March 1, 1932. S. WARD 1,847,736

METHOD AND APPARATUS FOR EXHAUSTING MOISTURE LADEN GASES

Filed Nov. 2, 1929

FIG. 1

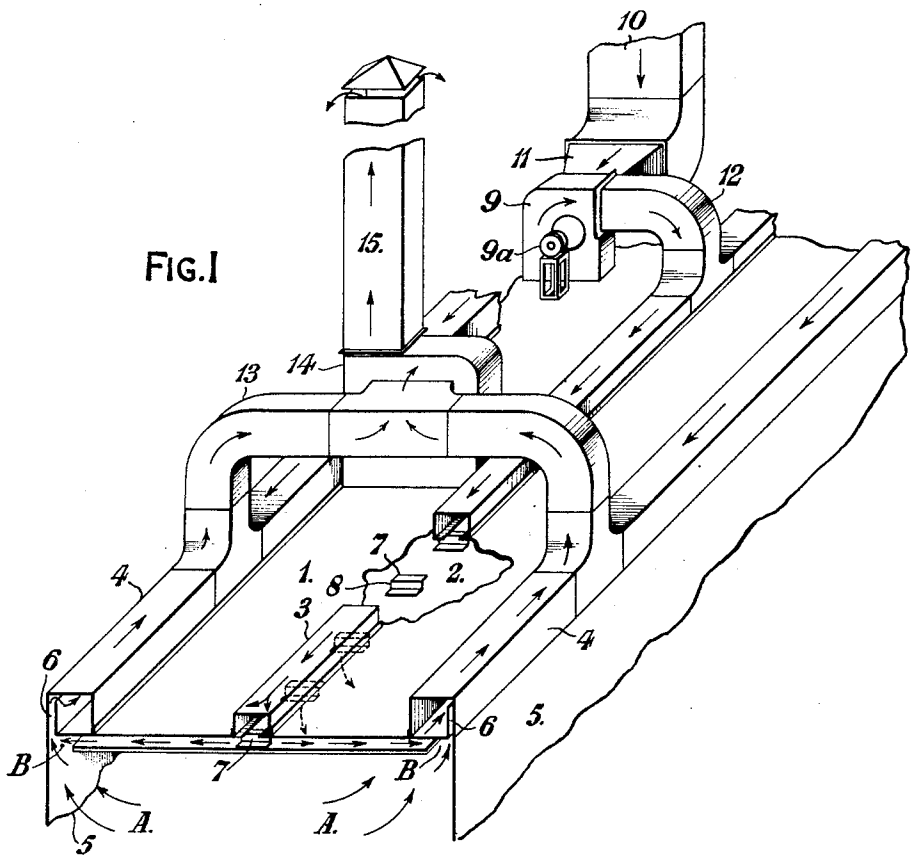


FIG. 2.

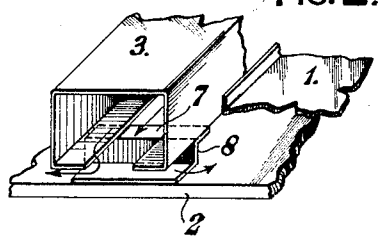
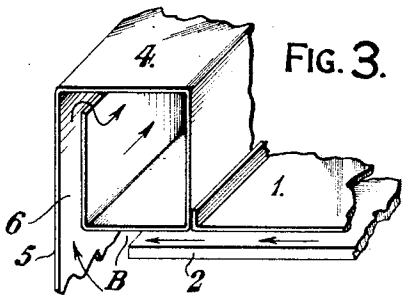


FIG. 3.



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METHOD AND APPARATUS FOR EXHAUSTING MOISTURE LADEN GASES

Application filed November 2, 1929, Serial No. 404,436, and in Great Britain September 30, 1929.

This invention relates to methods and apparatus for exhausting moisture laden gases, and has for its object to completely eliminate condensation from the gases exhausted and to effect the exhaustion in a simple, cheap and effective manner, and to obtain an even exhaustion.

