No. 790,162. PATENTED MAY 16, 1905.

E. N. TRUMP.

APPARATUS FOR DRYING MOIST MATERIAL.

APPLICATION FILED MAR. 27, 1902.

Fig. 1.

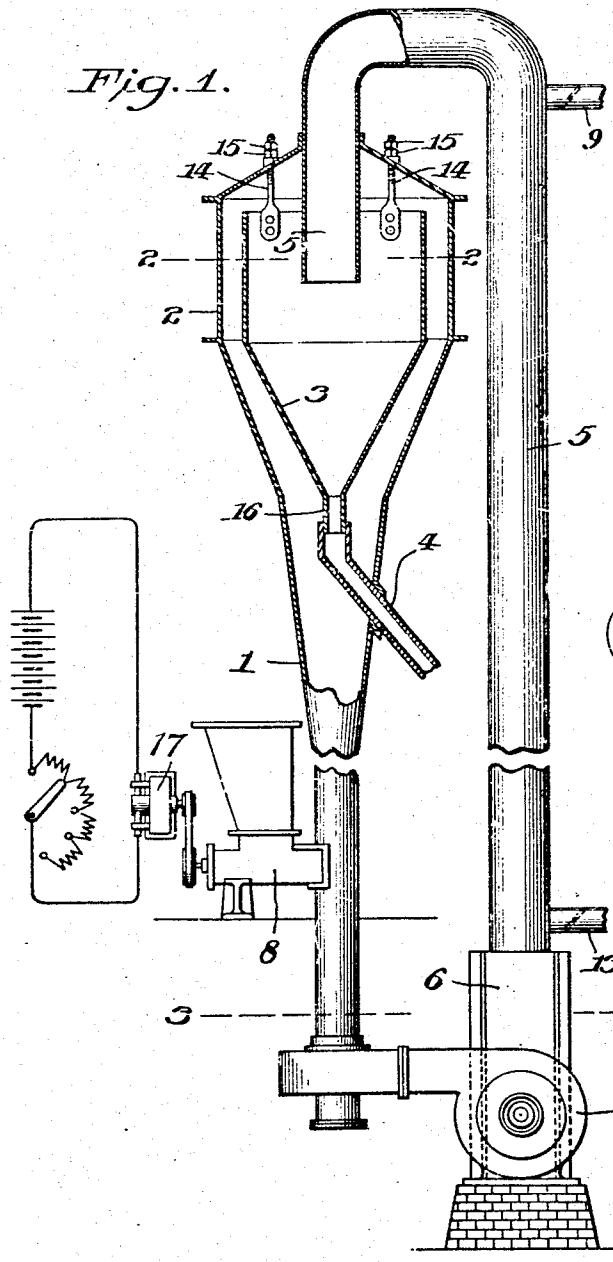


Fig. 2.

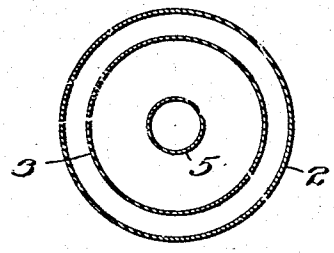
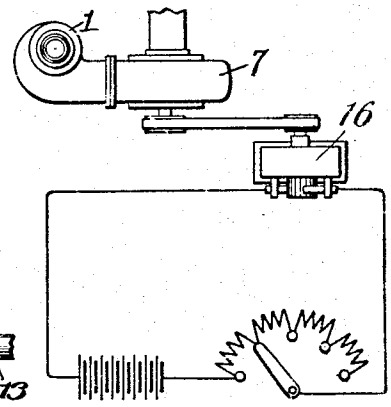


Fig. 3.



WITNESSES:

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No. 790,162. Patented May 16, 1905.

UNITED STATES PATENT OFFICE.

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APPARATUS FOR DRYING MOIST MATERIAL.

SPECIFICATION forming part of Letters Patent No. 790,162, dated May 16, 1905.

Application filed March 27, 1902. Serial No. 100,266.

To all whom it may concern:

Be it known that I, EDWARD N. TRUMP, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented new and useful Apparatus for Drying Moist Materials, of which the following is a specification.

My invention relates to improvements in apparatus for drying moist materials, absorbing gases or vapors, or decomposing and driving off gases from materials requiring such treatment or other similar purpose.

