June 30, 1953 C. B. SCHNEIBLE ET AL 2,643,867

CUPOLA STACK OR TOWER

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Fig. 1

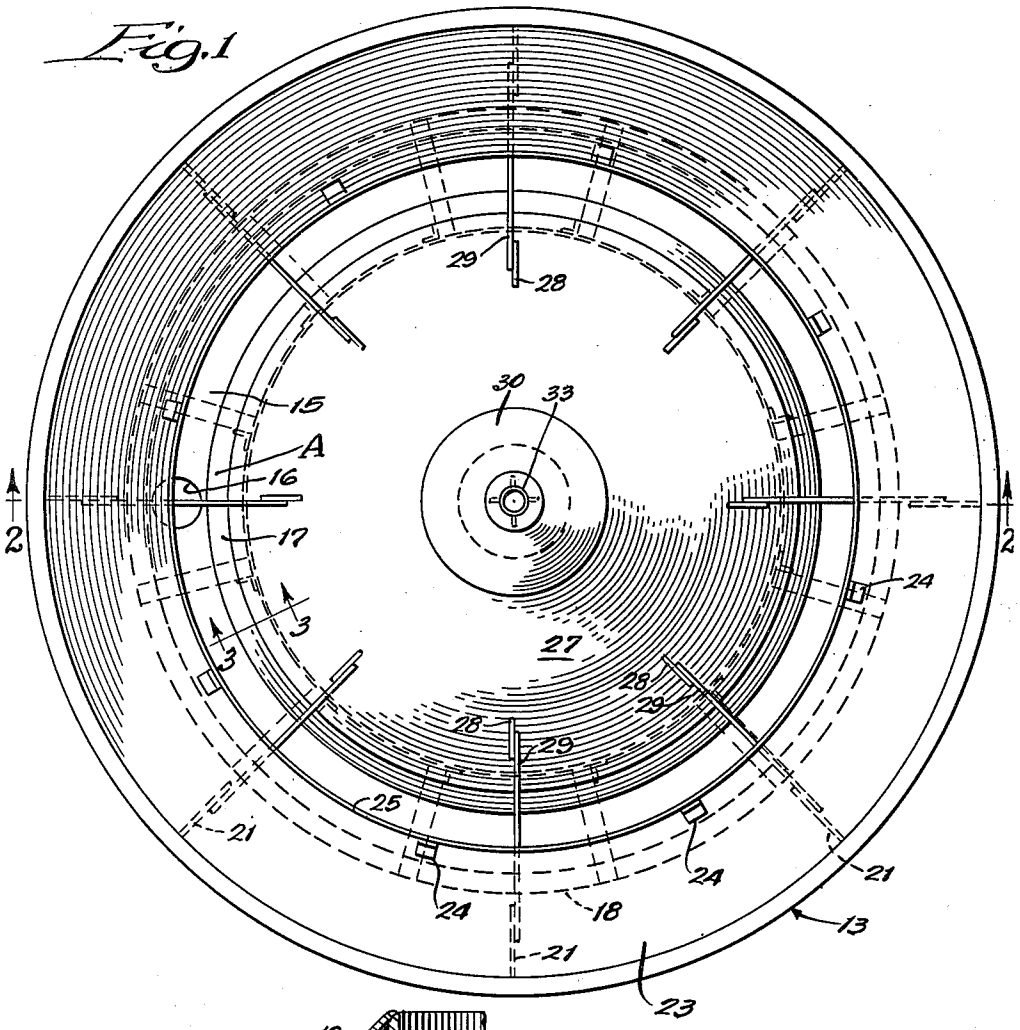
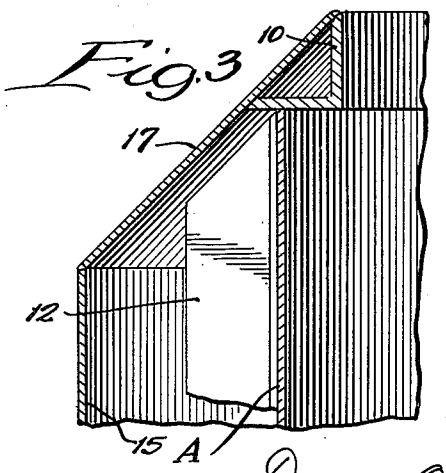


