particularly, to a hood construction for receiving hot effluent fluids or gases from a generator or converter such as used in refining or making metal.

Although the Bessemer process for making metal such as steel has, over a period of years, lost its position to the open-hearth process from the standpoint of producing and refining better quality metals, a generator or converter of the Bessemer type has again come into prominence in recent years due to development of the so-called oxygen-blow process. The smoke, fumes, dust, flame, etc. are bad enough in a Bessemer process using a side or bottom air blow, but the discharge from an oxygen-blow converter presents a greater problem due to the much higher temperatures involved, the relative speed of the procedure, and the greater thoroughness of the reaction and intensity of flame. In this connection, temperatures of 3200° F. or higher are common-place and an effluent discharge of about 156,000 cubic feet per minute at the mouth of the generator or converter may represent a relatively low figure.

Present day laws, in dealing with dirt, smoke, and flame control, necessitate some practical means for fully receiving or taking care of the discharge from the mouth of a generator such as one of the oxygen-blow type.

In my pending application, Serial No. 516,597, filed June 20, 1955, and entitled "Exhaust Apparatus", I have set forth a type of hood apparatus which has met favorable acceptance in the art. Since sectioned members or parts of such a hood are fixed together and constructed for usage as a unit, I have found that it is highly practical for converters or generators of up to about 50 ton capacity, but for larger capacities of the present day trend of 50 tons and higher, the weight of the hood presents a problem. Mechanical details of the construction involve the use of reinforcing members which further increase the weight and require a stronger mounting and actuating structure. Thus, although the basic principles involved in my early construction and utilization are highly practical, I have found that there is a need for modified construction for employment in larger capacity installations.

I have determined that a practical solution has to take into consideration the essential need for access to the converter or generator and for permitting it to be turned or rotated on its trunnions in connection with its charging, firing, discharging, and cleaning. At the same time, the installation should be such that the generator may be effectively charged through its mouth and that an oxygen-lance may be moved into and out of its mouth.

To provide access to and permit the generator to be employed in a conventional manner, it is thus necessary to make provision for varying or changing the position of the hood structure in order to alternately move its lower end portion or its adjuncts into a fluid discharge-receiving aligned or registered relationship with the mouth of the generator, and to also move or raise it to a withdrawn position which will define sufficient clearance spacing to permit the generator to be turned and employed in

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the usual manner after fluid discharge from its mouth has been disposed of. In other words, the hood, or at least a part thereof, should be capable of being easily and effectively moved between operative and inoperative positions from the standpoint of receiving effluents or fluid-discharge from the converter.

It has thus been an object of my invention to provide an improved discharge hood construction for use in a generator or converter installation;

Another object has been to devise a solution to the problem of providing a retractable hood construction for relatively larger and heavier installations;

These and many other objects of my invention will appear in view of illustrated embodiment and the description thereof;

In the drawings:

Figure 1 is a side view in elevation of a generator or converter installation showing the principles of my invention and disclosing the operatively aligned positioning of a hood apparatus as employed with a generator and an exhaust-receiving means;

Figure 2 is an enlarged fragmental side view in partial section particularly illustrating the construction, mounting, and utilization of a lower hood or retractable nose part as employed with a lower end portion of a main hood body or construction;

Figure 3 is a transverse sectional view of the same scale as and taken along the line III—III of Figure 2;

Figure 4 is a view on the scale of and somewhat similar to Figure 2, except that it shows the nose or lower part of the hood construction in a raised, retracted or withdrawn position with respect to the mouth of the generator or converter and as compared to a forwardly or downwardly-projecting, operatively aligned cooperative relationship of the nose part shown in Figure 2;

Figure 5 is a fragmental section taken along line V—V of and on the scale of Figure 2 and showing the relative positioning of the parts of such figure;

Figure 6 is a greatly enlarged transverse sectional detail in elevation showing the car or carriage roller construction and mounting of Figure 4 and is taken along the line VI—VI of Figure 4;

Figure 7 is a side view in elevation through structure employing my invention and particularly illustrating the construction and mounting of the lower hood or nose part; and

Figure 8 is a front elevation of the construction of Figure 7 and is taken at right angles to such figure.

