June 7, 1932. T. W. GRAY ET AL 1,862,396

DUSTING MACHINE

Filed Dec. 8, 1924

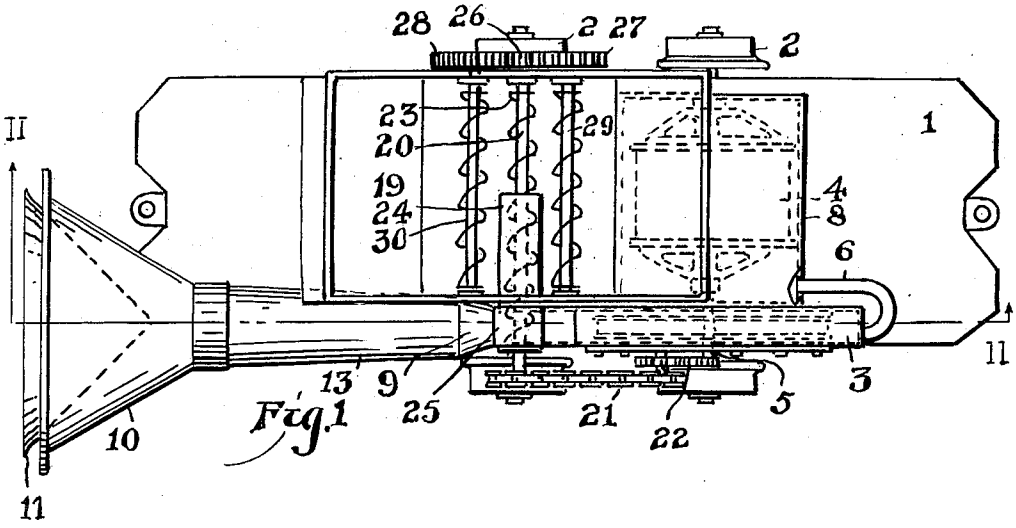


Fig. 1

Fig. 2

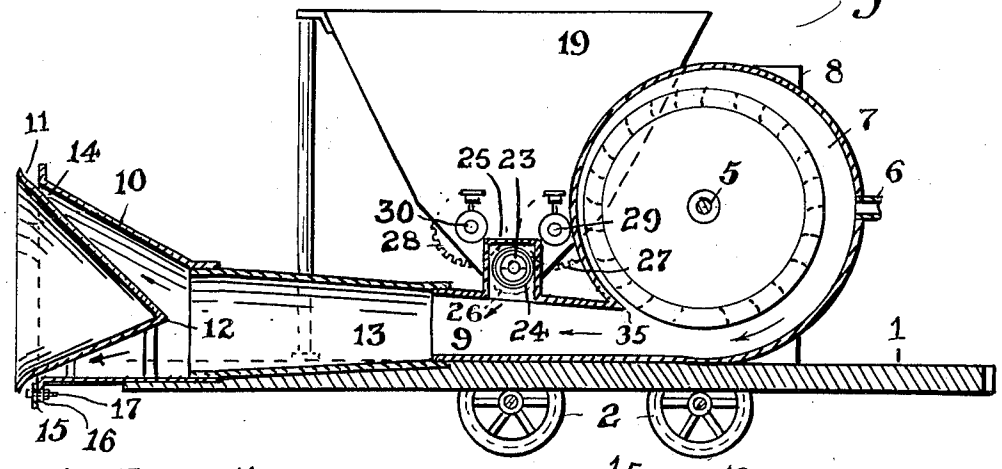
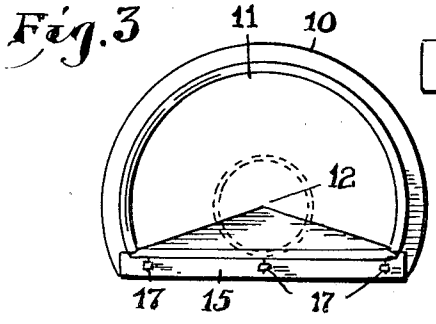


Fig. 3



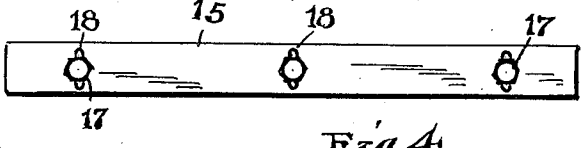


Fig. 4

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DUSTING MACHINE

Application filed December 8, 1924. Serial No. 754,635.

