July 1, 1952 J. A. STREUN 2,601,704

SCREEN CLEANING APPARATUS

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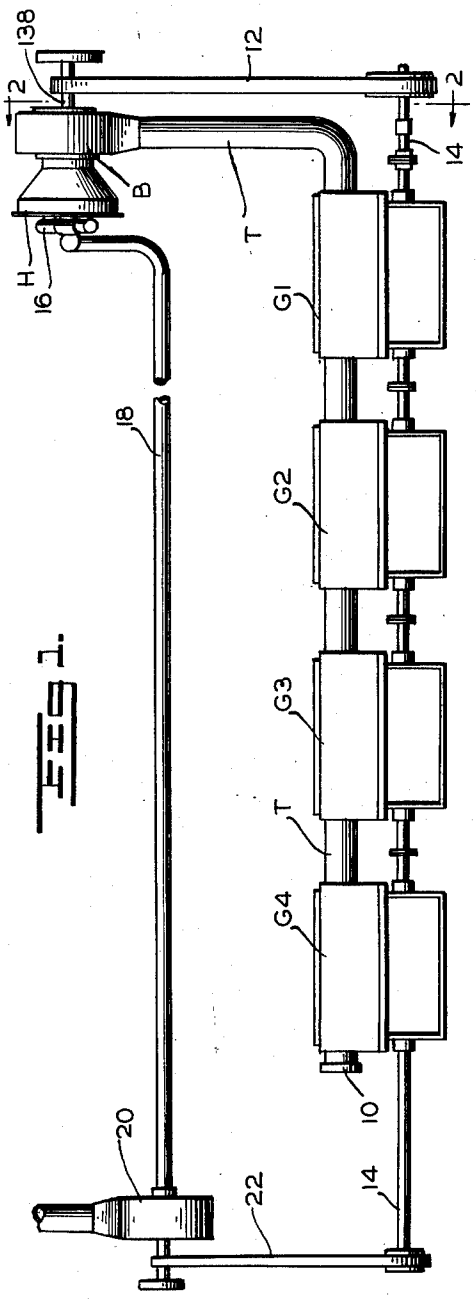

Fig. 1.

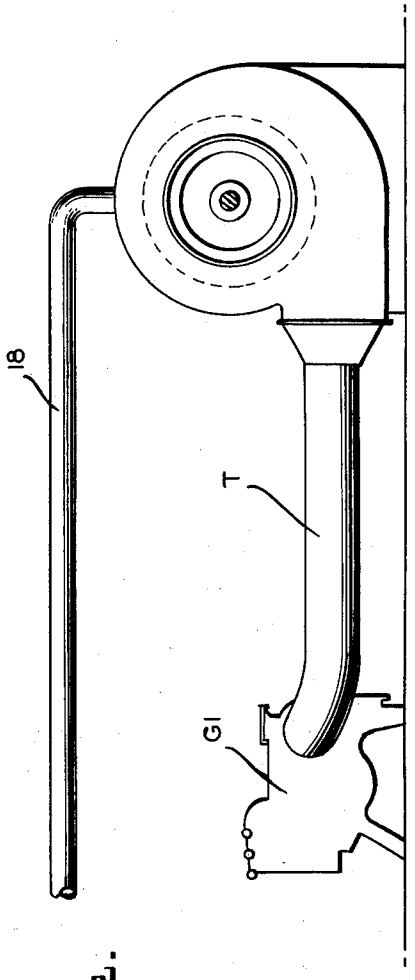

Fig. 2.

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Fig 3.

