

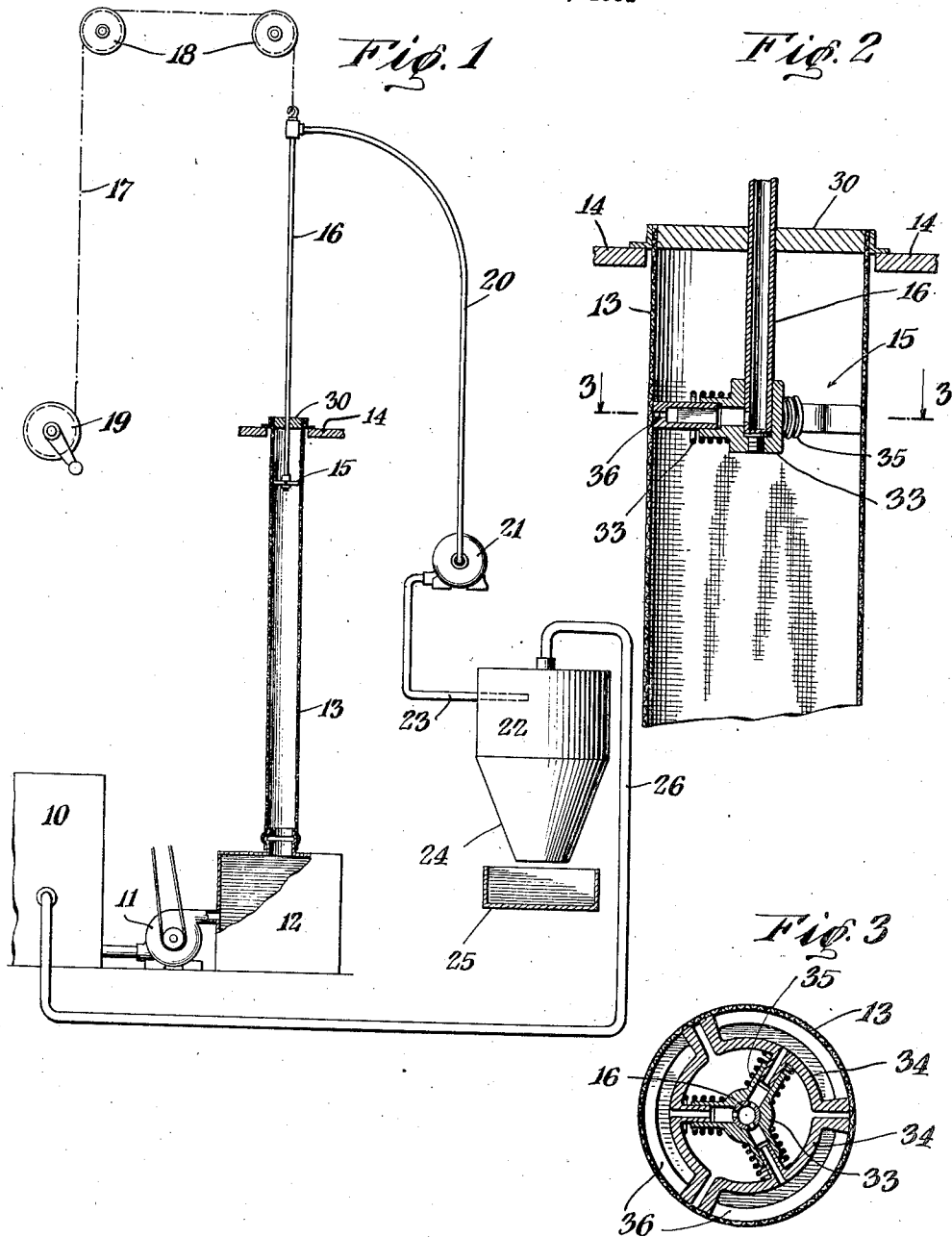
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FILTERING

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UNITED STATES PATENT OFFICE

1,944,267

FILTERING

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7 Claims. (Cl. 183—61)

The invention relates to the separation of solids from gases in which they are suspended, and more particularly to bag houses such as are used in connection with the smelting and refining of metals.