My purpose is to bring a moving current of gas, air, or other treating agent into intimate contact with the material in such a manner as to automatically separate and discharge the finished material as soon as the work is complete, at the same time imparting to or extracting from it the required amount of heat to extract or impart moisture or gas or to decompose the material.

The essential feature of my invention is to induce a current of treating agent which shall act oppositely to the initial movement of the raw material to cause its suspension, but which shall afterward select and carry off with said current the finished material—for instance, by introducing the particles of material into an upwardly-moving current of treating agent of varying velocity, by which it is first suspended against the action of gravity, and as its specific gravity is changed by the action of the treating agent its position is automatically changed until the desired purpose is attained and the material discharged.

This application comprises improvements upon the structures set forth in Letters Patent to me, No. 748,893, dated January 5, 1904, for apparatus for drying moist material.

I accomplish my object by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of my device with the upper part of the stack and separating-chamber in vertical section and a rheostat-controlled motor shown diagrammatically. Fig. 2 is a horizontal section on line 2 2 of Fig. 1. Fig. 3 is a plan view below line 3 3 of Fig. 1 with the heater omitted and a diagrammatic view of a rheostat-controlled motor added.

Similar numerals refer to similar parts throughout the several views.

The stack or chamber 1 is disposed vertically and is preferably of uniform cross-section as to its lower extension and then of gradually-increasing area of cross-section toward the upper extension, and finally of an accentuated increase of cross-section, terminating in the cylindrical drum 2. Inclosed within this drum 2 is the funnel-shaped receptacle 3, open at the top and opening at its lower extension into the conductor 4, which projects through the side of the stack 1. Chamber 3 may be adjustably suspended upon the rods 14, secured through the top of drum 2 by nuts 15. The lower end of chamber 3 terminates in pipe 16, adapted to fit neatly in the vertical portion of conductor 4 and vertically movable therein to permit of the vertical adjustment of chamber 3, as above indicated. The dimensions and location of the chamber 3 are such as to permit of sufficient space between its outer walls and the surrounding drum 2 for the free passage of the treating agent and the material suspended therein.

By the vertical adjustment of chamber 3 the space between it and the tapering wall of the surrounding drum may be increased or diminished, as desired, to suit the condition or character of the material or the method of treating same.

Extending through the top of drum 2 and projecting and opening downwardly at a distance from the top of the drum into the receptacle 3 is the conducting-pipe 5, leading back through heater 6 to blower 7. The blower 7 delivers the treating agent into the stack. This blower may be driven by any suitable means, such as the rheostat-controlled motor 16, and is connected with the base of the stack 1 in such a manner as to deliver a tangential spiral current to the stack, as is best indicated in Fig. 3.

The feed 8 is adapted to introduce material into the stack above or approximate the intake-point of the treating agent for the purpose hereinafter described.

The feed shown is the ordinary type of screw-feed, though other forms may be equally suitable. It may be driven by the rheostat-controlled motor 17, so that the same may be regulated to deliver the material at such rate as may be desired. The valve-controlled exit 9, located in conducting-pipe 5, is adapted to permit the escape of the treating agent, while valve-controlled inlet 13 is adapted to receive such additions to the treating agent as may be desirable.

The operation of my device is as follows: The current of treating agent, heated or dried, if such is desirable, by heater 6, is delivered by the blower 7 at or approximate the base of the stack in a spiral tangent to the sides, which will cause it to have a whirling upward current in a spiral course for the purpose hereinafter explained. The material to be treated is fed into the stack by the feeding device 8, above or approximate the intake-point of the treating agent. As it encounters the upward spiral current of treating agent it is suspended thereby and as it becomes more finished is carried upwardly by the current of treating agent in a spiral or whirling course. To secure the balancing or suspending by the current of treating agent of the raw material as it first enters the stack, the necessary adjustment is made between the rate of feed of material and the rate or vertical velocity of the current at the point of its encounter with the material, so that the wet or raw material as it enters the stack will be suspended or carried upward by the current of the agent. The vertical velocity of the current becomes partly spent in the gradually-widening spiral course consequent upon the increasing area of cross-section of the stack toward its upper extension, so that at a certain distance above the intake-point of material the said vertical velocity of the current is insufficient to support or suspend the raw or wet material, but is only sufficient to suspend the drier or partially-finished material. The point at which the current will not suffice to suspend the raw or wet material will depend upon the adjustment of the initial speed of current, rate of feed, and condition of material and the various respective cross-sections and longitudinal dimensions of the stack.