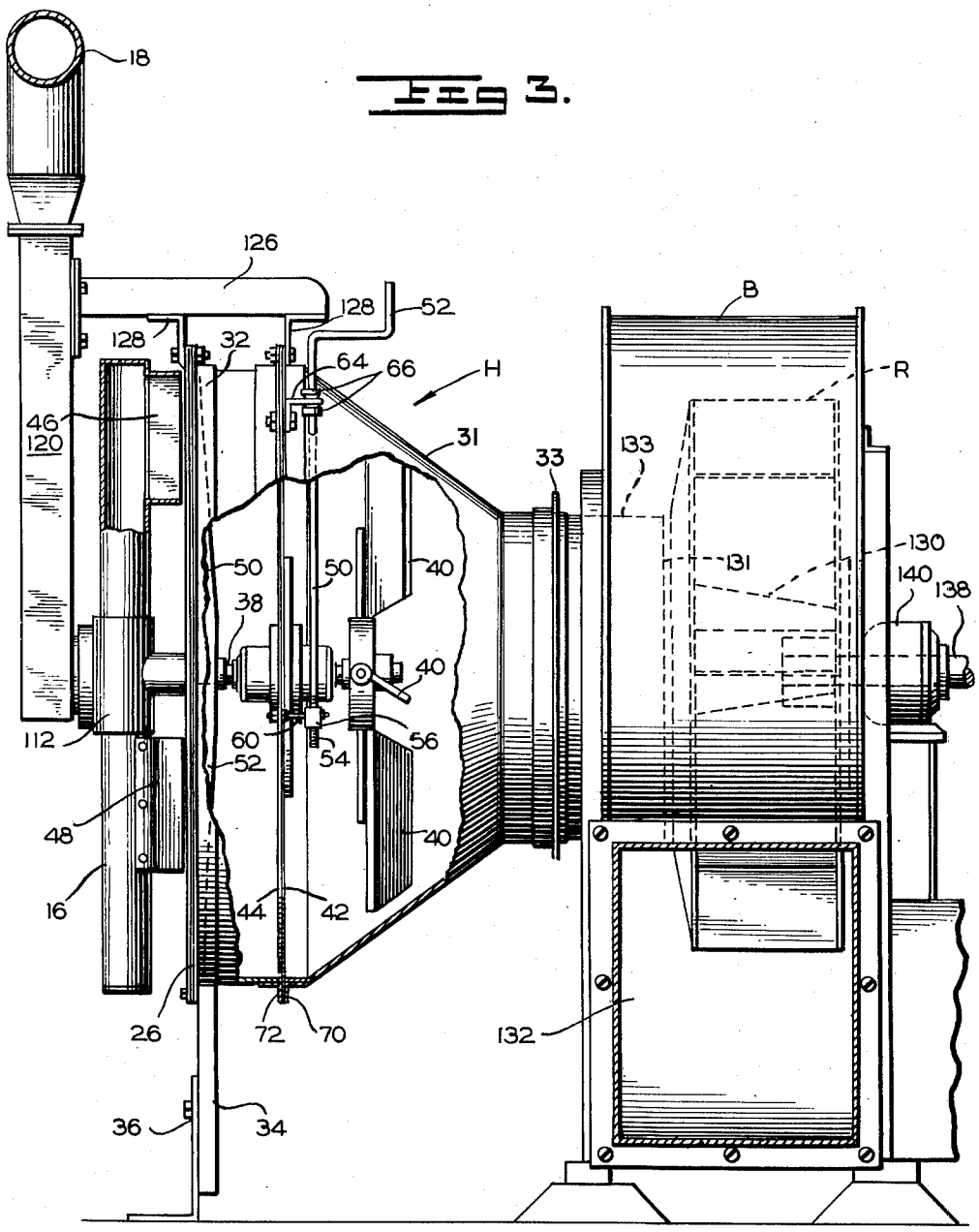

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Fig 4.

