July 2, 1957 R. J. BUNKER 2,797,768

AIR CLEANER

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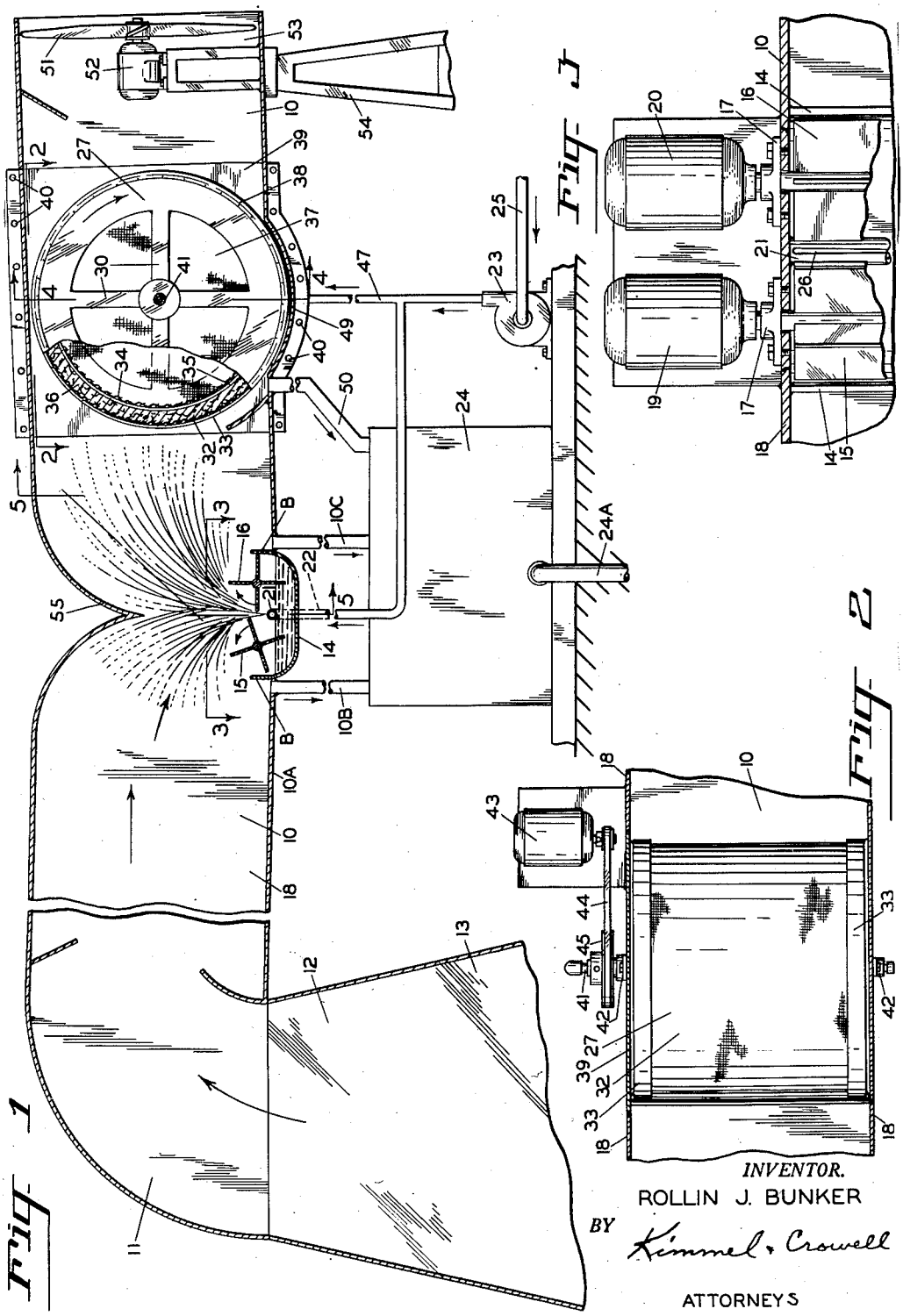