In accordance with my present invention, I have been able to make the greater body portion, extent or length of the exhaust hood stationary with respect to its mounting and without the necessity of changing, varying or separating an effective type of interfitting and sealing relationship between its upper or discharge end portion and the inlet portion of an exhaust receiving means or discharge receiver. This, itself, is greatly advantageous in that it eliminates the need for a nonwarping, slidable, fluid-sealing-off flange construction between the hood and its receiver. Also, importantly, it obviates the need for operatively-movably positioning and actuating the full or major extent of the body of the hood construction.

The desired results are obtained by providing a lower part or nose section of the hood construction with means for operatively mounting and actuating it with respect to the lower portion of the main body of the hood. A telescopic and fully cooperative relationship is maintained, so that its fluid-flow chamber is always in alignment with the fluid flow chamber of the main body of the hood and in general alignment with the mouth or discharge opening of the generator or converter. At the same time, the nose section is of relatively short effective length and thus, of minimized body and weight. It is movable be-

tween a so-called operating forward or down position that is closely adjacent with the mouth of the generator and a withdrawn, retracted or upper position with respect thereto to provide access clearance or for permitting the generator to be freely serviced.

Referring particularly to Figure 1 of the drawings, I have shown an oxygen-blow generator or converter 10 for refining or producing steel. It is noted that the generator is mounted for turning or rotative movement on its trunnion axis 10a. The path of travel of its mouth is indicated by the dot-and-dash lines of Figure 1.

The mouth of generator 10 will, during the refining operation, normally project upwardly (as indicated in Figure 1) and the effluent or hot fluid discharged therefrom will be collected by a lower hood section or nose part 14. Oxygen may be blown through an oxygen-lance or tube 12. The tube 12 is adapted to be raised or lowered in a customary manner into and out of the converter mouth and, in this connection, has a guide clamping apparatus 13 provided with a pair of side-straddling arms 13a. The arms 13a are secured on mounts 25a of a spaced-apart pair of vertically-inclined and extending hood support beams, rails or members 25 (see also Figures 2 to 4). In my copending application No. 507,631, filed May 11, 1955 now U. S. Patent 2,822,163 and entitled "Charging Apparatus," I have shown and described lance mounting and clamping means that may be employed.

The members 25 constitute a part of a framework construction 11 for supporting and mounting fluid-processing equipment for the converter 10. Such apparatus or equipment includes a stationary, main hood body 15 which is shown mounted or secured at its upper end portion by saddle strap means 19a to horizontal members 23 that define an upper platform level of the frame 11. Similar saddle-strap means 19b is shown as securing a lower end portion of the hood body 15 to members 25.

Movable hood part or nose section 14 has a cradle car or carriage operatively mounting it on the members 25 to cooperate with the lower portion of the hood body 15 and supply hot effluent fluid thereto. The upper end of the hood body 15 has a sealing flange 15a about its outlet or exhaust opening which cooperates with a similar flange 16a about an inlet passageway of an exhaust-receiving apparatus or discharge receiver 16. Conventional nut and bolt assemblies may be employed to secure the flanges 15a and 16a in a fixed, fluid-sealing-off relation with each other.

As shown by the dot-and-dash circular line of Figure 1, indicating the maximum outer diametrical sweep of the converter 10, during its movement, the nose part 14 (even in its discharge-receiving forward-position) may provide a minimum clearance sufficient to permit the generator 10 to be turned without withdrawing or retracting it into the hood body 15. However, for cleaning out, supplying a pre-determined volume of aspirated air for cooling gases or fluids in the hood, for removing the vessel or generator 10 from its stand by lifting it on its trunnion axis 10a, inspection and other access purposes, I have provided for about 24 inches of withdrawal of the nose part 14.

