April 29, 1958 S. B. HANSEN 2,832,585

AIR COOLED DAMPER CONSTRUCTION FOR FOUNDRY CUPOLA COOLING TOWERS

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FIG. 1.

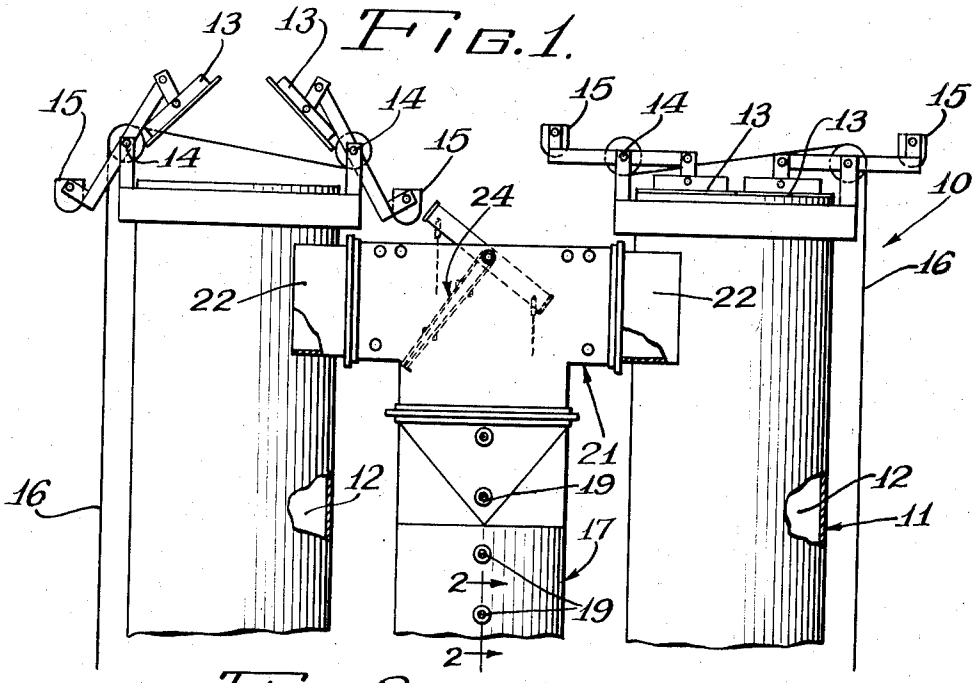



FIG. 2.

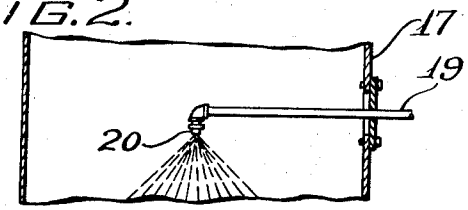



FIG. 3.

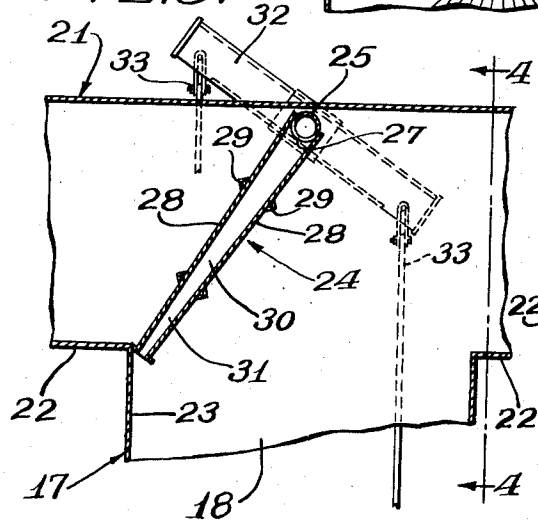
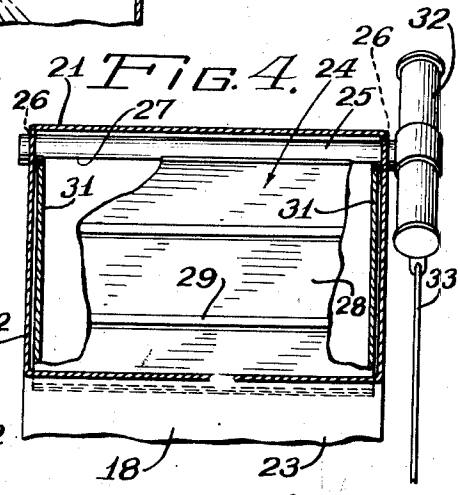



FIG. 4.




