Oct. 4, 1932. J. MITCHELL 1,881,058

SMOKE CLEANING DEVICE

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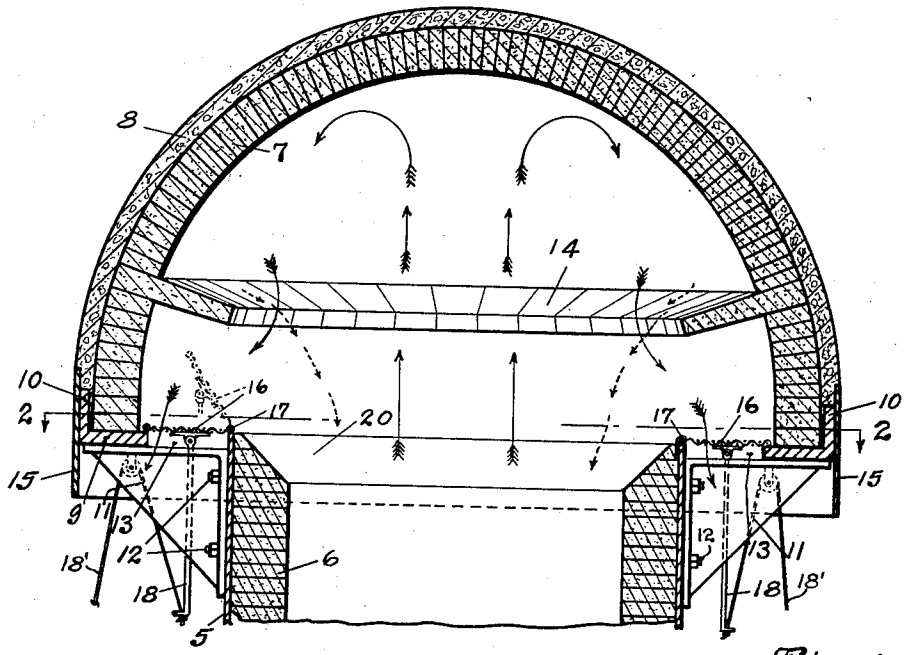