Fig. 3



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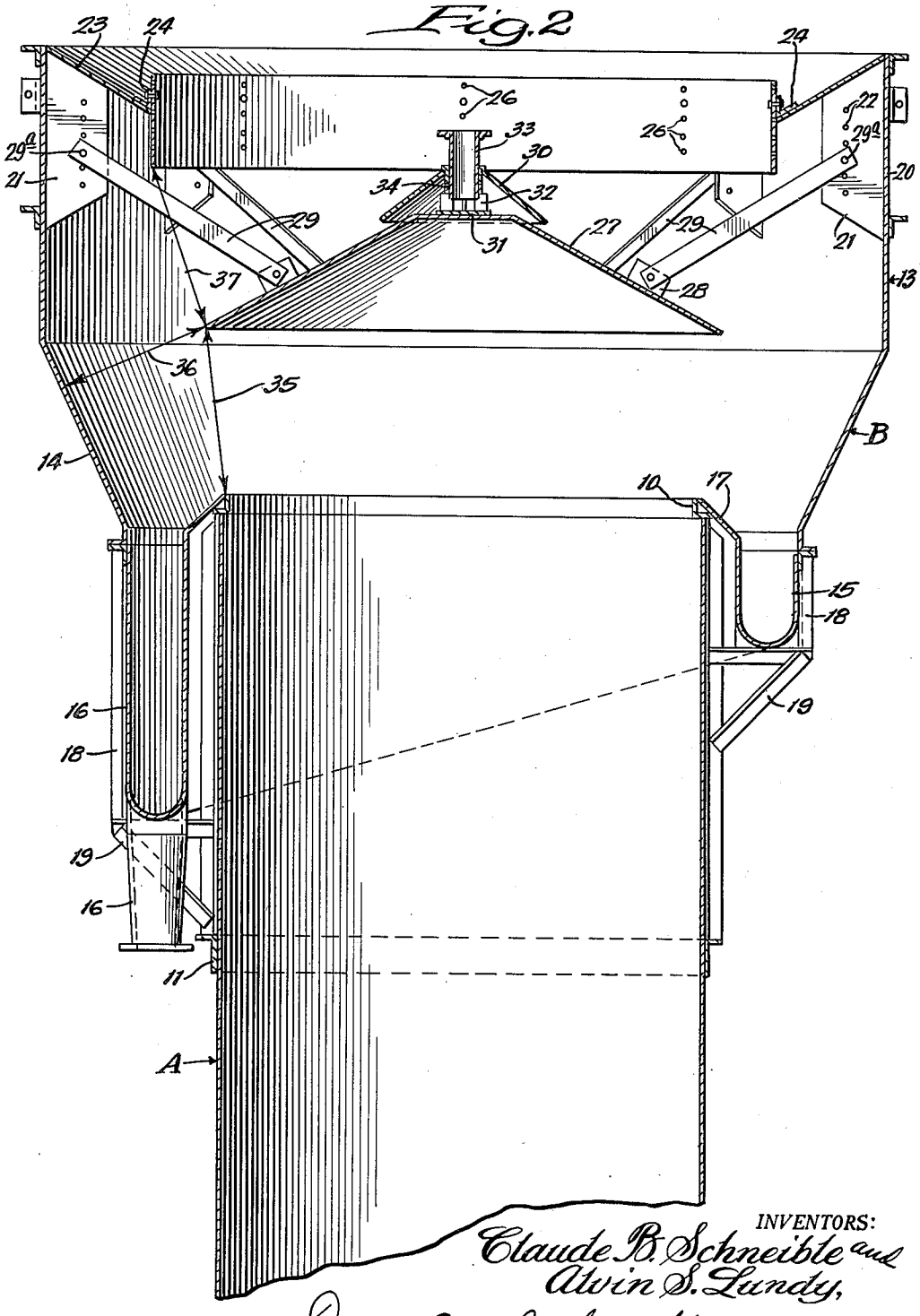
BY Dawson, Orrin, Barth and Spangenberg,
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Fig. 2



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CUPOLA STACK OR TOWER

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Application January 26, 1950, Serial No. 140,568

4 Claims. (Cl. 261—126)

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This invention relates to an improvement in foundry cupola stacks and similar towers. The invention will also be found to be applicable to other uses.

Present-day foundry cupola stacks are lined with firebrick to a predetermined diameter, and have little or no obstruction to the flow of gas upwardly to the outside atmosphere. The height of the stack is a main factor in determining the velocity of the heated gases in the stack. The trend today is to increase cupola stack heights in order to obtain from such increased height a greater area distribution of particulate matter in the hot gases. Such increased heights, however, create additional problems with respect to the control of velocities of the hot gases in the stack, and further with respect to proper velocities for dust collection if the stack is equipped with a dust collector.