Our invention relates to dusting machines, by which an inert dust, such as rock-dust, may be applied to the walls of coal mines to dislodge and mix with the coal dust thereby forming a non-explosive mixture.

One object of the invention is to provide means whereby the blast of air which feeds the dust to the mine walls can not blow into the hopper from which the dust is fed. Another object is to provide an improved spraying head for distributing or projecting the dust from the machine. Other objects appear hereinafter.

Referring to the accompanying drawing,

Figure 1 is a top plan view of a machine embodying our invention;

Figure 2 is a vertical section on the line 2—2 of Figure 1, parts being in elevation;

Figure 3 is an end elevation of the dust-spraying head; and

Figure 4 is a broken detail showing means for adjusting the gate 15.

In the drawing, the numeral 1 designates the horizontal base or body of our machine which is mounted on the car wheels 2. As shown, the base and wheels form a truck which carries the dusting machine proper, the truck being adapted to run on the rails or tracks usually provided in a mine. The base 1 carries a suitably mounted centrifugal blowing engine comprising a rotary blower or fan 3 and an electric motor 4, the latter having a suitable driving connection with the shaft 5 of the blower. A pipe 6 connects the blower chamber, indicated at 7, with the interior of a casing 8 which is provided around the motor 4, the pipe 6 serving to conduct air to the motor for the purpose of cooling it. The blower discharges a stream of air forwardly through the somewhat flaring conductor or discharge pipe 9 which lies on the base 1. This pipe preferably is composed of a series of flared telescoping sections, each section of which has a different flare, and terminates in a section which, as indicated at 10, is flared laterally and upwardly at a much greater angle than that of the other sections of the pipe. The making of the pipe in sections not only facilitates its manufacture, inasmuch as it is difficult to form a single piece of sheet metal into parts having different tapers and shapes of cross section, but also facilitates its repair by permitting the replacement of one or more sections with comparative ease.

In the mouth of the terminal section 10, a conoidal spreader 11 is located with its apex 12 pointing rearwardly in alinement with the axial center of the central section 13 of the pipe 9. This spreader flares at a greater angle than the pipe section 10 whereby the distance between these two parts gradually becomes smaller as the end of the pipe is approached. The spreader 11 preferably extends forwardly for a short distance beyond the terminal discharge space 14 so as to prevent the discharge of dust toward the axial center of the pipe 9. The bottoms of the section 10 and the spreader 11 preferably are made plane so that their ends are somewhat D-shaped. The space between the bottoms of section 10 and spreader 11 may, if desired, be regulated by a vertically adjustable gate 15. The gate shown is secured to the flange 16 of the section 10 by the bolts 17 which pass through the slots 18 of the gate whereby the gate may be adjusted and secured in any selected adjustment.

A hopper 19 is arranged above the tube 9 and mostly in front of the motor casing 8. The front and rear walls of the hopper converge downwardly to a line near the upper side of the tube 9. Just above and parallel with this line, a horizontal shaft 20 is arranged. This shaft 20 is driven by a sprocket chain 21 which, in turn, is driven by suitable gearing from the shaft 5. The shaft 20 carries the feed-screw 23, one end portion of which is arranged to receive the dust placed in the hopper and the remaining portion of which is arranged to feed the dust through a tube 24 which is located within, and at one side of, the hopper. The tube 24 extends through a wall of the hopper into a box 25 which communicates through a bottom opening with the discharge pipe 9.

The end of shaft 20, opposite the driving end, carries a gear 26 which meshes with oppositely disposed gears 27 and 28. These gears are respectively carried by screw shafts

29 and 30 which extend through the hopper at positions slightly elevated with respect to the shaft 20. The shafts 29 and 30 rotate in a direction opposite to that of shaft 20 but have their feed screws winding in the same direction as the feed screw 23 on shaft 20.