Fig. 1

Fig. 3

Fig. 2

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Fig. 4

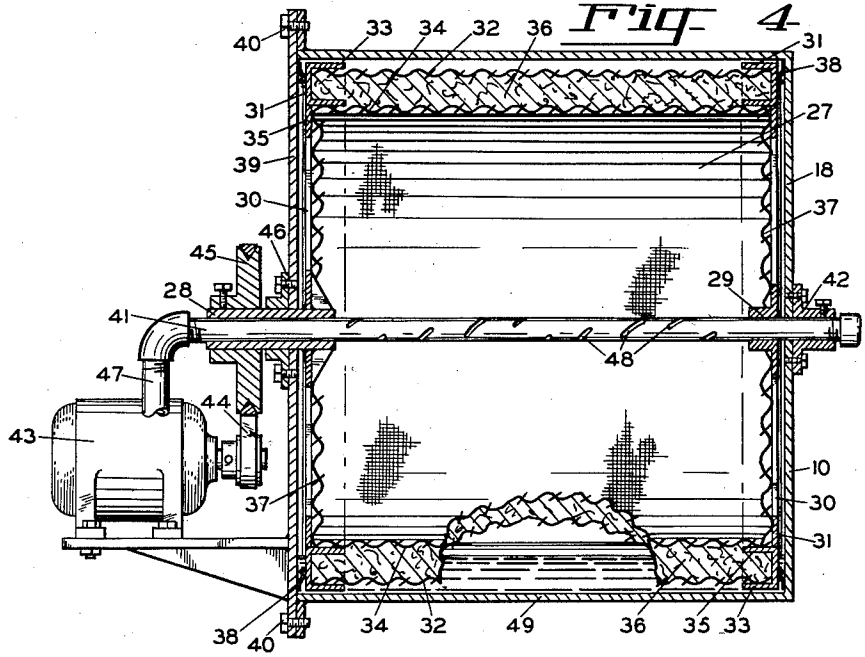


Fig. 5

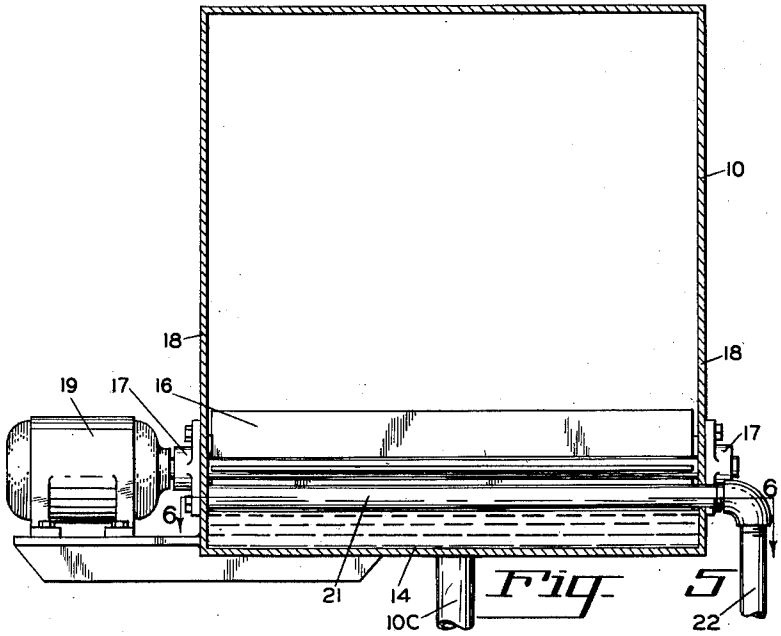
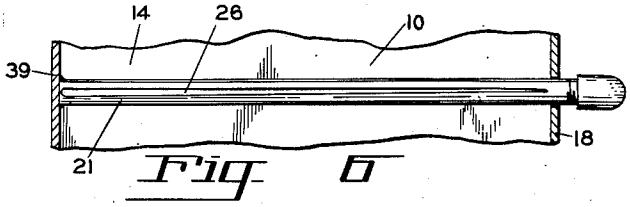


Fig. 6



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3 Claims. (Cl. 183—16)

This invention relates to liquid gas separation apparatus and more specifically, the invention pertains to means adapted for connection with smoke stacks for separating sawdust, dust, cinders, gases, smoke and other related materials from the air exhausted from the stacks.

One of the primary objects of this invention is to provide apparatus of the type to which reference has been made above which is inexpensive to manufacture, non-complex in construction and assembly, and durable in use.

Another object of my invention is to provide a new and improved air cleaner for connection with a smokestack or other exhaust means extending from burners, furnaces and the like, the apparatus prohibiting the dissipation of smoke or smog over industrial and residential areas.

Other and further objects and advantages of the present invention will become more evident from a consideration of the following specification when read in conjunction with the annexed drawings, in which:

Figure 1 is an elongated, longitudinally extending cross-sectional view of an air cleaner constructed in accordance with this invention, with parts thereof being broken away.

Figure 2 is an enlarged detail cross-sectional view taken on the horizontal plane of line 2—2 of Figure 1, looking in the direction of the arrows.