An object of the present invention is to provide a means for regulating the velocities of the hot gases in the stack, regardless of the height of the stack. A further object is to provide regulating means that may be adjusted in the event of the cupola being lined down (a reduced operation of the cupola) while still providing the desired velocity of gases at the top of the cupola. A still further object is to provide adjustable means for securing a proper gas velocity at the top of the tower so that a cupola dust collector may be furnished with proper operating velocities. A still further object is to provide simple means whereby a number of velocity control areas at the top of the stack may be effectively regulated through the movement of a single operaing part such as the deflector plate or cone, or deflector ring. Other specific objects and advantages will appear as the specification proceeds.

The invention is shown in an illustrative embodiment by the accompanying drawings, in which—

Figure 1 is a top plan view of a stack equipped with apparatus embodying our invention; Fig. 2, a vertical sectional view, the section being taken as indicated at line 2—2 of Fig. 1, and Fig. 3, a broken detail sectional view, the section being taken as indicated at line 3—3 of Fig. 1.

In the illustration given, A designates a cupola stack or other form of tower which is to be controlled; and B designates the velocity controlling and treating apparatus mounted upon the stack.

The stack A may be of any suitable type or construction. In the illustration given in Fig. 2, the top portion of the stack A is illustrated and is shown provided at its top with a support flange

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10. Another support flange 11 is secured to the stack casing at the point below flange 10, and as shown in Fig. 2. Vertical strips or flanges 12 extend upwardly from the flange support 11 and provide means for supporting the shell portion of structure B, which will now be described.

The structure B is provided with an exterior shell 13 having an angularly-extending lower portion 14. The inwardly-tapering waist or wall 14 extends at a sharply pitched angle as indicated in Fig. 2, and is important as a factor in providing a control for velocities, as will be later explained.

The tapering wall 14 communicates at its bottom with a collector trough 15, which extends around the stack A and is provided on one side with a draw-off pipe 16. The trough 15 is provided with an inwardly-turned annular flange 17 resting upon the support ring 10. Also a frame 18 is provided for supporting the trough 15, and depending brace members 19 secure the frame upon the vertical flanges 12.

The casing or shell 13 is provided with an enlarged diameter or straight shell portion 20 extending above the tapered waist 14. In the upper portion of the casing 20, and on the interior thereof, are a number of inwardly-extending support flanges 21 having a downwardly-tapered top wall and having also a plurality of spaced apertures 22. Resting upon the flanges 21 and extending downwardly and inwardly from the upper edge of the shell 20 is a deflector flange 23. The deflector flange 23 is provided at its lower free end with a plurality of spaced angle members 24, each having a vertically-extending flange adapted to be secured adjustably to a deflector or control ring 25. The deep ring 25 is provided with a series of spaced openings 26 adapted to be secured to the vertical flange 24 by bolts, so that the ring 25 may be thus suspended within the stack at different heights.

Within the area below the ring 25 and above the top of the stack is suspended a deflector plate or deflector cone 27. In the illustration given the cone-like structure has downwardly-tapering sides which extend over the top of the stack A. The deflector cone 27 is provided at spaced points with raised flanges 28, to which supporting strips 29 are secured by bolts or other means, and the upper ends of the supports 29 are secured to the flanges 21 by bolts 29^a. By reason of the vertically-spaced holes 22 in the flanges 21 the deflector plate 27 may be supported at any desired height for controlling velocities, etc., as will be later described.

The apparatus described may be operated with

or without means for supplying a washing fluid for the collection of dust, etc. If it is desired to supply a stream of water, etc., over the deflector cone 27, we prefer to employ with the deflector cone 27 a liquid distribution head 30, as illustrated more clearly in Fig. 2. In this structure we provide a wear plate 31 resting upon the top flat portion of the cone 27. Upon the wear plate are supported vertical thin flanges 32, which extend outwardly to provide an open support for the water-inlet pipe 33. The distribution head 30 may be supported at any desired point above the cone 27 to provide the desired distribution of the liquid by means of rings 34 of different heights which may be placed between the supports 32 and the ring flange of the distributor head 30. Such structure is shown in greater detail in the copending application of Claude B. Schneible, applicant herein, Serial No. 107,237, now Patent No. 2,597,192 of May 20, 1952, for Liquid Distributor. Water or other liquid is supplied through a pipe (not shown) which will be attached to the flanged end of the pipe 33.

For the control of velocities there are three areas which are found to be important. One area is that indicated by the double-headed arrow 35 as shown in Fig. 2. Another area is indicated by the arrow 36, and the third area is indicated by the arrow 37.