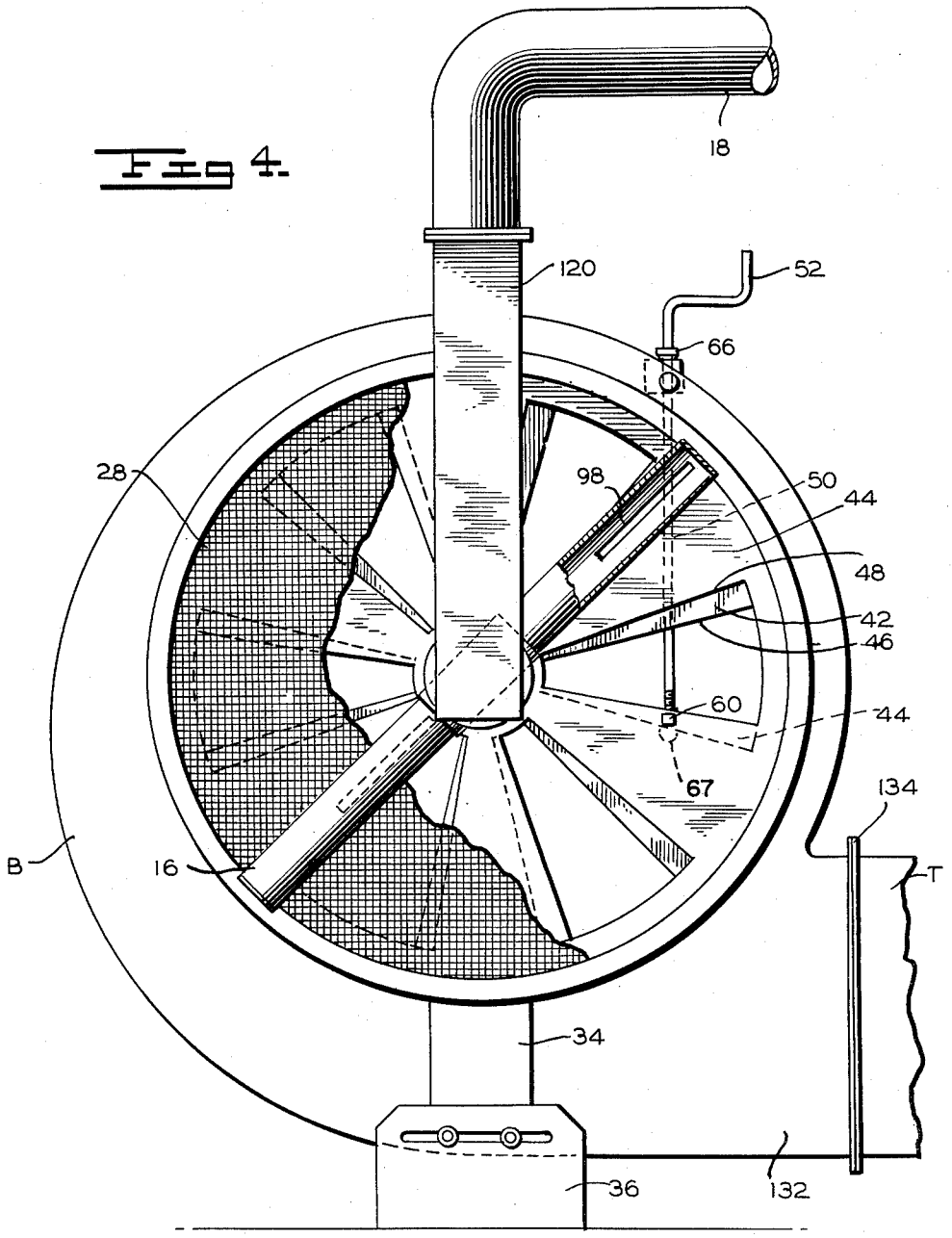

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Fig 5.