With the hopper 19 supplied with rock-dust or other finely comminuted inert material and the motor 4 set in operation, air is forced through the pipe 9 and discharged at the terminal space 14. At the same time, the motor causes the three screw shafts 20, 29 and 30 to rotate. The screw shaft 20 feeds the material into the tube 24 and forces it along the same to the box 25 where it drops into the pipe 9 and is caught up by the air therein and carried out through the space 14 and applied to the adjacent mine wall. The function of the tube 24 is to form a guard around the discharge end of the screw conveyor on shaft 20 to prevent a large mass of dust from falling or being shaken into the box 25 at one time. As shown the tube 24 extends back into the hopper about half its length which insures an even feed of the material into box 25. The screw shafts 29 and 30 agitate the material in the hopper and feed it in the opposite direction from that which the screw shaft 20 feeds it.

A most valuable feature of our invention is the use of an open top hopper. As far as we know, no other machine for dust spreading by compressed air has been built or even suggested without the use of a tight cover on the dust hopper which has to be opened and reclosed each time the hopper is charged. As this machine will deliver about 125 pounds of dust per minute, the saving of time by omitting the cover is obvious.

This result is accomplished by the design of the discharge pipe. Beginning at the point 35 where the discharge pipe joins the blower chamber 7, the discharge passage continually increases in area up to the apex of the conoidal spreader. It will be noted here, that the diameter of the conoidal spreader increases more rapidly than the diameter of the discharge pipe. It does not follow, however, that the area of the discharge passage will at once start to decrease. On the contrary, the area will continue to increase, starting with the apex of the spreader, and may do so up to the point of discharge, or, it may only continue to increase up to a certain point along the spreader and then decrease to the point of discharge. It is obvious that this will depend entirely upon the design of the spreader. We prefer a spreader, as shown in the drawing, in which the area will increase and then decrease but do not limit ourselves thereto. With such a spreader the decrease in area should be such that the suction at the dust feeding connection will not be materially affected. From the above it readily follows that the air current has its highest velocity at the point 35 from which point it continually decreases to the point of discharge or to a certain point along the spreader from which it will increase to the point of discharge.

It will be noted that the box 25 is located close to the fan discharge where the velocity of the air current is high and that the air discharged is thrown by centrifugal force against the bottom of the pipe 9 thus producing a greater density of air along the bottom between the box 25 and point 35 than at the top of the pipe. In addition an eddy is produced along the upper portion of the pipe 9 beginning at the point 35 and extending beyond the connection between the box 25 and the pipe 9. Thus we have found, by experiment, that when the parts are properly proportioned, a considerable suction effect will be maintained in the box 25 and tube 24 whether or not there is any dust in the hopper 19. It may be pointed out that in some instances, the actual pressure at the left end of the pipe 9, as measured by a manometer, was found to be plus 9½ inches of water column while the actual pressure at the inner end of the tube 24 was found to be minus 2½ inches of water column. It is obvious, therefore, that the hopper may have an open top and may be filled or emptied at any desired rate without blowing dust out through the top of the hopper. This makes it possible to carry a supply of dust in cars ahead of the machine and coupled thereto for the purpose of feeding dust to the hopper while the train of cars is running through the mine. In this way a mine tunnel several miles in length may be dusted in one continuous operation without delays for filling the hopper.

It will be noted that the suction effect above described is produced mostly by the eddy at the blower discharge but is assisted by the flare of the air passage which prevents a back pressure being built up such as would occur in a pipe of uniform cross section. The air current passes the box 25 at such a high speed that its inertia prevents any change of direction while the factors previously mentioned produces an actual suction effect. By these peculiarities of construction, a very valuable characteristic is obtained, and this feature is exclusive with this machine.

We do not limit our invention to the purpose described but desire to cover the principles thereof for whatever purposes the described apparatus may be used.