Movement of the cone deflector 27 in a vertical plane controls, by reason of the inclined or inwardly-tapered wall 14, both the area indicated by the arrow 36 and the area indicated by the arrow 35. This movement also exerts a control over the area between the cone 27 and the ring 25. Further, the ring 25 may be vertically adjusted to control the area indicated by the arrow 37.

Operation

In the operation of the apparatus, assuming that the apparatus B is to be used solely for controlling velocities and without the use of fluid, the deflector plate or cone 27 is supported by means of the straps or supports 29 upon the flanges 21 at a desired elevation. Similarly the ring 25 is suspended upon the supports 24 to a desired depth. By this means the areas indicated by the arrows 35, 36 and 37 may be accurately defined for regulating the velocities of the hot gases in the stack regardless of the height of the stack. Should the cupola be lined down or operated at a reduced operation, the deflector plate 27 may be lowered or raised to meet such change in operation, and similarly the ring 25 may be adjusted as desired to control the space indicated by the arrow 37. At any time during the operation of the cupola if it be found that the velocities, either for the cupola or for the operation of the dust collector, or for both, be unsatisfactory velocities for such operations, the above-described parts may be moved readily to obtain the desired velocities. In many cases by moving the deflector plate 27 alone, the desired change in velocities is made because such movement changes not only the critical area 36 between the edge of the deflector cone 27 and the inclined wall 14, but also the areas represented by the arrows 35 and 37. As the deflector plate 27 is lowered, the edges thereof are brought closer to the inclined waist or tapered wall 14, while also the cone directly approaches the top of the cupola A.

When the apparatus A is used as a dust collector or as a means for washing particulate matter from the rising gases, water or other fluid is passed through the pipe 33 and distributed by the head 30 so that water flows evenly about the deflector plate 27 and outwardly through the area indicated by arrow 36. The water or other fluid strikes the inclined wall 14 and flows downwardly into the collector trough 15, and may be drawn away through pipe 16. The water curtain discharged by the deflector plate is highly efficient in removing cupola fly ash and other particulate matter in the gases from foundries, etc. The distribution head shown is non-clogging, is adjustable, and may be readily raised for cleaning or inspection.

Through the use of the vertically movable deflector plate 27 in conjunction with the cupola top and the inclined wall 14 an effective control of velocities is attained, and a further nice control of the area 37 above the deflector plate is effected irrespective of the position of the deflector plate 27 through the separately movable deep ring 25.

While in the foregoing specification we have set forth a single structure in considerable detail for the purpose of illustrating an embodiment of the invention, it will be understood that such details of structure may be varied widely by those skilled in the art without departing from the spirit of our invention.

We claim:

1. In a tower structure, a shell forming an upper extension of said tower and providing an upwardly and outwardly-inclined annular wall, a deflector flange extending inwardly from the top of said wall, a deep ring abutting the inner edge of said deflector flange, means for supporting said ring in vertically adjustable position upon said flange, a deflector plate vertically aligned with the top of said tower, and means for suspending said deflector plate at different heights to vary the distance between the plate, said inclined wall and said deep ring.

2. In a tower structure, a shell forming an upper extension of said tower and providing an upwardly and outwardly-inclined annular wall, a deflector flange extending inwardly and downwardly from the top of said shell, a deep ring supported for vertical adjustment upon said deflector flange, a deflector plate vertically aligned with the top of said tower, and means carried by said shell for suspending said deflector plate at different heights to vary the distance from said plate to said tower, said wall and said ring.

3. In a tower structure, a shell forming an upper extension of said tower and providing an upwardly and outwardly-inclined annular wall, a deflector flange extending inwardly and downwardly from the top of said shell, a deep ring supported for vertical adjustment upon said deflector flange, a deflector plate vertically aligned with the top of said tower, and means carried by said shell for suspending said deflector plate at different heights to vary the distance from said plate to said tower, said wall and said ring, said ring extending laterally of said deflector plate.

4. In a cupola stack, a shell forming an upper extension of said stack and providing laterally of said stack an upwardly and outwardly-inclined wall, a collar trough below said shell and communicating with the bottom of said inclined wall, a deflector flange at the top of said shell and extending inwardly, a ring carried by

the inner edge of said flange and being vertically adjustable thereon, a deflector cone vertically aligned with said stack, means carried by said shell for supporting said deflector cone at varying heights to vary the distance from the cone to the stack, to said inclined wall, and to said ring, a distributor head upon said cone, and means for supplying liquid to said distributor head and over said deflector cone for providing a curtain of liquid between said deflector cone and said inclined wall.

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