The withdrawal of the part 14 also facilitates charging the generator 10 through its mouth when it is in the position of Figure 1. That is, a tramway and delivery bin (not shown) may be carried by the upper level frame members 23 to cooperate with a swingable delivery chute that is mounted on the inclined side members 25 to charge the converter 10 through its mouth when the hood nose 14 has been moved to its withdrawn position of Figure 4. That is, at this time, the feed chute may be swingably positioned to one side of the hood construction, so that it may be swung into a delivery position. Also, the chute may extend through a slot in the nose part 14 corresponding to slot 14a which is provided therein for by-passing the lance 12. See for example Figures 2, 4, and 8 of the drawings.

The support structure or framework 11, as shown, com-

prises vertical-upright members or beams 20, lower level defining horizontal support members or beams 21, and upper level defining horizontal support members or beams 23. As previously pointed out, a pair of vertically-inclined hood-mounting side rail members or beams 25 are secured to the frame 11 and are positioned to project between lower foot pieces 26 and an overhead cross beam 24b. A lower cross beam 24a also aids in supporting the framework 11.

To aid in mounting it, the hood 15 has a crane hook-receiving eye 15e, as does the hood part 14, see the eye 14e. The exhaust-receiving means, device or apparatus 16 is shown provided with inwardly-projected spray nozzles 16b, a dust or dirt collector chute 18, and a discharge piping or conduit 17 leading therefrom. The apparatus 14 and 15 serves to receive, cool and direct hot effluent fluids into the receiver, spark trap, or preliminary cleaning device 16. After the fluids or gases are processed in the device 16, they are conducted through conduit 17 to suitable intermediate or final cleaning apparatus to provide a final, clean, atmospheric discharge.

As shown particularly in Figures 2 and 4, the lower end portion of the hood part 15 is especially constructed to cooperatively receive the nose part 14. It will be noted that the refractory, brick-lined, main housing wall 15c extends into a receiving wall 15d at its lower end portion of enlarged internal diameter. The wall 15d defines an internal guide and banding portion to telescopically receive and cooperate with an upper delivery end portion of the movable hood or nose part 14. A study of Figure 2 in view of Figure 4, discloses that the nose part 14 moves between its expanded, outer and effective discharge-receiving position of Figure 2 to its upper, retracted and clearance-defining position of Figure 4 in a telescopic relationship within the enlarged wall 15d of the hood body 15.

As shown particularly in Figures 2, 4, and 5, the horizontal support or beam members 21 have a cross-platform 22 secured therebetween for supporting an actuating mechanism to raise and lower the nose part 14. A cross member or platform beam 25b is carried by and secured on the pair of inclined side members 25 and, in addition to reinforcing the structure of the members 25, provides a mounting for a cable pulley 35. A spaced-apart pair of rail or track members or I-beams 31 are secured to the bottom of a support cradle structure 32 which is, in turn, fixed to the nose part 14 to carry it. A pair of rollers or wheel assemblies 30 are operatively positioned along each side rail member 31 (as shown particularly in Figures 5 and 6) and between the members 25 and 31.

Each wheel assembly 30 is mounted by a bolt or pin and nut assembly 29 on one of side pairs of vertically spaced-apart and upwardly-projecting mounts 28 that are secured to and project from the inclined members 25 (see Figures 4 to 6). As shown particularly in Figures 2 and 4, each of the pair of members 25 has a mount 28a and a mount 28b. The inner portion 30a of each roller assembly (see Figure 6) is shown mounted on the pin assembly 29 and carries a bearing groove along its periphery to provide a race for a rotatable roller bearing assembly or portion 30b which carries an outer annular contact wheel or flange portion 30c. It is apparent that the portions 30a and 30b provide an anti-friction type of rotative movement for the wheel structure and thus, for the carriage or car of the cradle 32. Upper limit of travel of the car is controlled or restricted by stop means 27a that is secured to the rails 25 (see Figures 4 and 5) and the lower limit of travel is controlled or restricted by stop means 27b that is also secured to the rail members 25.