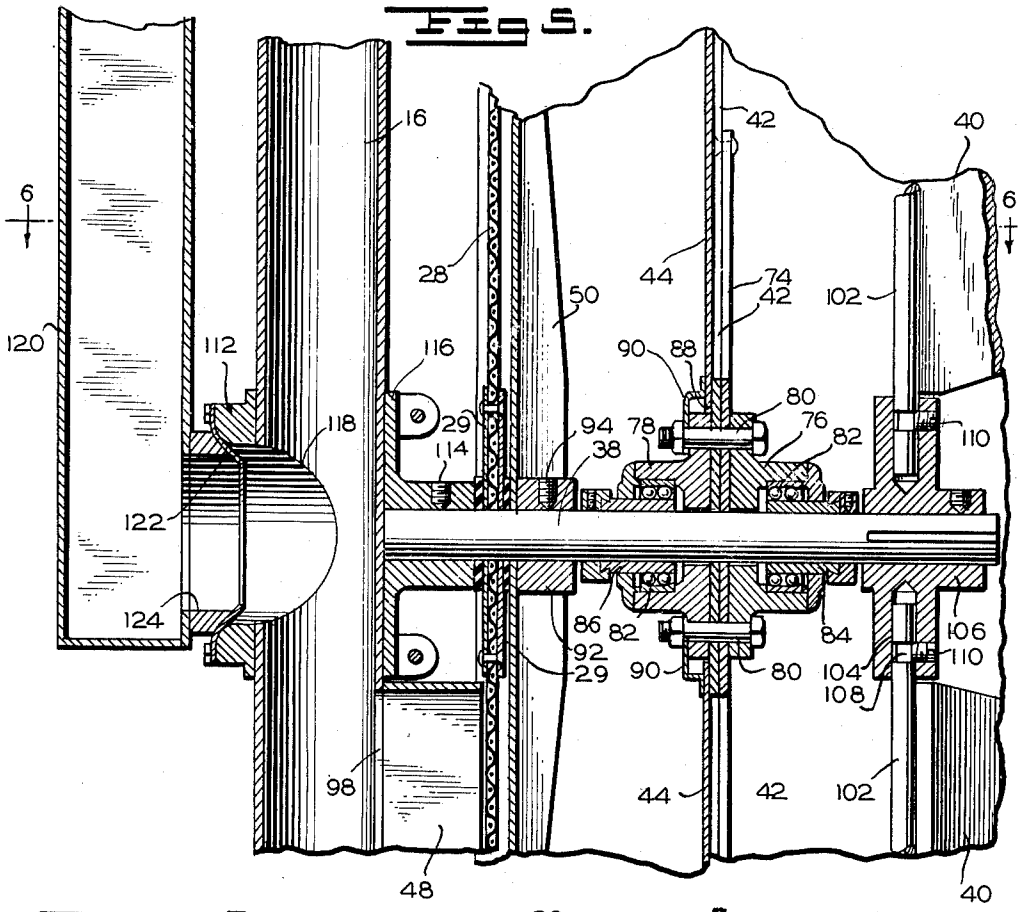
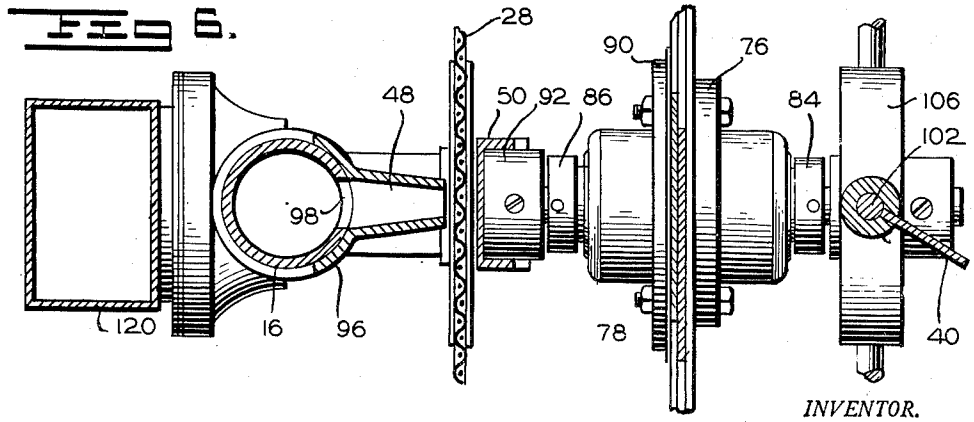


Fig 6.



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UNITED STATES PATENT OFFICE

2,601,704

SCREEN CLEANING APPARATUS

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Application July 25, 1950, Serial No. 175,740

11 Claims. (Cl. 19—72)

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The present invention relates to air cleaning mechanism particularly adapted for use in a cotton ginning plant, although the invention may have applications in connection with other similar installations. In particular, the mechanism is intended for employment in association with cotton gins of the well known air blast type, wherein an air blast trunk line passes through and serves the gins of a battery, the air thus delivered under pressure being conveyed to the conventional air blast nozzles which strip the lint from the saws, after the latter have passed through the ginning ribs. The construction of cotton gins of the air blast type is so well known as not to require specific description herein, the nozzles of said gins serving to strip the lint from the saws, and as stated, whereupon the released lint is conveyed by the air blast through a lint duct to the common lint flue, and onto the condenser, as is well understood.

It will be further understood that the air nozzle which blows the lint from the saws, comprises a relatively narrow slit presented to the saws and of length slightly greater than the saw cylinder. The slit or opening of this nozzle may be as narrow as three-sixteenths of an inch, and it is positioned close to the teeth of the saws, so that there is always the possibility that accumulated lint in the atmosphere of the gin house, or other foreign matter, will be conveyed through the air blast trunk line to the nozzles, causing them to become clogged.

A primary purpose of the present invention is to provide a screening assembly for this delivered air, which will remove the foreign matter, the said mechanism including an automatically adjustable cleaner for the screen, to carry away the foreign matter which may accumulate on the screen. More specifically, an object of the invention is to provide such a cleaner for the screen, which operates from an auxiliary source of suction, through cleaning nozzles, with provision to protect these cleaning nozzles against interference by the primary flow of air through the screen under the influence of the blower which supplies air to the air blast trunk.

A further object of the invention is to provide apparatus of the character referred to above, which is capable of refined and automatic adjustment, in accordance with the volume and velocity of air being moved through the air blast trunk line.

Various other objects and advantages of the invention will be apparent as the description herein progresses.