A method of exhausting moisture laden gases according to the present invention consists in forming an outer (preferably overhead) heat radiating layer for the gas and drawing off the warm moisture laden gas through a mixing chamber wherein further warm relatively dry gas is admixed with the warm moisture laden gas so as to obtain a volume for exhaust having a lesser relative humidity value than the moisture laden gas, and such that condensation is entirely eliminated.

Preferably the relatively dry warm gas is directed on to a heat retaining body disposed in the outer (preferably upper) regions of the gas to be exhausted, thereby forming a conduit for the relatively dry gas, terminating in the mixing chamber so that the dry gas first gives up heat to the radiating body and then is admixed to create a volume of gas for exhaust which cannot be lowered to dew point temperature in the exhausting system.

Preferably an attenuated mixing chamber is employed so that the moisture laden gas is drawn over an area corresponding to one dimension of the enclosure in which the gas is, thereby an even exhaustion obtains.

In the preferred form of construction according to the invention the heat radiating body is disposed near the ceiling of the enclosure for the gas to be exhausted, though the body may be disposed vertically, for instance in juxtaposed relation to a wall of a building.

Apparatus according to the invention comprises means for heating the air in the enclosure above dew point temperature and for supplying warm relatively dry air to the air drawn from the enclosure, whereby a volume for exhaust is obtained at a relative humidity preventing condensation in the system.

Preferably the apparatus includes a heat radiating plate disposed in juxtaposed relation and parallel or substantially parallel to the ceiling or wall of an enclosure, the said ceiling or wall comprising or being provided with a central duct of a length corresponding to one dimension of the wall for the supply of warm air into the space between the radiating body and the wall, and an exhaust duct to each side of said supply duct, said heat radiating body terminating near the exhaust duct in a mixing chamber in which the air to be exhausted and the warm air supplied through the supply duct is mixed prior to entering the exhaust duct.

Preferably the exhausting apparatus including supply ducts and exhaust ducts is in the form of a hood, and as such may be employed for exhausting moisture laden air from machines such as paper making machines, and in order that the invention may be more clearly understood this application of the invention and the preferred form of apparatus therefor will now be described with reference to the accompanying drawings; in which:—

Fig. 1 is a pictorial and more or less diagrammatic view of the apparatus; and

Figs. 2 and 3 show detail constructions of the supply and exhaust ducts respectively.

Referring to the drawings, the hood comprises an outer plate 1 and an inner plate 2 in spaced relation therewith, and conveniently suspended from the outer plate. The outer plate is comprised in two longitudinal parts which connect the central supply duct 3 and two exhaust ducts 4. The supply duct and the exhaust ducts are of a length dependent on the machine to be covered, and necessarily also the distance between the supply and exhaust ducts is variable according to the application of the apparatus.

The hood comprises side plates 5 which conveniently depend from the exhaust ducts, the amount of the extension again depending on the machine over which the hood device is applied.

The exhaust ducts are of scroll form providing an attenuated slot 6 between the duct itself and the side plate 5 so that air exhausted from within the hood has to pass

up through the slot 6 and into the duct and an even exhaustion obtained.

The supply duct has on the underside an opening 7 extending for the length thereof, and the air supplied to the duct passes down through this slot through the whole length thereof and is distributed to the side ducts 4 by the long flat ducts constituted between the outer plate 1 and the inner plate 2, which inner plate, as shown in Fig. 1, is conveniently suspended from the supply duct by Z-shaped angle bars 8.

The inner plate 2 constitutes the heat radiating body according to the present invention and obtains its heat from the air supplied through ducts 3, and the plate 2 is disposed as close as possible to the outer plate 1 so that a minimum volume of warm air is employed commensurate with heating the inner plate and supplying the volume to exhaust whereby condensation is eliminated.

The warm air may be supplied to the duct 3 by a fan 9, carried on any suitable form of support indicated at 9*a*, which pulls atmospheric air through an inlet 10 and a heater 11, which latter may comprise coils through which heating medium such as steam is circulated, and over which the air pulled in by the fan passes, the fan pushing the air through the elbow 12 into duct 3 from whence it passes through the whole length thereof through slots 7 to the ducts 4.

