

March 9, 1937.

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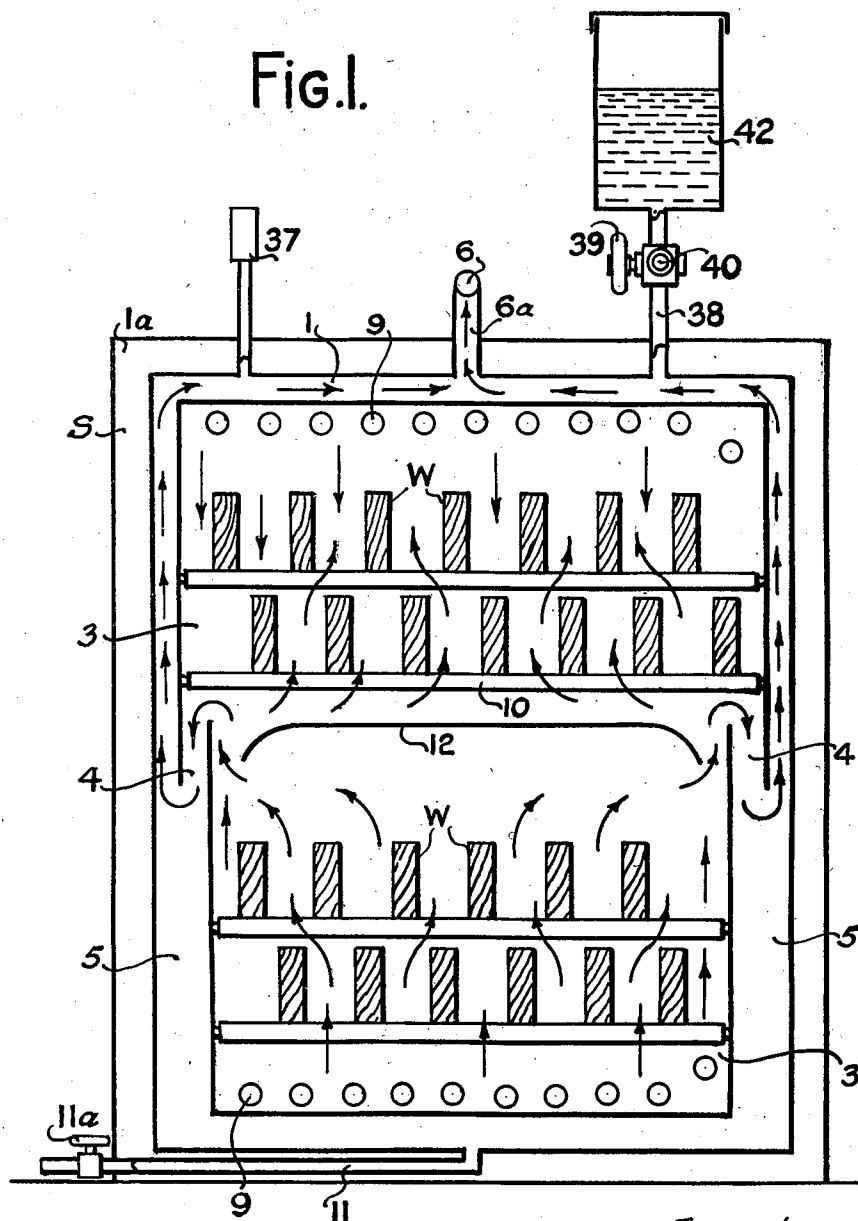
2,073,423

DRYING AND SEASONING WOOD AND ANALOGOUS VEGETABLE MATERIALS

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3 Sheets-Sheet 1

Fig. 1.