Fig. 1

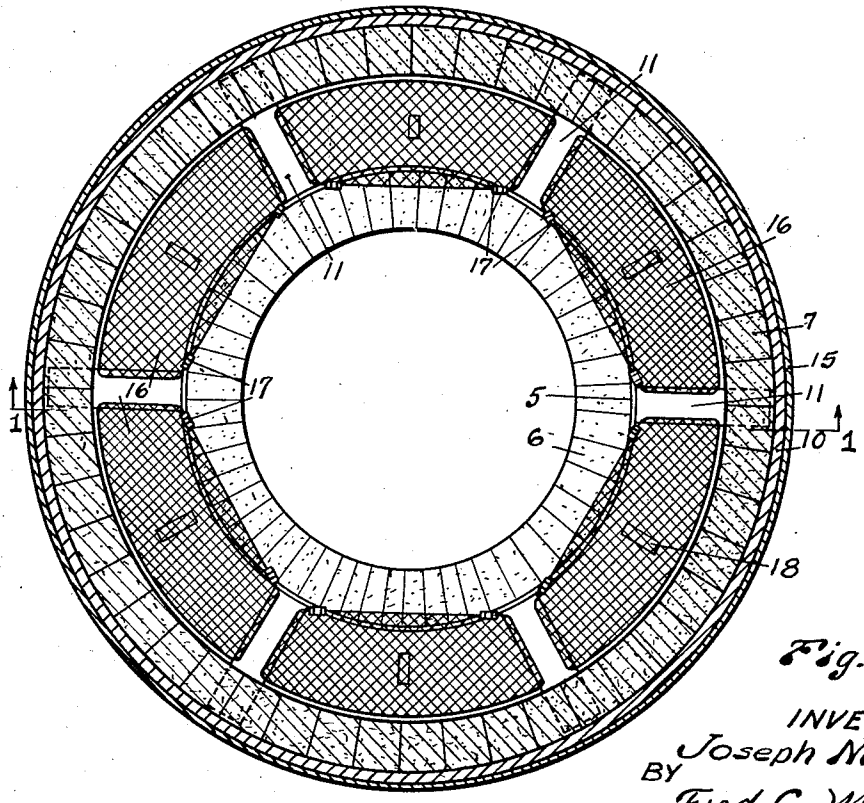


Fig. 2

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SMOKE CLEANING DEVICE

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My invention relates to soot and cinder arrester for use in connection with smoke stacks, refuse burners and flues of like character and the general object of my invention is to provide a simple and efficient soot and cinder arrester which may be applied to the tops of relatively large smoke stacks and burners and which will operate efficiently to remove the sparks, soot, cinders, dust and other solid matter from the discharging smoke and burned gases without substantially impairing or reducing the draft of said stacks or burners.

Another primary object of the invention is to provide a soot and cinder arrester of this nature which is not easily clogged and which is readily cleaned and which will catch the sparks and soot and cinders and other solid matter and discharge the same back down into the flue, thus greatly reducing the fire hazard and preventing the pollution of the adjacent atmosphere with ashes and dust.

A further object is to provide a soot and cinder arrester of this nature which is not expensive to manufacture and which is highly resistant to heat and will last for a long period of time under constant use at high temperatures.

More specific objects of the invention are to provide a soot and cinder arrester in the form of an inverted dome of heat resistant material supported over the top of a flue or burner, the internal diameter of said dome at the bottom being substantially larger than the external diameter of the top of the flue whereby smoke and gases will be directed downwardly and outwardly around the top of said flue and said dome having an internal annular downwardly inclined guard member positioned above the top of the flue to direct the solid matter back into the flue and further having screens for intercepting discharging solid matter, said screens being arranged so that they may be dumped by means operable from the bottom of the stack or flue, the bottom of the dome terminating substantially in the plane of the top of the flue.

Other and more specific objects of the invention will be apparent from the following description taken in connection with the accompanying drawing.

The problem of removing the sparks, soot, dust, ashes, cinders and like solid matter from the smoke which issues from large smoke stacks or flues, especially those used in connection with industrial establishments, as the flues of refuse burners of saw mills and the stacks of smelters, power plants, heating plants and the like, is often very serious. The smoke and gases issuing from the stacks are often laden with sparks and red hot cinders which are a dire menace in the vicinity and with soot, ashes, fine dust and the like which pollutes the air and is injurious to plant and animal life and soils everything with which it comes in contact. This smoke, as it issues from the top of the flue or burner, is often very hot and will quickly burn out any metal guards or parts, with which it comes in contact thus making it substantially impossible to provide a successful metal device for cleaning the solid matter out of the smoke. Another problem in connection with the construction of a successful device of this nature is to provide a smoke cleaner which will remove the solid matter from the discharging gases without substantially impairing the draft efficiency of the stack or burner on which it is installed. My invention overcomes all of the difficulties hereinbefore pointed out by providing a smoke cleaning device which will remove substantially all of the solid matter from the smoke without substantially impairing the draft and which may be constructed of materials which are highly resistant to heat thus making a device which will last for a long period of time without burning out.

In the accompanying drawing Figure 1 is a view in vertical section, substantially on a broken line 1—1 of Fig. 2, of a smoke cleaning device constructed in accordance with my invention as the same may appear when installed on the top of a smoke stack or burner.

Fig. 2 is a horizontal section of the same substantially on broken line 2—2 of Fig. 1,

showing the screens and top of the stack in plan.

Referring to the drawing, throughout which like reference numerals designate like parts, I show the top end of a smoke stack which may comprise an outer metal casing 5 lined with fire brick 6 and which may be the top of the flue of a wood refuse burner or may be any other form of stack from which hot smoke and gases laden with solid matter issue.