Inventor:
Svend B. Hansen
Paul O. Pippel Atty.

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# AIR COOLED DAMPER CONSTRUCTION FOR FOUNDRY CUPOLA COOLING TOWERS

Svend B. Hansen, Chicago, Ill., assignor to International Harvester Company, a corporation of New Jersey

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7 Claims. (Cl. 266—31)

This invention relates to a cooling tower for foundry cupolas and more particularly it relates to a damper construction for use in connection with a cooling tower arrangement associated with melting furnaces.

The present invention concerns, particularly, a foundry cupola arrangement wherein two furnaces are positioned in adjacent relation. The furnaces are suitably capped at their upper ends and are associated with a cooling tower which directs the hot gases from the cupolas to a suitable filtering apparatus such as is used in smoke and dust abatement normally associated with installations of this type. In such installations, a cooling tower is connected at its upper end by means of a T-connection to the discharge portions of the adjacent cupolas or furnaces. The cooling tower includes suitable washer or gas cooling means in the form of sprays which washes, cools and conditions the gas as it is discharged from the cupolas to the cooling water. In order to withdraw the gases, which are extremely hot, and under pressure, the cooling tower is suitably connected to a source of suction such as a high efficiency suction device which also has suitable means for filtering the dust and debris from the gases which are discharged thereto. In this manner the cupola operations are less objectionable since the gases and combustion products are not discharged to the atmosphere, but are instead filtered and suitably cleaned. In the operation of double cupolas and furnaces of this type it is generally the practice to operate the cupolas alternately. In other words, during the operation of one cupola, the other cupola is closed with respect to the chamber of the cooling tower. For this purpose numerous types of dampers have been provided and in general such dampers have done a satisfactory job for a short period of time. However, in view of the high temperatures of the gases as they are discharged from the cupola, it has been found that the dampers have been of extremely short life since warping and deterioration of the dampers results in a relatively short time. The high temperatures of the gases which impinge or surround the dampers causes the dampers to deteriorate rapidly and thus their useful life is greatly decreased. It is a prime object of this invention, therefore, to provide an improved damper construction for foundry cupolas and cooling tower arrangements.

A still further object is to provide an improved cupola construction and gas cooling arrangement having an improved air cooled damper construction.

A still further object is to provide an improved air cooled damper for the cooling towers of cupolas, the said damper having passage provisions adapted to direct air from the atmosphere through the damper for cooling the same to prevent excessive wear and warpage resulting from the high heats to which the damper is subjected.

Still a further object is the provision of an improved air cooled damper for foundry constructions, the said damper comprising a plurality of spaced plates suitably connected together to form a passage in communication with the atmosphere, whereby the said passage may receive air from the atmosphere which may be directed through the plates to sufficiently cool the same and to prevent their warpage during the normal use of said plates in the damper operation.



These and further object will become more readily apparent from a reading of the specification when examined in connection with the accompanying sheet of drawing.

In the drawings:

Figure 1 is a side elevational view, with certain portions broken away, of a metal smelting device comprising a pair of spaced furnaces or cupolas suitably connected to a cooling tower, the said arrangement including an improved air cooled damper construction;

Figure 2 is a detail sectional view taken substantially along the line 2—2 of Figure 1 showing one detail of a gas cooling tower;

Figure 3 is a cross sectional enlarged view of a damper construction showing portions of a T-connector or connection for a cooling tower and cupola construction;

Figure 4 is a cross sectional view taken substantially along the line 4—4 of Figure 3.