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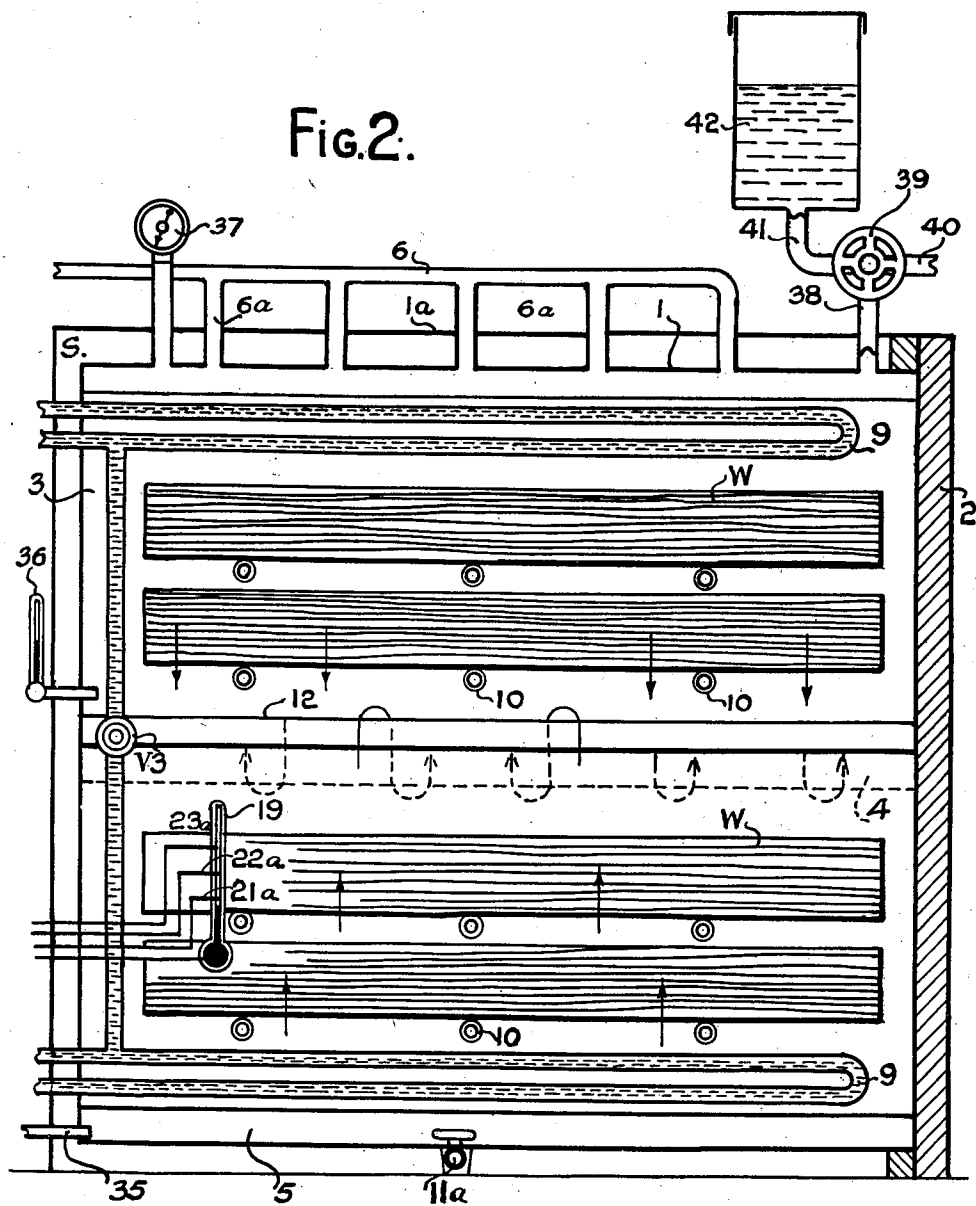
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Fig.2.