The exhaustion from the enclosure within the hood may be effected by connecting the ducts 4 by a breeches piece 13 connected to an exhausting fan 14 which pulls the air from the exhaust ducts 4 and distributes it through the outlet duct 15 to atmosphere.

In operation the fan 14 pulls the air from the enclosure towards the slot 6 as indicated by arrows A, at the same time the fan 9 is supplying warm air to the duct 3. This air in passing to the exhaust ducts 4 warms the plate 2 and heat is radiated to the air to be exhausted and after passing over the plate 2 this warm and relatively dry air passes to the slot 6 of the outlet ducts.

It will be seen therefore that just outside the slot 6, that is between the plate 2 and the side plates 5 of the hood, an attenuated mixing chamber indicated by the reference B is in fact formed, and at these areas B there is a definite admixture of the exhausted air and the warm relatively dry air supplied by fan 9.

By such an arrangement and by controlling the volume of air supplied by the fan, or the temperature of such air, or both, the moisture laden air in the enclosure beneath the hood is heated by radiation from the body 2 so that it is raised above condensation temperature, whilst the admixture obtaining at the mixing chambers B produces a volume for exhaust which is not reduced to dew point temperature during its passage through the ducts to exhaust, thereby condensation within the hood itself and within the exhaust ducts is entirely eliminated, further, an even exhaustion obtains.

By the employment of such form of apparatus a great saving in the product of paper making machines is attained especially at starting up periods, by the elimination of drops from a ceiling on to the paper, and consequently maintenance of efficiency for the machine is assured at very little expenditure as the amount of air supplied by the duct 3 is as small as possible.

Moreover the hood installation is as simple as possible and there are no parts to get out of order.

The inner plate 2 may be a plane member preferably as shown parallel to the outer plate 1, though a slight angular relation may be obtained, and may be made of wood, glass, sheet iron, asbestos, cement or other suitable heat retaining and radiating substance, and may be corrugated to obtain strength, the essential feature in selecting the material is to assure that rust cannot take place. If it is desired for purposes of strength to use a metal such as iron this may be embedded in a coating to prevent atmospheric effects.

By employing connecting means such as the angle bars 8 a baffling effect is obtained helping the distribution of the air supplied through the duct 3 to the ducts 4.

Although the apparatus described is shown in the form of a hood, the hood may be in fact attained by incorporating the construction in a building so that the roof constitutes the outer plate 1, and the side walls the depending plates 5, or alternatively the upper and lower plates, supply and exhaust ducts may be arranged between the walls of a building at a predetermined height above the floor space thereby providing a hood construction to the enclosure for the treatment of the air.

Similarly, instead of employing the outer and inner plates in horizontal position the construction can be obtained by disposing them in vertical position so that the ceiling and floor of a room are substituted for the side plates 5, and a wall of the room for the outer plate, the ducts 4 being at the ceiling and floor levels of the enclosure.

The construction according to the invention may be applied for the exhaustion of air from machines such as dyeing machinery or boiling vats, or when incorporated in a building may form the ceiling of a laundry.

In all constructions the arrangement provides an even exhaustion from the enclosure and the entire prevention of condensation.

As regards its application to paper machinery, it may also be mentioned that a hood construction acording to the invention may be employed over a machine drying paper pulp, to assure exhaustion of the moisture laden air employed for that purpose.

What I claim is:

1. Apparatus for exhausting air from an enclosure comprising a heat radiating plate disposed in juxtaposed relation and substantially parallel to a wall of the enclosure, the said wall including a central duct of a length corresponding to one dimension of the wall for the supply of warm dry air into the space between the radiating plate and the wall, and an exhaust duct to each side of said supply duct, said heat radiating body terminating near the exhaust duct in a mixing chamber in which the air to be exhausted and the warm air supplied through the supply duct is mixed prior to entering the exhaust duct.