Referring now particularly to Figure 1, a metal melting device is generally designated by the reference character 10. The metal smelting device 10 comprises a pair of laterally spaced cupolas or furnaces 11 of generally tubular construction, each of the same having a chamber 12. The cupolas or furnaces 11 may be of any conventional design for containing molten metal, coke, fluxes, and other ingredients designed to suitably melt metal materials which may be contained in the units. Each of the furnaces or cupolas 11 comprises a plurality of cupola caps 13 which are pivotally supported, as indicated at 14, to the upper ends of the cupola 11 and which may be suitably counter-weighted by means of counterweights 15. These cupola caps 13 are normally in a closed position, as indicated in the right-hand furnace 11 of Figure 1, the said cupola caps also being suitably controlled by means of cables 16. Further description of the cupola caps is unnecessary, since this is standard construction, and forms no part of the present invention.

The cupolas or furnaces 11 are provided with a gas cooling tower of tubular construction designated generally at 17. The gas cooling tower 17 comprises a chamber 18, the said chamber being in communication with a suitable suction and filtering device, the same not being shown, since it forms no part of the present invention. Sufficient to say, the suction device and filtering apparatus is designed to draw gases from the upper ends of the furnaces 11 to a suitable cleaning medium whereby the said gases are completely cleaned before they are discharged to the atmosphere or suitable containing devices. The cooling tower 17 includes a plurality of transversely extending tubes 19 which suitably support spray devices 20 designed to spray the interior of the chamber 18 and to cool, clean and condition gases which are drawn through the said chamber.

The upper ends of the cupola or furnace 11 are provided with a T-shaped connector generally designated at 21. The T-shaped connector 21 comprises a pair of opposed ducts 22 which are adapted to communicate with a vertical duct 23. The opposed ducts 22 are in communication with the upper ends of the cupola or furnace 11 and either one of the ducts may be placed in communication with the vertical duct 23 depending upon the position of a damper construction generally designated at 24.

The damper construction 24 is of an air cooled design and comprises generally a tubular member 25 which is pivotally supported in openings 26 disposed in the T-shaped connector 21, as particularly shown in Figure 4,

The openings 26 thus serve to journal the tubular member 25, it, of course, being understood that the tubular member 25 also may be suitably supported by other pivotal means such as bearings, journal members, not shown.

The tubular member 25 is provided at its lower end, as best shown in Figure 3, with a slot or opening 27. The damper 24 also comprises a pair of laterally spaced plates 28 which are suitably connected at their upper ends to the tubular member 25. The plates 28 extend downwardly in converging relation and they are suitably reinforced at their outer surfaces by means of a plurality of beads 29. The plates 28 form an air cooling passage 30 and the said passage 30 is suitably enclosed by means of side or end plates 31 suitably connected to the opposite ends of the plate 28. Thus the passage 30 is in communication with the slot 27 and is also in communication with the chamber 18 so that air may be directed through the open ends of the tubular member 25 through the passage 30 and into the interior of the chamber 18.

In the operation of a metal melting device 10 of the type indicated only one furnace 11 is utilized at one time and thus the damper 24 is positioned to shut off the other cupola 11, as shown in Figure 1. In Figure 1 the left-hand cupola 11 is not in operation and thus the damper 24 is swung to the position indicated with respect to the T-shaped connector 21. In this position the furnace 11 disposed on the right-hand side is in operation and gas from the upper end of said furnace is discharged through one of the ducts 22 to the chamber 18 and from there to a suitable cleaning and suction device.

The damper is swung to the position 24 by means of a pivot arm 32 which is suitably connected to the tubular member 25. A cable mechanism 33 is connected to the pivot arm 32 for suitably changing the swinging position of the damper construction 24. In other words, the damper construction 24 may be swung to a position opposite to that shown in Figure 1 when it is desired to place the left-hand furnace 11 into operation, whereupon the right-hand furnace is inoperative.