According to one form of practicing the invention, the gas containing the fume in suspension is passed into the inside of a bag, the gas passing through the bag and the fume being deposited on the inside surface. A suitable suction head is applied locally to the inside surface of the bag and connects with a suction blower for withdrawing the deposited solid particles from the bag into a second separating device where the fume is separated from the comparatively small amount of gas which carries it. If desired, the gas from the second separating device may be recycled back into the original source of fume and gas. The removal of the deposited particles from the inside surface of the bag is preferably carried on without interrupting the main gas flow through the remainder of the bag, but if desired, this flow may be discontinued while the deposited particles are being removed.

If desired, means may be provided to yieldably expand the suction head against the interior of the bag to maintain a tight relation between the bag and the suction head. Also, the separating device for finally separating the fume from the gas may be of the cyclone type in which the solid particles are separated from the gas by the use of centrifugal force.

The invention also consists in certain new and original features hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawing forming a part thereof, in which

Fig. 1 illustrates diagrammatically a system according to the invention;

Fig. 2 is an enlarged sectional detail of the upper end of the bag; and

Fig. 3 is a section on the line 3—3 of Fig. 2.

In the drawing accompanying and forming a part of this specification a practical embodiment of the invention is disclosed, but it will be understood that such illustration is primarily for purposes of disclosure and that the construction and method of operation may be modified in various

respects without departure from the broad principle and scope of the invention as hereinafter defined and claimed.

In the following description and in the claims parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

Like reference characters denote like parts in the several figures of the drawing.

Referring now to the drawing, the main flue which contains the solid particles and the gas in which they are suspended is denoted by 10. This mixture of gas and fume may result from any of the well-known metallurgical processes which produce this material. A fan or blower 11 is provided to force the mixture of fume and gas into a header 12 which may be located in the bag house. A plurality of suitable bags 13 are provided, being connected to the header 12 as indicated. These bags may be wool or other suitable material well known in the art. The bags which may be relatively long and narrow are suspended from suitable structural members indicated by 14.

Slidably mounted within the bag 13 is a suction head 15 connected to a pipe or other rigid conduit 16 passing through the closed end of the bag 13. A cable 17 riding on suitable pulleys 18 and connected to a hoist or windlass 19 is also connected to the upper end of the pipe 16 for moving the head 15 the entire length of the bag.

Connected to the pipe 16 is another conduit 20 which may be in the form of a flexible hose which is connected to a second fan or blower 21 which feeds a separating device 22.

The separating device 22 may be of the so-called cyclone type and the feed pipe 23 may enter the circular drum of the separator tangentially. The separator is formed with a conical lower portion 24 which empties into a suitable receptacle 25. From the top of the separator 22 a conduit 26 may be provided to recycle the excess gas bag into the main flue 10.

The upper end of the bag is closed by a suitable disc 30 through which the pipe 16 passes. Suitable means, such as a close sliding fit, may be provided for maintaining a reasonably tight joint between the pipe 16 and the disc 30.

The suction head 15 may be made in sections 34, each of which is telescopically connected to a center hub 33 which is connected to the pipe 16. Individual coil springs indicated by 35 may be provided to yieldably hold the sections 34 against the bag 13. The sections 34 have elongated open-

ings indicated by 36 for communicating with the surface of the bag to remove the deposited solid particles therefrom.

As an example of a condition under which the invention may be practiced, the source of gas and fume in the flue 10 may contain anywhere from 3 pounds to 50 pounds of dust or fume per 100,000 cubic feet. The blower 11 may compress the fume and gas in the header 12 to a pressure of from 1 inch to 1½ inches of water, and may feed the gas through the bag 13 at rates varying from 1,000 to 1,500 cubic feet per minute per bag with bags of the order of 18 inches in diameter and 30 feet in length. The gas on the outside of the bags 13 is at substantially atmospheric pressure and may be wasted or may be connected to any suitable reclaiming apparatus for extracting any remaining values therein.

This causes the fume to be deposited on the inside surface of the bag 13. The suction head 15 is then moved up and down the length of the bag 13. The exhaust fan 21 causes a reduced pressure in the header 15. The atmospheric pressure outside the bag causes the deposited fume which is subjected to the suction head 15 to be removed and to be carried into the separator 22 where the fume is separated from the comparatively small amount of gas which carries it. If desired, the excess gas which may contain a small amount of fume may be recycled through the pipe 26 into the flue 10, or this step may be omitted and the excess gas from the pipe 26 may be wasted.

The mixture of gas and fume which is carried to the separator 22 has been enriched so that this mixture may comprise in the order of 200 pounds of fume per 100,000 cubic feet of gas.