2. Apparatus for exhausting air from an enclosure comprising a heat radiating plate disposed in juxtaposed relation and substantially parallel to a wall of the enclosure, the said wall including a central duct of a length corresponding to one dimension of the wall, an admission opening into the enclosure for the length thereof for the supply of warm air into the space between the radiating plate and the wall, an exhaust duct to each side of said supply duct, said heat radiating body terminating near the exhaust ducts, and side plates extending from said exhaust ducts forming with the said wall mixing chambers for the moisture laden air and the dry air, whereby attenuated outlets from the enclosure for the mixture are formed and an even exhaustion from the enclosure obtained.

3. Apparatus for exhausting moisture laden air from an enclosure in the form of a hood comprising a roof, a central supply duct opening into the hood for the length thereof, an inner plate spaced from said roof and forming between the said plate and roof an attenuated conduit leading from said supply duct, exhaust conduits formed in the roof for the length thereof with admission openings contiguous to side walls of the hood, means for supplying warm dry air to said supply duct and means for exhausting air from the enclosure through said exhaust ducts, said inner plate extending towards said side walls of the hood so that an attenuated mixing chamber for the supplied dry air and the moisture laden air of the enclosure is formed contiguously to the exhaust outlets.

4. Apparatus for exhausting moisture laden air in the form of a hood comprising a flat roof slotted centrally for the length thereof, a duct over said slot and means for supplying dry air through said duct and through said longitudinal slot, means for exhausting air from within the said enclosure including outlets formed by spacing the longitudinal edges of the roof from the side walls of the hood, a plate suspended from said roof extending for the length thereof and nearly to the side walls of the hood, thereby forming a long flat duct between the supply duct and the exhaust outlets one wall of which is the plate suspended from the roof, whereby the plate is heated by the incoming dry air and the moisture laden air is mixed with the dry air prior to passing through the outlets to said exhaust conduits.

5. Apparatus for exhausting moisture laden air in the form of a hood comprising a roof slotted for the length thereof and covered by a duct, means for supplying dry air through said duct and said slot, exhaust ducts in said enclosure of scroll form the opening between said enclosure and said exhaust ducts extending for the length of the roof and being contiguous to the side walls of the hood, whereby attenuated outlets are formed, a plate suspended from said roof and in close relation therewith extending for the length of the roof and towards the side walls of the hood so as to direct into the inlets of the exhaust ducts the warm air directed on to said suspended plate from the supply duct, the arrangement being such as to provide a mixing chamber for the moisture laden air with the dry air contiguously to the inlets to the exhaust.

6. Means for ventilating a building, comprising a flat ceiling, a supply duct opening for the length thereof into the building, means for supplying dry air into said building, a plate in substantially parallel relation with said ceiling spaced therefrom below said supply duct and extending towards the side walls of the building, exhaust ducts formed in said ceiling, opening for the length thereof into said building, disposed contiguously to the side edges of said plate, whereby the warm dry air is directed by said plate to said exhaust ducts, plates depending from the outside wall of said ducts past the plate below said supply duct and means for drawing the air from the enclosure through an exhaust opening between said plate and said side plates, the arrangement being such that the dry air is mixed with the moisture laden air prior to exhaustion in the attenuated mixing area formed between the side plates, the plates suspended from the ceiling and the opening to the exhaust ducts.

7. A hood construction for withdrawing moisture laden air from machines comprising means for supplying dry air through the roof of the hood for the length thereof, a plate below said roof for distributing such warm air to the sides of the hood, exhaust ducts at the sides of the hood with openings to the enclosure extending for the length thereof, and means for drawing off the air in the enclosure through said exhaust ducts.

8. A hood construction for withdrawing moisture laden air from machines comprising means for supplying dry air through the roof of the hood, including a heater and means for drawing atmospheric air through said heater prior to passing through the hood,

a plate below said roof for distributing said warm air to the sides of the hood, exhaust ducts at the sides of the hood with openings to the enclosure extending for the length thereof and means on the roof for drawing off air in the enclosure through said exhaust ducts.

In testimony whereof I affix my signature.

STANLEY WARD.