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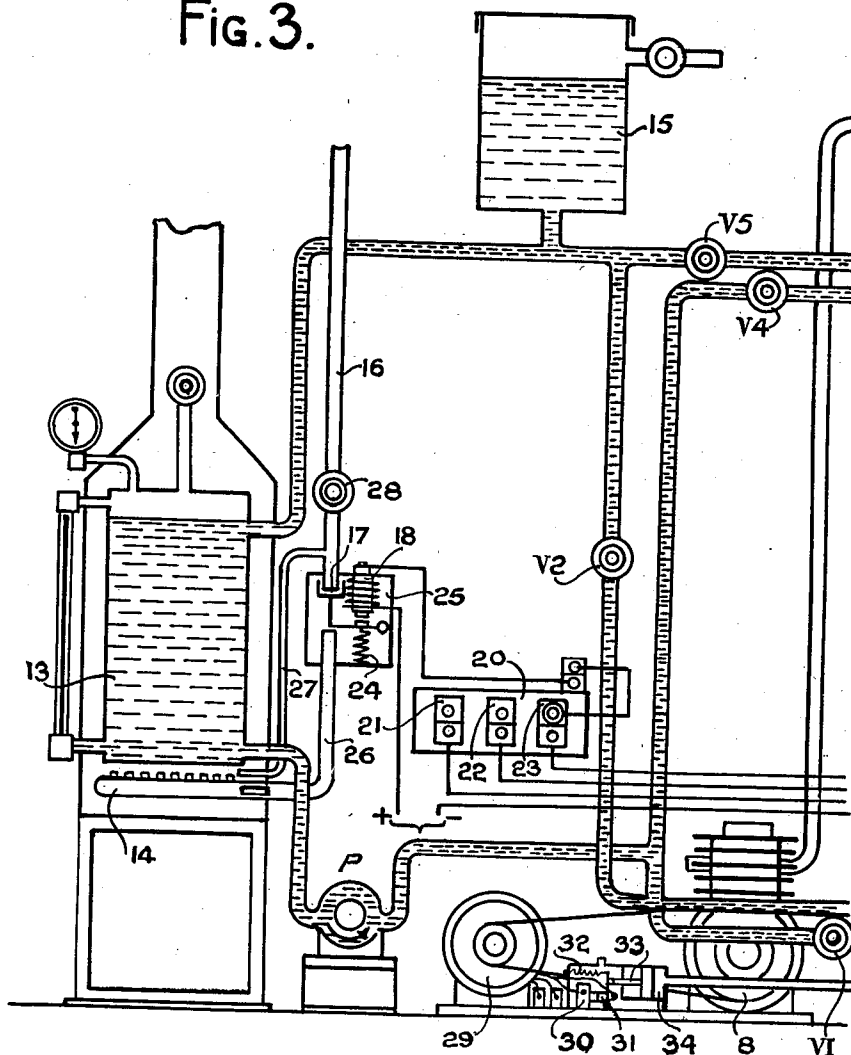
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3 Sheets-Sheet 3

Fig. 3.



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UNITED STATES PATENT OFFICE

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DRYING AND SEASONING WOOD AND
ANALOGOUS VEGETABLE MATERIALS

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5 Claims. (Cl. 34-19)

This invention relates to apparatus and a process for drying and treating wood or analogous vegetable material employing the known principle of vacuum and heat dessication.

According to present practice wood is seasoned by a process of kilning, that is, applying the heat to the wood when stacked in a suitable chamber, and it has also been suggested to season wood by steaming it or applying hot air to the drying chamber either under vacuum or pressure above atmosphere, the effect of all these processes being to withdraw from the wood the sap and aqueous content thereof in the form of vapour which is subsequently condensed, usually by a suitable condenser.

In its green state the timber contains a large number of salts which are held in solution in the sap and when the timber is dried, either naturally or artificially by the above processes, the fact that the sap is extracted by evaporation causes the salts to remain in a microscopic pulverulent state and because these salts readily absorb humidity from the air they are prejudicial to the preservation of the wood so as to cause it to warp even after a long period subsequent to the drying.

The known processes and apparatus for drying wood apart from leaving the salts in the wood require a considerable time for removing the aqueous content, for example, as much as five or six weeks or even longer when green timber is being dried, and it is the object of the present invention to provide apparatus for seasoning wood by extracting the sap and aqueous content thereof with the salts in solution and to effect the necessary seasoning in a considerably less time (about thirty or forty hours).

To this end according to this invention apparatus for drying or treating wood or analogous vegetable material by applying vacuum and heat without effecting vaporization of the sap or aqueous content of the material comprises a sealable outer chamber, controllable suction means for creating and maintaining a predetermined vacuum in the chamber and a controllable heating system for applying heat to the chamber and raising the internal temperature of the air therein, such heating and vacuum creating means being controlled so as not to cause vaporization of the sap as it is withdrawn from the timber being treated, in combination with baffles forming an inner chamber surrounding the timber and so arranged as to have a dual purpose, that of causing the heated air as it is evacuated from the inner chamber to circulate around the whole surface of the timber and of guarding the timber from direct application of suction whereby a uniform dessication of the timber may be effected simultaneously with the removal of the sap in liquid form with the salts in solution therein.