Actuation of the nose part 14 and its car is effected by a cable or chain 34 that is at one end secured to a tab mount 33a on a reinforcing cross-beam 33 of the carriage (see Figure 5). The cable interleaves over a pulley or sheave 35 that is journaled in mounts 36 on

the transverse member 25b. The other end of the cable 34 is operatively secured on a winding-drum 37 having bearing mounts 38. The drum is driven through a gear-reduction unit 39 and a gear unit 40a by a reversible motor 40. A brake unit 41 locks the mechanism in a desired raised position.

Referring particularly to Figures 7 and 8, I have disclosed details of the lower hood or nose part 14. It comprises substantially concentric inner and outer shell portions 14b and 14c which are in a spaced relationship with each other to define a cooling spacing or jacket therebetween. One of the shell portions, such as 14b, may have a series of spaced-apart ribs 14d to guide the cooling fluid or water in a circuitous path along the flow spacing.

To supply cooling fluid, such as water, to the jacketing of the part 14, I provide a main inlet header 43 that may be supplied by flexible tubing means (not shown) through a suitable fitting, such as T 42. As shown particularly in Figure 8, branch lines 43a are connected between the inlet header 43 and lower portion of the spacing or jacket of the nose part 14.

To exhaust warm fluid from the inside of the jacket, I have provided a series of branch outlet connections or pipes 44, 45, 46 and 47 which are connected to an outlet header 48. The header 48 has a discharge T 49 that may be connected to a connected flexible discharge tubing (not shown).

It may be noted that the tubing or piping construction consisting of members 44 to 48 is all located in such a manner that it will be below the portion 15d of the hood body 15 when the part 14 is in its maximum inward, upward or retracted position of Figures 4 and 7. Thus, it does not interfere with the variable positioning of the part 14.

I have also shown a cooling fluid tubular ring or header 50 about the lower mouth of the nose part 14 that may be supplied through inlet 51 by means of flexible tubing (not shown). As disclosed in Figure 7, a radial series of spray heads or jet 52 project inwardly of the header 50 to supply or spray cooling fluid directly to the effluent being received by the nose part 14.

If desired, spray heads 52 may be located at suitable positions along the main hood part 15 and particularly, adjacent to the lower end portion 15c, as indicated by the spray heads 86 of Figure 2 of my above-mentioned copending application No. 516,597.

It will be apparent that my present invention makes possible the elimination of movable positioning means for raising and lowering the main hood part and for providing a joint relationship between the exhaust of such part and an exhaust receiver. In the present structure the joint may be a relatively loose one, since it is at a lower level of the installation and relatively close to the converter, itself. Thus, in this connection, a telescopic relationship has been found highly satisfactory and without the need for sealing-lip flanges such as would be required at the delivery or discharge end of the hood part.

What I claim is:

1. Apparatus for receiving a hot effluent discharge from an upwardly-open discharge mouth of a vessel such as a converter and for conducting the effluent discharge to an overhead discharge receiver which comprises, an upright support structure, an upwardly-inclined hood enclosure body defining a fluid passageway therealong and being secured to project along a side of said upright support structure, means for connecting an upper end portion of said hood enclosure body to the discharge receiver to deliver effluent thereto, a variable-position nose part defining a fluid passageway therealong and having a lower mouth portion to cooperate with the mouth of the vessel to receive the effluent discharge therefrom, an upwardly-inclined support frame carried by said support structure along said hood enclosure body

and said nose part, roller means operatively positioned between said nose part and said inclined support frame to position said nose part for upwardly-inclined movement along said inclined support frame and between a lower end portion of said hood enclosure body and the mouth of the vessel, means for effecting such movement of said nose part while it is in an aligned fluid-flow relationship between the lower end portion of said hood enclosure body and the mouth of the vessel, water-jacketing means along said nose part, a water-supply header about the mouth portion of said nose part and having a water supply inlet, and a series of spraying nozzles about the mouth portion of said nose part and connected to said header to direct a water spray upwardly within the passageway of said nose part.