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Figure 1 is a schematic view of a part of a gin house installation, showing the arrangement of the cleaner in association with a battery of gins.

Figure 2 is an end elevational view of the cleaner, showing its association with the air blast trunk line leading to the first gin of a battery.

Figure 3 is a side elevational view of the air cleaning apparatus, showing its association with the blower which supplies air under pressure to the air blast trunk line.

Figure 4 is an end elevational view of the cleaner of Figure 3, looking inwardly from the left side of Figure 3.

Figure 5 is a partial vertical sectional view through the housing of the air cleaner, showing the arrangement of the parts mounted on the rotating shaft in said housing.

Figure 6 is a horizontal sectional view taken along the lines 6—6 of Figure 5.

Figure 1 is a view looking downwardly on a battery of gins G^1 through G^4, which are shown merely in outline, it being understood that they are of the conventional air blast type. Extending through all of the gins of the battery is an air blast trunk line T, which is closed at its terminal end by a cap 10. As is well known in the art, air under pressure delivered to the trunk T is caused to pass through the air blast nozzle in each gin, to strip the lint from the saws. The trunk T leads from a conventional blower B, the fans of the latter being rotated from any suitable source of power, as by a belt 12 connected with the driven saw shaft 14 of the gins, at a velocity of approximately 2300 R. P. M., whereby air is blown through the trunk, building up pressure through the air blast nozzles to strip the lint from the saws. Air is admitted to the blower B by way of a passage through a cleaner housing H, which has a screen mounted across the passage at the inlet end of the housing, and foreign matter which accumulates on the outer face of this screen is removed by suction nozzles carried on a rotating tubular cleaning element 16, auxiliary suction being applied to the interior of the element 16, and to its nozzles, through an auxiliary pipe 18 which connects with any convenient source of suction 20 in the gin house. The source of suction 20 may be a special suction blower. The blower 20 may suitably be of the type having fan blades driven by any suitable source of power, such as by means of a belt 22 (Figure 1), likewise driven by the saw cylinder shaft 14 of the battery of gins. While I have shown the source of suction

20 located at the opposite end of the battery of gins, with respect to the cleaner housing H, it will be understood that this source 20 might be located to the right of the blower B, as viewed in Figure 1, and its fan would then be driven by a belt 22 located to the right of the belt 12, suitably connected to the shaft 14. In such an arrangement, the auxiliary suction pipe 18 would be curved around the housing H to connect with the source 20, as will be apparent from Figure 1 and the above description.

Were it not for the cleaner comprising the tubular element 16, and the associated mechanism hereinafter described in detail, it would be necessary for the ginner to constantly attend the screen, using a cloth or the like to wipe the lint and fine trash therefrom. Should he neglect to do so, the screen would become coated with foreign matter, thus retarding the flow of air through the blower B and thereby reducing the pressure of air through the air blast nozzles in the gins. Such reduction in pressure impairs the efficient operation of the gins, causing back lashing, the proper flow of air past the saws being reduced to a point where the lint remains on the saws, going round and round with the saw teeth, injuring the lint as it is repeatedly passed through the seed roll of the ginning breast. Continued clogging of the screen would ultimately cause a break down in the operation of the gins, and the ginner would then be presented with the undesirable and time consuming job of cleaning the ginning ribs as well as cleaning off the screen.

As shown in Figure 3, the housing H has an outer cylindrical portion terminating in a circular flange 26, at its open end, and a screen 28 is suitably bolted at its perimeter, to this flange. The other end of the housing tapers inwardly as at 31 (Figure 3) and it is secured in any suitable manner to a circular opening in the front end of the blower B, at about the point 33, there being a cylindrical formation at the inner end of the housing which is flanged to a tube 133 extending from within the housing, or any other suitable manner of effecting a tight connection at this point may be employed. The housing is supported at its forward end by a circular bracket 32, which carries a leg 34, adjustably connected with a footpiece 36 of angular formation, resting on the floor, as shown in Figures 3 and 4.

Extending into the housing H, from the forward end thereof, is a rotatable shaft 38, and this shaft carries a rotatable tubular cleaning element 16, as well as a windmill fan comprising blades 40 which are adjustably connected to the shaft at a point near its inner end, within the housing. Disposed between the screen and the fan 40, there is an adjustable air register, comprising a fixed plate 42 and a circularly adjustable contiguous plate 44, these plates having cooperating openings therein movable into and out of register, to regulate the volume of air which is permitted to flow inwardly to the blower B.