The invention also provides means for auto-

matically controlling the heat and vacuum applied to the chamber, such means being settable so that when the temperature of the chamber rises above the predetermined temperature at which the sap vaporizes the heat is cut off and is restored when the temperature falls below the predetermined temperature, the vacuum in the chamber being maintained to the required degree in a similar manner and thus when the automatic means is set the whole plant can be left without attention until the seasoning process is finished, that is for the period of thirty or forty hours necessary to treat the timber.

A further feature of the invention provides means for introducing into the chamber while under vacuum and subsequent to the drying of the wood a microbicide which is in the form of a vapour that penetrates throughout the wood so as to destroy the deleterious micro-organisms remaining in the wood.

Further the invention also provides means for introducing into the drying chamber a vaporized liquid or a gas possessing the property either of fireproofing the wood or rendering it waterproof, that is, impermeable to humidity. Such liquid or gas will be introduced after the wood has been dried by re-creating a vacuum in the drying chamber.

These and other features of the invention will be more clearly understood with reference to the following description taken in conjunction with the accompanying drawings which show diagrammatically and by way of example only one preferred embodiment of the invention, and wherein—

Figure 1 is a transverse sectional elevation through the apparatus,

Figures 2 and 3 combined form a longitudinal elevation—partly in section—showing particularly the automatic control for the heat and the vacuum.

In the drawings like reference numerals denote like or similar parts.

The apparatus shown comprises an outer chamber 1 made of iron or other suitable material, hermetically closed and sealed by the door 2. Inside the outer chamber 1 are baffles forming an inner chamber 3, the baffles being arranged so that the inner chamber is in two parts with a continuous outlet 4 centrally on either side, this outlet communicating with the suction space 5 formed between the two chambers and connected to the suction pipe 6 of the vacuum pump 8.

Within the inner chamber 3 and in upper and lower sections thereof are mounted heating coils 9 for raising the internal temperature, the heating system in which the coils are connected including an arrangement of valves as hereafter described for heating one or other half of the chamber or the entire chamber as desired.

The pieces of wood W may be stacked in the inner chamber or on a removable truck therein with wooden transverse battens placed between the several layers of the wood, or as shown the inner chamber may be provided with lines of transverse supports 10—preferably in the form of rollers—spaced apart to support the timber with sufficient clearance to allow of the requisite circulation of the evacuating air about the timber as will now be described.

The timber being stacked in the inner chamber and the apparatus sealed, heat is applied by means of the coils 9 and a predetermined degree of vacuum is created and maintained in the chambers 1 and 3 by means of the pump 8. As will be clearly seen in Fig. 1 the baffles at and forming the outlets 4 overlap one another so as to cause the heated and evacuating air to circulate or lap around the whole surface of the timber being treated and from the top to the bottom in the upper part of the chamber 3 and from the bottom to the top in the lower part of the chamber as is indicated by the arrows.

Whilst the timber is being treated a balance between the degree of vacuum applied and the heat is arranged, the temperature being kept very low so that no evaporation of the sap or aqueous content of the timber is caused and the sap will, therefore, be extracted together with the salts which it holds in solution.

The temperature and degree of vacuum is dependent on the nature and the kind of the wood being treated, the vacuum usually applied to produce the required results varying from 15 to 17 centimetres of mercury drop from normal atmospheric pressure with a temperature of from 30° C. to 50° C. It is apparent that the combined vacuum and heat controlled according to this invention has the effect of drawing or bringing the sap with the salts or the chemical constituents of the sap to the surface of the timber from whence they are discharged in part to the atmosphere of the chamber and in part to the bottom of the outer chamber 1 which is provided with a discharge outlet 11 and a cock 11a by which the extracted sap can be removed. The time taken for drying varies according to the thickness of the wood and its nature, and as to what degree of seasoning is required, but it is found that the process and apparatus according to this invention can effectively dry the wood in approximately thirty or forty hours.