Having described our invention, we claim:—

1. In a dust spraying machine, a frame, a motor mounted thereon, a blower of the continuously discharging type driven by said

motor, an air discharge pipe leading from said blower and flared towards its discharge end, the arrangement of the pipe and blower being such as to create a partial vacuum area within said pipe during the flow of air, air passage restricting spreader means at the end of said discharge pipe, said means restricting the air passage insufficiently to destroy the partial vacuum area within said pipe, a dust hopper, and a dust connection from said hopper to the partial vacuum area of said pipe.

2. In a dust spraying machine, a frame, a motor thereon, a blower driven by said motor, an air discharge pipe leading from said blower, a wedge-shaped dust hopper, a feed conveyor lying in the thin bottom end of the hopper and discharging dust into the air pipe, a pair of agitating conveyors in parallel relation to said feed conveyor, and one of each being at one side and above the feed conveyor, and moving in the opposite direction and means for driving all of said conveyors.

3. In a dust spraying machine, a frame, a motor thereon, a blower driven by said motor, an air discharge pipe leading away from said blower and flared toward the discharge end, a dust hopper, a conveyor extending into said hopper and discharging into said air pipe, means for driving said conveyor, a pair of agitating conveyors in said hopper, said conveyors being positioned to agitate the dust and convey the same to said conveyor first mentioned and gearing connecting said first conveyor and the said second pair of conveyors to drive the latter.

4. In a dust spraying machine, a frame, an electric motor thereon, a blower driven thereby, a main discharge pipe for said blower, a dust hopper, means for mixing the dust with the air in said main discharge pipe, and means for diverting a portion of the air discharged by said blower to the motor to cool the latter.

5. In a dust spreading machine, a blower, an air discharge pipe leading therefrom, having a flare towards its discharge end, a spreader in the discharge end of said pipe, a hopper, and a feeding connection between said hopper and said flare, said feeding connection spreader and flare being so arranged that upon the operation of said blower, a partial vacuum is created around said feeding connection.

6. In a dust spreading machine, a blower, a fluid discharge pipe connected thereto, having a flare extending from a point adjacent the blower toward the discharge end of the pipe, air passage restricting spreader means in the discharge end thereof, a hopper, and a feeding means between said hopper and said flare adjacent the blower end thereof, said feeding means, spreader means, and flare being so arranged that upon the operation of said blower, a suction effect is created around said feeding connection.

7. In a dust spreading machine, a blower, a discharge pipe connected thereto and flared towards its discharge end, said discharge pipe consisting of several sections and the last section being flared at a much greater angle than the previous sections, a spreader located in the last section of said discharge pipe, a hopper, and a feeding connection between said hopper and a flaring portion of said discharge pipe, said feeding connection and flaring portion being so arranged that upon the operation of said blower, a partial vacuum is created around said feeding connection.

8. In a dust spreading machine, a blower, a flared discharge pipe connected thereto and consisting of several sections, the last section being substantially D shaped, a spreader substantially conforming in shape to and positioned symmetrically in said last section, a hopper and a dust feeding connection between said hopper and said discharge pipe.

9. In a dust spreading machine, a blower, a flared discharge pipe connected thereto and consisting of several sections, the last section having a plane bottom forming one side and the other side being substantially semi-circular in shape, a conoidal spreader located therein and substantially conforming in shape thereto but having a greater angle of flare, an adjustable gate adapted to vary the discharge area between the bottom sides of the spreader and the discharge pipe, a hopper and feeding means between said hopper and said discharge pipe.

10. In a dust spreading machine, a blower, a flared discharge pipe connected thereto consisting of several sections, a conoidal spreader located in the last section, an adjustable gate attached to one side of the discharge pipe and adapted to be moved toward or away from the spreader and thereby vary the discharge area, a hopper and feeding means between said hopper and said discharge pipe.

11. In a dust spreading machine, a blower, a flared discharge pipe connected thereto, a spreader located in the discharge end thereof, a hopper, a dust feeding passage from said hopper to said discharge pipe, a feed conveyor located therein, auxiliary agitating conveyors in said hopper to agitate the dust and convey it to the feeding conveyor and common driving means for said blower and said conveyors.

In testimony whereof we hereunto affix our signatures this sixth day of December, 1924.

THOMAS W. GRAY.
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CHARLES B. LE BON, SR.