As stated, the tubular cleaning element 16 is mounted for rotation on the outer end of the shaft 38, and it has opposite radially extending portions which carry suction nozzles 46 and 48, the restricted open ends of which are presented toward the screen, being spaced a distance of approximately one-eighth of an inch therefrom. Also mounted on the shaft 38, but inside of the screen 28, are air shields or baffle elements 50 and 52, the latter being simple plates mounted on the shaft 38 in alignment with the tubular element 16 and with the nozzles 46 and 48, and rotatable therewith on the shaft 38. These air shields prevent the inwardly flowing stream of primary air, from interfering with the local action of the nozzles 46 and 48, acting by suction outwardly, to remove foreign matter from the outer surface of the screen.

With the arrangement as generally described above, the air register is adjusted by relative movement of the apertured plate 44 with respect to the fixed plate 42, in order to adjust the volume of air flowing through the housing, and the trim of the fan blades 40 is likewise adjusted, on the shaft 38, to govern the speed of rotation of this shaft. Thereafter, when the blower B is started, a primary movement of air will be initiated inwardly through the housing H, discharging from the periphery of the rotor of the blower, in order to build up pressure of air in the trunk T, and this movement of primary air will act on the blades 40 to turn the shaft 38. Rotation of the shaft 38 will rotate the tubular cleaning element 16 with its nozzles, and will likewise rotate the aligned air shields 50 and 52. The outward suction applied to the nozzles 46 and 48 from the source of suction 20 will cause the surface of the screen to be cleaned, and power to rotate the shaft 38 and the operating devices which it carries, is derived from the rotor of the blower B, through the action of the induced primary flow of air through the housing.

As shown in Figures 3 and 4, the fixed plate 42 has a segmental opening 46 therethrough, and the movable plate 44 has a similar segmental opening 48 therethrough, and these openings are arranged to be brought into partial register with one another to adjust the space through which air may pass to the blower. To accomplish this adjustment, a rotatable rod 50 having a crank handle end 52 is provided, the inner end of this rod being threaded as at 54 where it passes through a nut 56, the latter being pivotally attached to the movable plate 44 by a bolt 60, this bolt passing through the opening 46 in the fixed plate 42. The outer end of the rod 50 passes through an opening in a bracket 64, and the latter is mounted for limited pivoting movement on the exterior flange of the housing, as shown in Figure 3, there being collars 66 secured on the rod 50 and bearing against opposite sides of the bracket 64, to restrain the rod against longitudinal movement through the opening in the bracket. Thus, when the handle 52 is turned, nut 56 is caused to move toward and from the handle, and through the connection 60, this causes a relative circular movement of the disc 44 with respect to the plate or disc 42, whereby the degree of alignment of the openings in these discs is regulated, to govern the volume of air flowing through the housing. As shown in Figure 4, a recess 67 is provided in the fixed plate 42 in the lower edge of its opening 46 to receive the connecting rod 60 when the plates are adjusted to the full open position.

It will be understood that any appropriate number of registering openings 46 and 48 may be provided, spaced around the plates 42 and 44, as shown in Figure 4.

As shown in Figure 3, the fixed plate 42 of the register or damper, is permanently carried by the housing, between circularly flanged members 70 and 72, and this plate thus provides a foundation for supporting the rotatable shaft 38, as now to be described.

Referring to Figure 5, the fixed plate 42 is centrally reinforced by a disc 74, and opposite bear-

ing housings 76 and 78 are bolted to the central portions of the plates 42 and 74, by means of bolts 80. The housings 76 and 78 each have outwardly opening ball bearing chambers, and these receive suitable ball bearing structures 82, there being sleeves 84 and 86 keyed or otherwise rigidly secured to the shaft 38. Thus, a bearing is provided for the shaft 38, centrally thereof, and this bearing is supported from the housing frame, through the fixed plate 42 and its mounting, as described. The movable plate 44 is centrally apertured as at 88, and it is held in close contact with the fixed plate 42 by a central resilient retaining clip 90 secured by the bolts 80, as shown in Figure 5.