Thus, it will be seen that the separation of the fume from gas is carried on in two steps: First, the separation of the fume from the larger volume of gas; second, the separation of the fume from the smaller volume of gas. An advantage of the present method is that the blower 11 does not have to be stopped while the fume is being removed from the bag although, of course, if desired the passage of gas through the bag 13 may be stopped during removal of the fume. Furthermore, the fume is removed more or less continuously so that the bag is kept cleaner, resulting in a larger handling capacity for the same size bags.

In case the fume is removed more or less continuously by the suction head from the bag, thereby obviating the necessity of stopping the blower 11 from time to time, the additional operating advantage is obtained of keeping the pressure in the header 12 constant. Since the fume is removed continuously, there is no chance for the pressure to build up, as always occurs when the fume is allowed to accumulate. Furthermore, as the dust content in the gas passing into the header changes, the speed of dust removal from the interior of the bags can be changed correspondingly either by changing the amount of vacuum or the speed of travel of the suction head.

By the method above described the optimum point of resistance pressure, which is no more than is required for clean filtering, may be actually reached and maintained instead of being approached in varying degrees, intermittently, as heretofore practiced.

It has been found that with bags of the size mentioned above, under the old practice of periodically turning off the gas flow and shaking the bags, a bag could handle of the order of about 50

to 100 cubic feet per bag per minute at pressures of from 1 inch to 1½ inches of water. Under the present practice, as above stated, with the same size bags and same pressures anywhere from 1,000 to 1,500 cubic feet of gas may be handled per bag per minute at the same fan pressure.

It will be understood that in place of the hand operation of the suction head 16 illustrated, machine operation may be used and that if desired more than one suction head may be used per bag, each suction working on a smaller area of the bag.

While certain novel features of the invention have been shown and described and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. A cleaning head for bag cleaning comprising a plurality of arcuate sections, a central portion having a plurality of radial tubes, one for each section, said sections having second radial tubes telescoping said first radial tubes, respectively, and coil springs surrounding said telescoping tubes to urge said sections against the bag.

2. A cleaning head for bag cleaning comprising a plurality of sections forming an annular ring, said sections being disposed substantially end to end, a central portion to which a pneumatic source is connected and means for yieldably individually connecting said sections and central portion to press said sections against the bag.

3. In a separator, a bag having an open end and a closed end, means for supplying fluid containing the solid particles to be separated to the open end of said bag, a curved cleaning head within said bag and extending circumferentially around the inside surface of the wall of the bag, a conduit connecting said cleaning head and passing out through the closed end of said bag, means for imparting an axial motion to said conduit to move said cleaning head axially over the inside surface of said bag to locally remove the deposited particles, and a source of suction connected to said conduit.

4. In separating apparatus, a filter medium, means for applying a fluid containing solid particles to be separated therefrom to said filter medium, a pneumatic cleaning device for cleaning said filter medium comprising a plurality of sections disposed substantially end to end and extending over the surface of said filter medium and means for individually yieldably pressing said sections against said filter medium.

5. In gas separating apparatus, a filter medium, a blower supplying particle-laden gas to a given side of said filter medium, a suction head on said given side of said filter medium, means for moving said suction head so as to operate over a substantial area of the filter medium, a suction blower connected to said suction head, a cyclone separator receiving material from said suction blower, and means for recycling gas from said cyclone separator back to the inlet of said first blower, whereby said cyclone separator is subjected to a maximum pressure difference.

6. In gas separating apparatus, a filter medium, a blower supplying particle-laden gas to a given side of said filter medium, a suction head on said given side of said filter medium, means for moving said suction head so as to operate over a substantial area of the filter medium, a cleaning channel comprising a suction blower and a cy-

clone separator and connecting pipes serially connected, said cleaning channel connecting said suction head and the inlet of said first blower for applying suction to the suction head and re-cycling gas from the cyclone separator back to the inlet of the first blower, whereby said cyclone separator is subjected to a maximum pressure difference.

7. A cleaning head for bag cleaning comprising a plurality of segmental sections curved lengthwise to fit the curvature of the bag, a central portion to which a pneumatic source is connected and means for yieldably individually connecting said sections and central portion to press said sections against the bag.

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15	90
20	95
25	100
30	105
35	110
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45	120
50	125
55	130
60	135
65	140
70	145