2. Apparatus for receiving a hot effluent discharge from an upwardly-open discharge mouth of a vessel such as a converter and for conducting the effluent discharge to an overhead discharge receiver which comprises, an upwardly-extending relatively heavy hood enclosure body defining a fluid passageway therealong, means for connecting an upper end portion of said hood enclosure body to the discharge receiver to deliver effluent thereto, a variable-position nose part defining a fluid passageway therealong, an upwardly-inclined support frame, a support structure for said frame positioned to one side of said hood enclosure body, roller means operatively positioned between said support frame and said nose part and having a trackway to position said nose part for inclined movement along said support frame in a telescopic relation with said hood enclosure body, means for moving said nose part along said inclined support frame in a connected fluid-flow relationship with said body to and from a close effluent-receiving adjacency with respect to the mouth of the vessel, said nose part having an upwardly-elongated open portion along a side wall thereof, a vertical feed means for the vessel, guide clamping means for positioning said feed means to project downwardly through said open portion towards the converter mouth, and means carried by said support frame to mount said guide clamping means in an outwardly-projecting relation therewith.

3. Apparatus for receiving a hot effluent discharge from an upwardly-open discharge mouth of a vessel such as a converter and for conducting the effluent discharge to an overhead discharge receiver which comprises, a side-positioned upright support structure, an upwardly-inclined hood enclosure body secured in position on said support structure to extend upwardly therealong and define a fluid passageway, said support structure mounting the discharge receiver, means for connecting an upper end portion of said hood enclosure body to the discharge receiver to deliver effluent thereto, a nose part defining a fluid passageway therealong and being connected with a lower end portion of said hood enclosure body to deliver effluent thereto, an upwardly-inclined frame secured to extend along said support structure, roller means operatively carried on said frame and positioning said nose part for telescopic movement along said frame relative to said hood enclosure body, means operatively connected to said nose part to move it in an inclined path upwardly and downwardly along said frame in a fluid-flow-connected relationship with respect to the lower end portion of said hood enclosure and into and out of a close effluent-receiving adjacency with respect to the mouth of the vessel, means positively holding said nose part in a movable relationship on said inclined frame, and means to limit the extent of movement of said nose part on said frame.

4. Apparatus for receiving a hot effluent discharge from an upwardly-open discharge mouth of a vessel such as a converter and for conducting the effluent discharge to an overhead discharge receiver which comprises, a side-positioned and upwardly-projecting support structure, an upwardly-extending hood enclosure body defining a fluid

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passageway therealong and secured to incline upwardly along said support structure to the discharge receiver, means for connecting the upper end portion of said hood enclosure body to the discharge receiver to deliver effluent thereto, a variable-position nose part defining a fluid passage therealong and having an upper end portion operatively telescoping within a lower end portion of said hood enclosure body, an upwardly-inclined frame secured along said support structure and extending along said hood enclosure body and said nose part, a rolling carriage on said nose part operatively mounted for movement along said inclined frame, and means for moving said rolling carriage along said inclined frame and said nose part in a telescoping relationship into and out of the lower end portion of said hood enclosure body while moving a lower end of said nose part into and out of a close effluent-receiving adjacency with respect to the mouth of the vessel.

5. Apparatus for receiving a hot effluent discharge from an upwardly-open discharge mouth of a vessel such as a converter and for conducting the effluent discharge to an overhead discharge receiver which comprises, an upright support structure, an upwardly-inclined hood enclosure body defining a fluid passageway therealong and being secured to project along a side of said upright support structure, means for connecting an upper end portion of said hood enclosure body to the discharge receiver to deliver effluent thereto, a variable-position nose part defining a fluid passageway therealong, an upwardly-inclined support frame carried by said support structure along said hood enclosure body and said nose part, roller means operatively positioned between said nose part and said inclined support frame to position said nose part for upwardly-inclined movement along said inclined support frame and between a lower end portion of said hood enclosure body and the mouth of the vessel, means for effecting such movement of said nose part while it is in an aligned fluid-flow relationship between the lower end portion of said hood enclosure body and the mouth of the vessel, said roller means being secured on said inclined support frame to project outwardly therefrom, and side track members secured along said nose part and having enclosing flange portions operatively engaging said roller means to operatively guide and hold said nose part in position with respect to said inclined support frame.