As further shown in Figures 5 and 6, the air shield 50 for the cleaner nozzles is of angular cross-section, and it is rigidly carried on a hub 92 which is rigidly bolted to the shaft 38 as by the bolts 94. The outer face of the shield is flat, and as shown in Figure 6, it is in alignment with the nozzles 46 and 48, and is spaced about one-eighth of an inch from the inner face of the screen 28. The nozzles 46 and 48 taper inwardly toward their inner ends and at their outer ends they are flanged as at 96 where they are secured as by welding to the outer wall of the tubular element 16, there being openings 98 through the wall of the tubular element in alignment with the nozzle passage. With respect to the cooperative arrangement of the cleaning nozzles 46 and 48 and the air shields 50, it will be understood that by reason of the action of the blower B, there will be a rather strong primary flow of air inwardly through the screen 28, depending on the speed or rotation of the blower, and the adjustment of the plate 44 as heretofore described. However, the cleaning action of the nozzles 46 and 48 depends on a suction through the nozzles acting in a direction opposite that of the primary movement of the air through the passage in the housing H, so that in the absence of some protective agency, the nozzles would not function effectively to remove foreign matter from the outer face of the screen. It is in recognition of this difficulty that I have provided the baffle elements or air shields 50, the outer faces of which substantially cover the openings of the suction nozzles 46 and 48, and provide a local rotating dead space in front of the suction nozzles, so that the cleaning action of the latter will be effective.

As further shown in Figure 5, the fan blades 40 are carried on rods 102, the inner ends of which are adjustably fitted in cylindrical sockets 104 in a flanged nut 106 which is keyed and bolted to the shaft 38. Rods 102 have reduced portions 108 which receive the inner ends of securing bolts 110, whereby these bolts may be loosened to permit turning of the rods 102, and consequent angular adjustment of the fan blades 40 as will be apparent from Figure 6. Thus, the fan blades 40 may be trimmed or angularly adjusted with relation to the shaft 38, and this adjustment will permit selective variation of the speed of the shaft 38 responsive to the primary movement of air through the passage in the housing, caused by the operation of the rotor of the blower B. Thus, as a result of the permissible adjustment of the movable plate 44 of the register, with respect to the fixed plate 42 thereof, and the adjustment of the fan blades 40, as just described, the cleaning action of the nozzles 46 and 48 may be controlled, to suit the existing conditions.

As further shown in Figure 5, there is a hollow fitting 112 secured on the outer end of the shaft 38 beyond the screen 28, as by a bolt 114, and the hollow tubular cleaning element 16 extends through a cylindrical opening 116 in this fitting, and is secured or strapped therein, in any suitable manner. The tubular element 116 has an opening or cut-out 118 in its outer wall, being thereby open to suction exerted through a square conduit 120 which is held in fixed position but presented to the outer open end of the fitting 112, there being a leather-lip like gasket 122 positioned between the outer end of the fitting 112 and a cylindrical engaging nipple 124 carried by the lower end of the square conduit 120. As shown in Figure 3, the conduit 120 is supported by an arm 126 carried by brackets 128 fixed to the upper end of the housing H.

As previously indicated, the blower B may be of conventional construction, comprising a hollow housing of generally circular configuration as shown in Figure 4, and having a rotor R sealed to an entrance pipe 133 in the housing and having appropriately curved fan blads 130, which are designed to draw the primary air into the center of the rotor, and discharge it from the open periphery of the rotor into the hollow interior of the blower, the air being discharged through the extension 132 (Figure 4) and into the end of the trunk T which is flanged to the lower housing, as at 134 (Figure 4).

As best shown in Figure 3, one cleaning suction nozzle 46 is positioned near the outer end of one radial extension of the tubular element 16, while the other suction nozzle 48 is positioned near the center of rotation of the tubular element 16. Thus, the respective suction nozzles sweep through concentric areas, one within the other, and thus substantially the entire surface of the screen is acted upon and cleaned.

As indicated in Figures 1 and 3, the rotor of the blower is carried on a shaft 138, which is mounted in a bearing 140 on the frame of the blower, and this shaft may be driven in any suitable manner, as by an independent electric motor, or by a belt 12 (Figure 1) connected with the power or saw shaft of the battery of gins.

The operation of the apparatus will be clear from the above description. By adjusting the opening in the damper or register, the volume of primary air may be increased, thus increasing the pressure in the air blast trunk and the velocity of air delivered by the air-blast nozzles. The pressure of the air may be built up to 9 to 20 inches of water or 4½ to 10 ounces' pressure. The damper thus sets the required amount of pressure. The fan blades are adjusted to set the speed to suit the flow of air passing through the blades to the blower. The fan speed is regulated to furnish all the air required for both maximum and minimum air pressure to be used.