In view of the high temperatures of the gases as they leave the upper ends of the furnaces, the conventional dampers soon become inoperative and do not effectuate proper closing of the openings in view of warping and other reasons. This is eliminated by applicant's novel design wherein the damper 24 comprises the air cooling passage 30 which permits air to enter into the open ends of the tubular member 25 through the slot 27 and through the passage 30 down into the chamber 18. This air is quick to enter through the passage 30 since the suction within the chamber 18 causes downward movement of the gases and discharge from the cooling tower 17.

Thus it is obvious that during operation the damper construction 24 is constantly cooled by cool air and thus warpage of the plates 28 is greatly minimized. Such a damper construction will out-perform any of the conventional designs and maintenance is held at a minimum.

It is thus obvious that the objects of the invention have been fully achieved and that an improved damper construction has been described and disclosed. It must be understood that changes, variations, and modifications may occur which are definitely within the scope of the present invention as set forth in the appended claims.

What is claimed is:

1. In a metal melting device comprising a pair of upright furnaces having gas discharge openings adjacent their upper ends, a gas cooling tower including an elongated tubular structure adapted to be connected to a suction generating means for discharging gases from said tower, a gas inlet opening adjacent the upper end of said tower, a T-shaped connector adjacent the upper end of said tower, said connector including a pair of horizontally opposed ducts, each duct communicating with one of said gas discharge openings, and a vertical duct on said connector communicating with said opposed ducts and the upper end of said cooling tower; a damper construction disposed in said connector, said damper construction comprising an open end tubular member, means pivotally connecting said tubular member on said connector between said horizontally opposed ducts and substantially centrally with respect to the vertical duct, said tubular member having at its lower end an elongated slot, a pair of laterally spaced plates connected to said tubular member for pivotal movement therewith, said plates extending downwardly in non-parallel relation whereby an extension of the plane from one end of one plate will intersect an extension of a plane from the end of the other plate, said plates providing an air passage communicating at its upper end with said slot and at its lower end with said cooling tower to provide cooling means for said damper, and means for pivoting said damper whereby either of said opposed horizontal ducts may be closed with respect to said vertical duct.

2. In a metal melting device comprising a pair of upright furnaces having gas discharge openings adjacent their upper ends, a gas cooling tower including an elongated tubular structure adapted to be connected to a suction generating means for discharging gases from said tower, a gas inlet opening adjacent the upper end of said tower, a T-shaped connector adjacent the upper end of said tower, said connector including a pair of opposed ducts, each duct communicating with one of said gas discharge openings, and a third duct on said connector communicating with said opposed ducts and the upper end of said cooling tower; a damper construction comprising an open end tubular member, means pivotally connecting said tubular member on said connector between said horizontally opposed ducts, said tubular member having at its lower end an elongated slot, a pair of laterally spaced plates connected to said tubular member for pivotal movement therewith, said plates extending downwardly in converging relation whereby an extension of the plane from one end of one plate will intersect an extension of a plane from the end of the other plate, said plates providing an air passage communicating at its upper end with said slot and at its lower end with said cooling tower to provide cooling means for said damper, and means for pivoting said damper whereby either of said opposed horizontal ducts may be closed with respect to said vertical duct.

3. In a metal melting device comprising a pair of upright furnaces having gas discharge openings adjacent their upper ends, a gas cooling tower including an elongated tubular structure adapted to be connected to a suction generating means for discharging gases from said tower, a gas inlet opening adjacent the upper end of said tower, a connector adjacent the upper end of said tower, said connector including a pair of opposed ducts, each duct communicating with one of said gas discharge openings, and a third duct on said connector communicating with said opposed ducts and the upper end of said cooling tower, a damper construction disposed in said connector said damper construction comprising an open end tubular member, means pivotally connecting said tubular member on said connector between said horizontally opposed ducts, said tubular member having at its lower end an opening, a pair of laterally spaced plates connected to said tubular member for pivotal movement therewith, said plates extending downwardly in converging relation whereby an extension of the plane from one end of one plate will intersect an extension of a plane from the end of the other plate, said plates providing an air passage communicating at its upper end with said opening and at its lower end with said cooling tower to provide cooling means for said damper, and means for pivoting said damper whereby either of said opposed horizontal ducts may be closed with respect to said vertical duct.