Figure 3 is an enlarged fragmentary detail cross-sectional view taken on the horizontal plane of line 3—3 of Figure 1, looking in the direction of the arrows.

Figure 4 is an enlarged transverse cross-sectional view taken on the vertical plane of line 4—4 of Figure 1, looking in the direction of the arrows.

Figure 5 is an enlarged transverse detail cross-sectional view taken on the line 5—5 of Figure 1, looking in the direction of the arrows.

Figure 6 is an enlarged detailed cross sectional view taken on the horizontal plane of line 6—6 of Figure 5, looking in the direction of the arrows.

Referring now more specifically to the drawings, reference numeral 10 designates, in general, an air cleaner constructed in accordance with the teachings of this invention. As is seen in the drawings, the air cleaner 10 comprises a substantially horizontal chamber or duct having a substantially rectangular cross-section. One end 11 of the duct 10 is mounted on and secured to the upper end 12 of a smoke stack designated in general by the reference numeral 13. The bottom wall 10A of the duct 10 is provided with a transversely and horizontally extending water trough 14. A pair of water impeller wheels 15 and 16 are mounted for rotation within the trough 14. The impeller wheels 15 and 16 are supported within bearings 17 connected to the side walls 18 of the air duct 10, and the impeller blades thereof are driven by motors 19 and 20 in counter-rotation with respect to each other. The impeller wheels are adapted to pick up water from the trough 14 and throw the same vertically within the air duct 10 to form a substantially continuous water shield which extends transversely of the duct.

A pipe or nozzle means 21 is mounted transversely

with respect to the duct 10 and is disposed intermediate the impeller wheels 15 and 16. The pipe 21 is connected to a water supply line 22 connected with the pressure side of a water pump 23. The water pump 23 is connected to a source of water supply (not shown) through supply line 25. The pipe 21 is provided with a V-shaped slot 26 which permits the water to spread evenly and pass upwardly transversely of the air duct 10, and the surplus water from this pipe falls back into the trough 14 to provide a water supply for the impellers or rotors 15 and 16.

A pair of baffiles are provided on opposite sides of the trough 14 and serve to prevent particles of material removed from the air from being thrown into the air duct 10, this being accomplished by directing the overflow of the water and refuse outwardly of the trough 14 through the drain pipes 10B and 10C to the sludge tank 24. The tank may be drained by way of the pipe 24A. In many cases the tank 24 would not be used and in such cases the drain pipes 10B could be connected directly with the sewer system.

Referring now to Figure 4 of the drawings, for certain air cleaning operations the water supply shown therein is sufficient to cleanse the air, but in other cases, it may be found desirable to install a transversely extending drum 27 in the duct 10. The drum comprises a pair of hubs 28 and 29 having spokes 30 which connect with a channel shaped rim 31. A relatively fine screen 32 is secured to the leg 33 of the channel and extends completely around the drum. A second drum shaped screen 34 is secured to the leg 35 of the channel 31, thereby providing a double-screen drum through which the air must pass. A special filtering material 36 is packed between the screens 32 and 34.

A somewhat coarser screen 37 bridges across the spokes 30 of the drum to close the ends thereof. A flexible sealing ring 38 seals the periphery of the drum to the side walls 18 and the side wall 39. The side wall 39 is removable from the air duct as indicated at 40, to provide access to the drum 27.

A transversely extending tube or pipe 41 is fixedly secured by means of the boss 42 to the side walls 18 of the duct 10. The hubs 28 and 29 of the drum 27 rotate on this transverse piping and the drum 27 is rotated by the motor 43 through the endless belt 44 connected with the driven pulley 45, the latter being keyed to the hub 28 of the drum assembly.

The sub 28 is journalled within the bearing 46, which is secured to the side wall 39 of the duct 10.

Water under pressure is delivered from the pump 23 through the supply pipe 47 into the pipe 41 and passes through the spiral slots 48 formed in the pipe 41 into the interior of the drum 27. As is seen in Figure 1 of the drawing, the drum 27 is rotatable within a trough 49 and will pick up on its outer periphery as the drum is rotated water disposed within the trough. Surplus water from this trough is fed back into the sludge tank 24 by means of the drain pipe 50.

Air to be cleansed is drawn through the duct 10 by the high speed propeller or fan 51 which is driven by the motor 52. The fan 51 is disposed on the outlet end 53 of the duct 10. The outlet end 53 may be supported by any suitable support as, for example, the pedestal 54.