I claim:

1. Apparatus of the character described comprising a hollow housing for the passage of air, a screen mounted across the inlet to said housing, means for generating a primary movement of air through said screen and said housing, an air suction operated screen cleaner mounted for movement across the outside surface of said screen, a baffle element mounted for movement across the inside surface of said screen in alignment with said cleaner to locally counteract the effect of said primary movement of air through said screen in areas of said screen adjacent said cleaner, and means for simultaneously moving

said cleaner and said baffle element over the surfaces of said screen.

2. Apparatus of the character described comprising a hollow housing for the passage of air, a screen mounted across the inlet to said housing, means for generating a primary movement of air through said screen and said housing, a screen cleaner comprising an air suction nozzle presented toward and mounted for movement across the outside surface of said screen, means for applying suction to said nozzle and to the area of said screen to which it is presented, an air shield mounted for movement across the inside surface of said screen in alignment with said nozzle to locally protect its suction from interference by said primary movement of air through said screen, and means for simultaneously moving said nozzle and said shield over the surfaces of said screen.

3. Apparatus of the character described comprising a hollow housing for the passage of air, a screen mounted across the inlet to said housing, means for generating a primary movement of air through said screen and said housing, a screen cleaner comprising an air suction nozzle presented toward and mounted for movement across the outside surface of said screen, means for applying suction to said nozzle and to the area of said screen to which it is presented, and means mounted for movement with said nozzle for locally counteracting the effect of said primary movement of air through said screen in areas of said screen adjacent said nozzle.

4. Apparatus of the character described comprising a hollow housing for the passage of air, a screen mounted across the inlet to said housing, a blower for generating a primary movement of air through said housing, a shaft extending into said housing, an air suction operated cleaner mounted on said shaft adjacent the outer end thereof for rotation across the outer surface of said screen, a baffle element mounted on said shaft adjacent said cleaner for movement across the inner surface of said screen in alignment with said cleaner to protect the action of the latter from interference by said primary movement of air, and means responsive to said primary movement of air for rotating said shaft.

5. A construction in accordance with claim 4 wherein said means responsive to said primary movement of air is adjustable to regulate the speed of rotation of said shaft.

6. Apparatus of the character described comprising a hollow housing for the passage of air, a screen mounted across the inlet to said housing, a blower for generating a primary movement of air through said housing, a shaft extending into said housing, an air suction operated cleaner mounted on said shaft adjacent the outer end thereof for rotation across the outer surface of said screen, a baffle element mounted on said shaft adjacent said cleaner for movement across the inner surface of said screen in alignment with said cleaner to protect the action of the latter from interference by said primary movement of air, means on said shaft adjacent the inner end thereof responsive to said primary movement of air for rotating said shaft, and an adjustable air register mounted within said housing across the passage therethrough between said screen and said means on said shaft.

7. Apparatus of the character described comprising a hollow housing for the passage of air, a screen mounted across the inlet to said housing, a blower for generating a primary movement of air through said housing, a shaft extending into said housing, a cleaner mounted on said shaft adjacent the outer end thereof for rotation across the outer surface of said screen, said cleaner comprising a tubular member disposed at right angles to said shaft and having portions which extend on opposite sides thereof, said extending portions having suction nozzles therein presented toward the outside face of said screen, an air shield mounted for movement across the inside surface of said screen in alignment with said nozzles to locally protect their suction from interference by said primary movement of air through said screen, means responsive to said primary movement of air for rotating said shaft and simultaneously moving said nozzles and said air shield, and means for applying suction to the interior of said tubular element.

8. A construction in accordance with claim 7, wherein said nozzles are of shorter radial length than the radial lengths of said extending portions of said tubular element, and wherein one nozzle is positioned adjacent to said shaft and the other nozzle is positioned adjacent the outer end of its extending portion.

9. A ginning plant comprising a battery of air blast gins having a common air blast trunk line leading therethrough, a blower at the end of said trunk line remote from the gins for drawing air from the atmosphere into said trunk line, a hollow housing having an air passage therethrough connected with said blower and constituting the air inlet thereto, a screen mounted in said housing across its passage, a cleaner on said housing comprising a suction nozzle mounted for movement across the inlet side of said screen, an air shield element mounted therein adjacent to the air delivery side of said screen and in alignment with said nozzle, means therein for simultaneously moving said nozzle and shield across the surfaces of said screen, and an auxiliary suction pipe leading from said nozzle and connected with a suction line in the gin house.

10. A construction in accordance with claim 9, wherein said housing has an adjustable air register extending across its passage on the air delivery side of said screen.

11. A construction in accordance with claim 9 wherein said housing has means therein for moving said nozzle in response to the flow of air through said passage induced by said blower.

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