4. In a metal melting device comprising a pair of upright furnaces having gas discharge openings adjacent their upper ends, a gas cooling tower including an elon-

gated tubular structure adapted to be connected to a suction generating means for discharging gases from said tower, a gas inlet opening adjacent the upper end of said tower, a connector adjacent the upper end of said tower, said connector including a pair of opposed ducts, each duct communicating with one of said gas discharge openings, and a third duct on said connector communicating with said opposed ducts and the upper end of said cooling tower, a damper construction disposed in said connector, said damper construction comprising an open end tubular member, means pivotally connecting said tubular member on said connector between said horizontally opposed ducts, said tubular member having at its lower end an elongated slot, a pair of laterally spaced plates connected to said tubular member for pivotal movement therewith, whereby an extension of the plane from one end of one plate will intersect an extension of a plane from the end of the other plate, said plates providing an air passage communicating at its upper end with said slot and at its lower end with said cooling tower to provide cooling means for said damper, and means for pivoting said damper whereby either of said opposed horizontal ducts may be closed with respect to said vertical duct.

5. In a metal melting device comprising a pair of upright furnaces having gas discharge openings adjacent their upper ends, a gas cooling tower including an elongated tubular structure adapted to be connected to a suction generating means for discharging gases from said tower, a gas inlet opening adjacent the upper end of said tower, a connector adjacent the upper end of said tower, said connector including a pair of opposed ducts, each duct communicating with one of said gas discharge openings, and a third duct on said connector communicating with said opposed ducts and the upper end of said cooling tower; a damper construction disposed in said connector, said damper construction comprising an open end tubular member, means pivotally connecting said tubular member on said connector between said horizontally opposed ducts, said tubular member having an opening, a pair of laterally spaced plates connected to said tubular member for pivotal movement therewith, whereby an extension of the plane from one end of one plate will intersect an extension of a plane from the end of the other plate, said plates providing an air passage communicating at its upper end with said opening and at its lower end with said cooling tower to provide cooling means for said damper, and means for pivoting said damper whereby either of said opposed horizontal ducts may be closed with respect to said vertical duct.

6. In a metal melting device comprising a pair of upright furnaces having gas discharge openings adjacent



their upper ends, a gas cooling tower including an elongated tubular structure adapted to be connected to a suction generating means for discharging gases from said tower, a gas inlet opening adjacent the upper end of said tower, a connector adjacent the upper end of said tower, said connector including a pair of opposed ducts, each duct communicating with one of said gas discharge openings, and a third duct on said connector communicating with said opposed ducts and the upper end of said cooling tower; a damper construction disposed in said connector, said damper construction comprising an open end tubular member, means pivotally connecting said tubular member on said connector between said horizontally opposed ducts, said tubular member having an opening, a pair of laterally spaced plates connected to said tubular member for pivotal movement therewith, whereby an extension of the plane from one end of one plate will intersect an extension of a plane from the end of the other plate, said plates providing an air passage communicating with said opening and with said cooling tower to provide cooling means for said damper, and means for pivoting said damper whereby either of said opposed horizontal ducts may be closed with respect to said vertical duct.

7. A damper construction for alternately opening and closing a duct leading to a chamber, the duct being adapted to convey heated fluids under pressure with respect to said chamber comprising; a support associated with said duct, a tubular member pivotally mounted on said support, said tubular member having an inlet opening in communication with the atmosphere, a pair of laterally spaced plate members connected to said tubular member, said plates being positioned in relative angled relation whereby an extension of the plane from one end of one plate will intersect an extension of a plane from the end of the other plate, end walls connecting said plate members to provide with said plate members a passage communicating with said inlet opening and with said chamber to provide air cooling means for said damper, and means connected to said tubular member for pivoting said damper to open and closed positions with respect to said duct, whereby in either position of said damper, air may flow through said passage for cooling said damper.

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