The duct 10 is reduced in transverse area as indicated at 55 in Figure 1, the reduction being in the direction of the rotors 15 and 16. This results in the spray from the pipe 21 and the impeller wheels 15 and 16 to more thoroughly cover the path of the air to be cleansed.

In operation, smoke and refuse are drawn from the top of the stack 13 by the suction created by the fan 51. As the air and refuse pass the water screen delivered by the nozzle 21 and the impellers 15 and 16, coarse im-

purities are removed therefrom, such as sawdust, dust, smoke and the like. This water screen is generally quite efficient in the removal of relatively solid particles from the air. However, in the case of some gasses and dust impurities, the air requires a second cleansing. This second cleansing or filtering is obtained by passing the air and its entrained gaseous impurities through the drum **27**. As the drum **27** is revolved in the trough **49**, the outer surface of the screen **32** picks up water through which the air has to pass, as well as through the filter material **36**. The supply of the water from the nozzle or pipe **41** imparts a film across the inner screen and further washes impurities from the air.

This invention contemplates the provision of two separate motors **19** and **20** for rotating the impellers **15** and **16** whereby the speed of one relative to the other may be changed to meet various conditions depending upon the type of impurities which are carried by the air stream.

Having described and illustrated one embodiment of this invention, it will be understood that the same is offered merely by way of example, and that the present invention is to be limited only by the scope of the appended claims.

What is claimed is:

1. An air cleaner comprising an elongated substantially hollow rectangular duct having inlet and outlet ends, said duct having an arcuately offset transversely extending trough formed in one side thereof intermediate said ends and the side opposing said trough being transversely and inwardly indented to reduce the cross-sectional area of the duct, a water pipe longitudinally disposed within said transverse trough, said pipe having an elongated V-shaped discharge slot formed longitudinally therein, an elongated impeller wheel disposed parallel with and adjacent to one side of said pipe, a second impeller wheel disposed parallel with and adjacent to the other side of said pipe, and means for driving said wheels in opposing directions to impel the water discharged from said pipe in spray form across said indented portion of said duct.

2. An air cleaner comprising an elongated substantially rectangular hollow air duct having inlet and outlet ends, said duct having a transversely extending arcuately offset trough formed in one side thereof intermediate said ends and the side opposing said trough being inwardly indented, a pair of oppositely disposed baffles extending inwardly from and formed integrally with the edges of said trough, said duct having a second arcuately offset trough formed in said one side between said first trough and said outlet end and a plurality of drainage pipes disposed adjacent said troughs, said drainage pipes having one of their ends connected with said one side of said duct, an elongated transversely extending water pipe disposed within said first trough and being connected to a water pump, said pipe having a narrow longitudinally extending slot formed

therein and disposed in confronting relation to said inwardly indented wall, said pipe having an elongated impeller wheel disposed on either side thereof in a spaced parallel relation, means for counter-rotating said impeller wheels with respect to each other, the blades of said impeller wheels rotating so as to intersect the water emitted from said slot, a transversely extending filter drum rotatably mounted on said duct for rotation within said second trough, said drum having oppositely disposed U-shaped channel members integrally formed on the periphery thereof, the oppositely disposed arms of said channel members having cylindrical screen members secured thereto and extending therebetween, filtering material disposed between said screen members, means for rotating said filter drum, an elongated water pipe having a plurality of transversely extending water discharge slots formed therein, said pipe extending axially through said drum, one end of said pipe being connected to said water pump, an exhaust fan disposed adjacent said outlet end adapted to draw air through the duct, and means for driving said exhaust fan.

3. An air cleaner comprising an elongated substantially hollow rectangular air duct having inlet and outlet ends, a transversely extending arcuately offset trough formed in one side of said duct intermediate said ends and the side opposing said trough being inwardly indented, a second arcuately offset trough formed in said one side of said duct intermediate said first trough and said outlet end, a plurality of drainage pipes disposed adjacent said troughs, said drainage pipes having one of their ends connected with said one side of said duct, nozzle means mounted in said duct and connected with a source of water under pressure, said nozzle means being disposed in confronting relation relative to said oppositely disposed other side, a pair of elongated impeller wheels disposed on opposite sides of said nozzle in spaced parallel relation, said wheels being positioned above and projecting downwardly into said first trough, means for counter-rotating said impeller wheels with respect to each other, said impeller wheels rotating to intersect the water emitted from said nozzle means, a transversely extending filter drum rotatably mounted in said duct for rotation within said second trough, means supplying water under pressure to the interior of said filter drum, and air exhaust means for said duct.

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