In addition to causing the evacuating air to circulate in the desired manner, the baffles forming the inner chamber 3 also act as a guard protecting the timber from the direct application of suction, and the action of the suction on the timber is thus effected in a uniform and gentle manner so as to prevent clefts being made in the wood during its treatment.

So as to insulate the outer chamber from the atmosphere and to retain the heat the outer chamber may be lagged or surrounded by a covering 1A providing a space S in which any required degree of vacuum may be maintained.

If desirable or necessary, intermediate baffles 12 may be located between layers of the timber in order to facilitate the circulation and act as deflectors which catch the sap from an upper layer as it is extracted and direct the sap away to the sides of the chamber so that the timber beneath is not affected.

The heat coils 9 are connected in a system including a water boiler 13 heated by a gas burner 14, a supply tank 15 for filling the boiler and

maintaining the necessary amount of water in the system and a pump P for circulating the water through the system. Included in the system is an arrangement of valves V1, V2, V3, V4 and V5 by which the coils 9 in either section of the inner chamber 3 can be cut off from the boiler as desired. To cut off the circulation of the hot water in the coils of the lower section valves V1, V2 and V3 are closed, whereas the coils of the upper section are disconnected by closing the valves V3, V4 and V5. When the coils in both sections are in use valves V2 and V4 are closed.

In order to obtain an evenly distributed suction effect around the inner chamber 3, the outer chamber 1 has a plurality of outlets 6a arranged in spaced relation along the top of the outer chamber 1 and connected to the suction pipe 6.

To permit the apparatus to be left without attendance for the duration of the treatment, the control of the heat and the vacuum is preferably automatic and to this end the gas supply pipe 16 includes an electro-magnetically operated valve 17, the electromagnet 18 of which is connected in an electric circuit including a thermostatic switch 19 located in the inner chamber 3, and a switchboard 20 having a plurality of contact points 21, 22 and 23 connected to corresponding switch positions 21a, 22a and 23a of the switch 19.

The valve 17 is mounted on the armature of the magnet 18 and is retained in the open position under the action of a spring 24. The electromagnet and the valve assembly are contained in a gas tight chamber 25 from which a pipe 26 leads to the burner 14, the supply pipe having a bye-pass 27 which terminates in a jet allocated adjacent the gas burner 14.

When the gas cock 28 is open and the gas lighted the gas supply through the pipe 26 will continue until the temperature in the inner chamber 3 rises about a limit as predetermined by whichever contact point 21, 22 or 23 is connected in the electric circuit. As shown, contact point 23 is connected up and immediately the thermostatic switch 19—which may be of the common thermometer type wherein the mercury is the wiping contact—reaches the position 23a the circuit is completed as follows:—negative pole of battery, switch 19 and position 23a, contact point 23 of the switchboard 20, electromagnet 18 to positive pole of battery. Electromagnet 18 operates and causes the valve 17 to close the supply pipe 16 whereupon the burner 14 is extinguished until such time as the electric circuit is broken at the thermostatic switch 19 by the mercury falling whereupon the magnet 18 releases and the burner is again connected up to the gas supply and relighted by means of the bye-pass jet.

In a similar manner the invention provides means for automatically controlling the vacuum pump 8. As shown, the pump 8 is driven by an electric motor 29 in the circuit of which are switch contacts 30 and 31 mounted in and controlled by a device sensitive to changes of vacuum in the drying chambers.

The contact 30 is fixed and the contact 31 is moveable and normally retained in engagement with contact 30 by means of a tension spring 32. To the contact 31 is connected a piston 33 working in a cylinder 34 having an outlet 35 communicating with the suction space 5 between the inner and outer chambers.

During operation of the pump 8 the pressure on the chamber side of the piston 33 will be reduced until such time as the pressure on the contact 31

side of the piston is greater than the combined pressure of the spring 32 and the pressure on the chamber side of the piston. The contacts 30 and 31 will thereupon open to cut off the electric motor 39 from its source of power thereby stopping the vacuum pump which is again started immediately the contacts 30 and 31 close, i. e., when the vacuum in the chambers 1 and 3 is reduced or broken. The tension of the spring 32 is made adjustable so that a predetermined vacuum may be created and maintained in the drying chambers.

The apparatus includes a separate thermometer 36 and a vacuum gauge 37 for checking the degree of heat and vacuum existing in the drying chamber.