In accordance with my invention I provide directly over the top of the smoke stack 5—6 an inverted dome of substantially semi-spherical shape formed preferably of an inner fire brick lining 7 and an outer covering 8 of concrete or like material. The fire brick at the lower end of said dome rest on an annular dome supporting member of annular cross section having a horizontal flange 9 and a vertical flange 10. The annular dome supporting member 9—10 is supported on brackets 11 which may be secured as by bolts 12 to the casing 5 of the stack and said annular supporting member is substantially flush with the top of the stack and is considerably larger in diameter than the exterior of the stack thereby leaving an annular opening 13 between the inner edge of the horizontal flange 9 and the exterior of the stack, which opening is subdivided into a plurality of segments by the brackets 11. The combined area of the segments which form the opening 13 is preferably greater than the cross sectional area of the flue to avoid creating back pressures.

If the smoke stack does not have an external metal jacket in the nature of the jacket 5 then a metal collar may be provided on the top of the stack to secure the dome to.

An annular downwardly inclined flange 14 is provided within the dome a short distance above the annular opening 13, said flange 14 overhanging said opening 13 in such a way as to direct soot and cinders and solid matter in all forms into the stack and prevent such solid matter from passing out through the opening 13. The flange 14 is preferably formed of fire brick which are longer than the brick used in building up the dome and which are laid in their order as the dome is built from the bottom up.

An annular guard 15 extends around the dome supporting angle member and is secured to the vertical flange 10 of said angle member and projects above and below said flange, 10. The upper edge of said guard 15 helps to support the base of the outer concrete layer 8. The lower edge of said guard 15 extends downwardly a substantial distance below the flange 9 and forms a wind or draft guard which prevents the wind from interfering with the discharge of smoke through the opening 13.

The several segments into which the opening 13 is divided by the brackets 11 are each provided with a screen 16, which is hinged as at 17 and is connected with a downwardly extending dump rod 18 by which it may be raised into the position shown by dotted lines at the left in Fig. 1, to dump any solid matter which may collect thereon into the stack. The dump rods 18 may extend down far enough so that they may be operated from the ground or they may be connected with cables 18′ operable from the ground by which they may be raised thus making the dumping of said screens a very simple and convenient operation.

In the operation of this smoke cleaning device the hot smoke and gases laden with hot cinders, soot, dust and like solid matter is discharged from the stack into the top of the dome where the velocity of the solid particles is arrested and the direction of movement of both the solids and gases is reversed. The gases pass downwardly through the space adjacent the inner edge of the firebrick guard ledge 14 and out through the screens 16 and openings 13 thus discharging downwardly around the outer circumference of the stack.

The solid matter which falls on the annular guard 14 drops off of the inner edge of said guard and falls back down the flue and any large particles of solid matter which may be caught by the discharging gases and carried over onto the screens will lodge on the screens and may later be dumped into the flue. Any solid matter which passes the screens is moving in a downward direction and will usually settle directly to the ground. Solid matter may pile up on the top of the annular guard 14 until it builds up an angle which is steeper than the angle of the ledge in case said ledge is not swept clean at all times by the rapidly moving gases. The arrows in Fig. 1, indicate approximately the path of the smoke and gases while the darts in dotted lines show the path of the greater portion of the solid matter. When an installation is made the necessary fire bricks 6 near the top of the lining of the stack are preferably removed to permit insertion of the bolts 12 which hold the brackets 11 and the uppermost fire bricks 6 in the stack are tapered as at 20, to form an expanding flue mouth which will assist in directing the solid matter back down the stack.

The fire brick lining 7 will withstand high temperatures without rapid deterioration and the guard member 14 will protect the screens from a direct blast of the heated gases and will distribute the heated gases to all of the screens thus prolonging the life of the only metal parts which are exposed to high heat. The gases are also cooled to a certain extent within the dome and are not so hot when they pass out through the screens. The concrete covering 8, which may be reinforced if de-

sired, will protect the fire bricks 7 against weathering and add to the strength of the dome.

The foregoing description and accompanying drawing clearly disclose a preferred embodiment of my invention but it will be understood that this disclosure is merely illustrative and that such changes in the invention may be made as are fairly within the scope and spirit of the following claims.