6. Apparatus for receiving a hot effluent discharge from an upwardly-open discharge mouth of a vessel such as a converter and for conducting the effluent discharge to an overhead discharge receiver which comprises, an upwardly-extending relatively heavy hood enclosure body defining a fluid passageway therealong, means for connecting an upper end portion of said hood enclosure body to the discharge receiver to deliver effluent thereto, a variable-position nose part defining a fluid passageway therealong, an upwardly-inclined support frame, a support structure for said frame positioned to one side of said hood enclosure body, roller means operatively positioned between said support frame and said nose part and having a trackway to position said nose part for inclined movement along said support frame in a telescopic relation with said hood enclosure body, means for moving said nose part along said inclined support frame in a connected fluid-flow relationship with said body to and from a close effluent-receiving adjacency with respect to the mouth of the vessel, said roller means being operatively carried by said inclined support frame, and said trackway having side portions operatively interlatched with said roller means to hold said nose part in position on said frame and define an inclined guide path along said trackway for movement of said roller means.

7. Apparatus for receiving a hot effluent discharge from an upwardly-open discharge mouth of a vessel

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such as a converter and for conducting the effluent discharge to an overhead discharge receiver which comprises, an upwardly-extending relatively heavy hood enclosure body defining a fluid passageway therealong, means for connecting an upper end portion of said hood enclosure body to the discharge receiver to deliver effluent thereto, a variable-position nose part defining a fluid passageway therealong, an upwardly-inclined support frame, a support structure for said frame positioned to one side of said hood enclosure body, roller means operatively positioned between said support frame and said nose part and having a trackway to position said nose part for inclined movement along said support frame in a telescopic relation with said hood enclosure body, means for moving said nose part along said inclined support frame in a connected fluid-flow relationship with said body to and from a close effluent-receiving adjacency with respect to the mouth of the vessel, said roller means comprising roller bearings and cooperating parts defining an anti-friction rolling relationship between said support frame and said trackway, and means along said support frame to define upper and lower limits of movement of said nose part therealong.

8. Apparatus for receiving a hot effluent discharge from an upwardly-open discharge mouth of a vessel such as a converter and for conducting the effluent discharge to an overhead discharge receiver which comprises, an upwardly-extending relatively heavy hood enclosure body defining a fluid passageway therealong, means for connecting an upper end portion of said hood enclosure body to the discharge receiver to deliver effluent thereto, a variable-position nose part defining a fluid passageway therealong, an upwardly-inclined support frame, a support structure for said frame positioned to one side of said hood enclosure body, roller means operatively positioned between said support frame and said nose part and having a trackway to position said nose part for inclined movement along said support frame in a telescopic relation with said hood enclosure body, means for moving said nose part along said inclined support frame in a connected fluid-flow relationship with said body to and from a close effluent-receiving adjacency with respect to the mouth of the vessel; said means for moving said nose part comprising, an actuating means positioned on said frame structure substantially in horizontal alignment with the lower end portion of said hood enclosure body, a cable connected between said nose part and said actuating means, and pulley means on said support frame to guide said cable on a vertical plane along said support frame to substantially the position of said actuating means and then on a horizontal plane to said actuating means.

9. Apparatus for receiving a hot effluent discharge from an upwardly-open discharge mouth of a vessel such as a converter and for conducting the effluent discharge to an overhead discharge receiver which comprises, an upwardly-extending relatively heavy hood enclosure body defining a fluid passageway therealong, means for connecting an upper end portion of said hood enclosure body to the discharge receiver to deliver effluent thereto, a variable-position nose part defining a fluid passageway therealong, an upwardly-inclined support frame, a support structure for said frame positioned to one side of said hood enclosure body, roller means operatively positioned between said support frame and said nose part and having a trackway to position said nose part for inclined movement along said support frame in a telescopic relation with said hood enclosure body, means for moving said nose part along said inclined support frame in a connected fluid-flow relationship with said body to and from a close effluent-receiving adjacency with respect to the mouth of the vessel, and said nose part having a vertical slot portion along a side wall thereof defining a port to bypass said means of a type that projects vertically towards the converter mouth.

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