The predetermined limits of temperature at which the gas valve operates are respectively 30° C., 40° C. and 50° C., but it will be clear that by providing more contact positions on the switchboard 20 and the thermostatic switch 19 the apparatus can be made to operate at intermediate temperatures.

At the top of the outer chamber 1 is an inlet 38 communicating with a two-way valve 39 controlling a vent 40 to the atmosphere and a pipe 41 connected to a container 42.

In the container 42 is placed the microbicide or liquid for impregnating or waterproofing the timber subsequent to drying. In one position of the valve 39 the container 42 is connected to the drying chambers and the impregnating liquid will flow into the chambers wherein it will vaporize and be absorbed by the dried timber. In the other position of the valve atmospheric air is admitted to the chambers to break the vacuum therein, the impregnating vapour or the air circulating around the timber in a similar manner to the circulation when the vacuum was being formed in the chambers. In one method of preserving the timber subsequent to its drying ammonia in liquid form is introduced into the chamber and upon entering the ammonia evaporates due to the vacuum existing in the chamber and percolates into the open pores of the wood right through to the core, producing the appearance of age as well as fireproofing the wood. After this operation is completed the temperature in the drying chambers can be reduced by opening the air valve direct to the atmosphere thereby breaking the vacuum in the chambers. The door to the apparatus can then be opened to permit of the wood being removed.

A cut out switch may be connected in the circuit of the electric motor which drives the vacuum pump 8 so as to stop the pump when not in use as well as to enable it to be controlled independently of the contacts 30 and 31 as such as may be desirable when the impregnating vapour is introduced into the chambers.

I claim:

1. Apparatus of the character described comprising a sealable casing, and means for producing within said casing a suction effect and a negative pressure which are substantially uniform throughout the interior of said casing, said means comprising wall means within and spaced from and cooperating with the casing to provide a suction space, and a second wall means within the casing spaced inwardly from said first wall means and having a free end portion thereof dis-

posed in overlapping relationship to a free end portion of the first wall means and cooperating with the casing to require air sucked from the casing into said suction space first to pass through the space between the overlapping end portions of the respective wall means.

2. Apparatus of the character described comprising a sealable casing, and means for producing within said casing a suction effect and a negative pressure which are substantially uniform throughout the interior of said casing, said means comprising a pair of side walls and a connecting wall defining a suction space between the casing and said walls, the side walls terminating near the middle of the casing, and other walls spaced inwardly from said side walls and having terminal portions overlapping the terminal portions of said side walls and cooperating with the casing to require air sucked from the casing into said suction space first to pass through the spaces between the overlapping terminal portions of said walls at opposite sides of the casing.

3. Apparatus of the character described comprising a sealable casing, and means for producing within said casing a suction effect and a negative pressure which are substantially uniform throughout the interior of said casing, said means comprising top and bottom inner casing elements each having a pair of side walls spaced from the casing sides, respectively, the top element having a top wall spaced from the casing top and the bottom element having a bottom wall connecting the side walls thereof, the side walls of the upper elements terminating above the bottom of the casing and the side walls of the bottom element being spaced inwardly from the side walls of the upper element and terminating below the top wall of said upper element in overlapping relationship to the side walls of the upper element, whereby, when air is evacuated from the space between the casing and the top element, air flowing to said space from the space within said top and bottom elements is required to pass between the overlapping portions of the side walls of said elements, and means for sucking air from the space.

4. Apparatus of the character described comprising a sealable casing, baffle elements within said casing forming an inner chamber and a suction space between the casing and said baffle means, said baffle elements having overlapping spaced apart terminal portions forming elongated passageways at opposite sides of the casing and affording the sole means of communication between the inner chamber and said suction space, and means connected with said suction space for subjecting said space to a sub-atmospheric pressure.

5. Apparatus of the character described comprising a sealable casing, baffle means within and spaced from said casing and forming an inner working space and a suction space between the casing and the baffle means and outlets at opposite sides of the working space between the top and the bottom thereof communicating with said suction space, so that when the suction space is subjected to a sub-atmospheric pressure air is withdrawn substantially uniformly from all parts of the working space, and means connected with said suction space for subjecting the same to a sub-atmospheric pressure.

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