I claim:

1. In a smoke cleaning device of the class described, for use in connection with a smoke stack, an inverted bowl shaped dome supported above said smoke stack and having a bottom diameter greater than the diameter of the smoke stack to afford an opening around the top of the smoke stack through which the smoke may discharge downwardly, an annular guard member extending inwardly and downwardly from the walls of said dome at a distance above said smoke discharge opening and forming a shelf above said smoke discharge opening, the inner edge of said guard member being substantially flush with the outer edge of the top of said smoke stack whereby solid matter will be deflected toward the top end of said smoke stack and screens mounted for dumping movement and covering said smoke discharge opening.

2. In a smoke cleaning device of the class described, for use in connection with a smoke stack, an inverted bowl shaped dome supported above said smoke stack and having a bottom diameter greater than the diameter of the smoke stack to afford an opening around the top of the smoke stack through which the smoke may discharge downwardly, and screens mounted for dumping movement and covering said opening.

3. In a smoke cleaning device of the class described for use in connection with a smoke stack, an inverted bowl shaped dome supported above the discharge end of said smoke stack, said dome being lined with fire brick and the open end of said dome terminating substantially in the plane of the top of the stack and being of larger diameter than the stack to leave a smoke discharge opening around the top of said stack, screens covering said opening, means for lifting said screens into dumping position relative to said stack, and an annular guard member extending inwardly and downwardly from the wall of said dome at a distance above said smoke discharge opening.

4. In a smoke cleaning device of the class described, for use in connection with a smoke stack, a bowl shaped fire brick dome supported in inverted position above the discharge end of said smoke stack, the open end of said dome terminating substantially in the plane of the top of the stack and being of larger diameter than the stack to leave a smoke discharge opening around the top of said stack, an annular wind deflector at the bottom of said dome extending below said smoke discharge opening, screens covering said opening and hinged at the edge adjacent said stack, downwardly extending operating rods connected with said screens for tilting the same into dumping position relative to said stack, and an annular guard member extending inwardly and downwardly from the wall of said dome at a distance above said smoke discharge opening.

5. In a device for removing solid matter from smoke and hot gases, for use in connection with a smoke stack, brackets secured to the top end of said smoke stack and extending outwardly therefrom, a dome support carried by said brackets, a bowl shaped dome supported by said dome support in inverted position over the top end of said smoke stack, the open bottom end of said dome being of larger internal diameter than the exterior of said stack to leave an annular opening through which the smoke may discharge downwardly, pivotally mounted screens covering said smoke discharge opening, means operable from the ground at the base of said stack for dumping said screens and an annular guard member extending inwardly and downwardly from the wall of said dome at a distance above said smoke discharge openings, the inner edge of said guard member overhanging the inner edge of said smoke discharge opening.

6. In a device for removing solid matter from smoke and hot gases, for use in connection with a smoke stack, brackets secured to the top end of said smoke stack and extending outwardly therefrom, an annular dome support of angle shaped cross section carried by said brackets, a bowl shaped dome carried by said dome support in inverted position over the top end of said smoke stack, the open bottom end of said dome being of larger internal diameter than the exterior of said stack to leave an annular opening through which the smoke may discharge downwardly, an annular wind guard secured to said dome support and extending below the bottom edge thereof, pivotally mounted screens covering said smoke discharge opening, means for dumping said screens and an annular guard member extending inwardly and downwardly from the wall of said dome at a distance above said smoke discharge openings.

7. In a device for removing solid matter from smoke and hot gases, for use in connection with a smoke stack, a bowl shaped dome supported in inverted position over the top end of said smoke stack to leave a downwardly directed smoke discharge opening around the exterior of said smoke stack said dome being made of fire brick, one layer of said firebrick being substantially longer than

the adjacent layers to form a guard member which extends inwardly and downwardly at a distance above said smoke discharge opening and a covering of concrete on the exterior of said fire brick.

In testimony whereof I affix my signature.

JOSEPH MITCHELL.