As above described, by the proper adjustment of the above-mentioned factors of initial speed of current, rate of feed, and cross-section and longitudinal dimension of stack a point exists where the raw or wet material will not be supported by the current; but to be supported at this point the material must be partially finished or dried. It follows that as the area of cross-section of the stack increases as the stack ascends the vertical force or velocity of the current decreases in like proportion, and consequently the higher in the stack that the material is suspended the more completely dried or finished it must be. It will thus be seen that from the point where the current is at first able to suspend the raw or wet material to the top of the stack there is a constant and automatic separation of the finished from the less finished material until the perfectly finished and dried material is delivered at the top entirely free from any of the unfinished portions of the material.

As the treating agent rises in a spiral course upwardly in the stack and around the receptacle 3 it carries with it the finished material held suspended therein. As it strikes the top or the conical-shaped roof of the stack it is deflected downwardly and whirls against the inner vertical walls of receptacle 3. The finished material being heavier than the suspending agent is carried by centrifugal force against said vertical walls and falls to the bottom of receptacle 3, whence it is carried through conductor 4 to a suitable conveyer (not shown) or other suitable receptacle for packing or transportation. The treating agent is drawn first upwardly and then downwardly through the conducting-pipe 5, thence through the heater 6 and blower 7 back to the stack. Thus it is seen the finished material is automatically separated from the unfinished material and then separated from the treating agent and carried off through one exit while the treating agent is discharged through another exit and may be returned in part or in whole through heater and blower to the stack.

As indicated in the first paragraph of the specification, my invention is intended for the drying of moist material or for chemically treating material, and in my use of the term "treating" in the following claims I mean thereby either the drying of material or the causing of some chemical change in the material treated as distinguished from the mere mechanical separation of different particles of a heterogenous mass, such as the separation of wheat from chaff or any heavier particles from lighter particles.

What I claim is—

1. In an apparatus for treating materials, the combination of a series of chambers forming a closed circulatory system, a vertical stack as one of said series of chambers terminating at its upper extension in an enlarged chamber or drum, a separator-chamber inclosed within said drum and means for causing an upward current through said stack of an agent for operating upon and transporting the material.

2. In an apparatus for treating materials, the combination of a series of chambers forming a closed circulatory system, a vertical stack as one of said series of chambers terminating at its upper extension in an enlarged chamber or drum, a separator-chamber inclosed within the drum and communicating

therewith, and means for causing an upward circulation through said stack of an agent for operating upon and transporting the material.

3. In an apparatus for treating materials, the combination of a stack, a blower for delivering a treating agent into the lower extension of the stack and a feed for delivering material into the stack above the intake of the agent, and means for adjustment with respect to said elements whereby a current of treating agent of decreasing vertical velocity is induced through the material to suspend the same until treated, and a separator-chamber inclosed within the stack.

4. In an apparatus for treating materials, the combination of a stack, a blower for delivering a treating agent into the lower extension of the stack and a feed for delivering material into the stack above the intake of the agent, and means for adjustment with respect to said elements whereby a current of treating agent of decreasing vertical velocity is induced through the material to suspend the same until treated, a separator-chamber inclosed within the stack, and an external conductor for the agent leading from the upper part to the lower part of the stack.

5. In an apparatus for treating materials, the combination of a stack, a blower for delivering a treating agent into the lower extension of the stack and a feed for delivering material into the stack above the intake of the agent, and means for adjustment with respect to said elements whereby a current of treating agent of decreasing vertical velocity is induced through the material to suspend the same until treated, a separator-chamber inclosed within the stack, an external conductor for the agent leading from the upper part to the lower part of the stack, and a heater connected with the conductor.

6. In an apparatus for treating materials, the combination of a stack, a blower for delivering a treating agent into the lower extension of the stack and a feed for delivering material into the stack above the intake of the agent, and means for adjustment with respect to said elements whereby a current of treating agent of decreasing vertical velocity is induced through the material to suspend the same until treated, a separator-chamber inclosed within the stack, and an external conductor for the agent leading from the upper part to the lower part of the stack, said conductor having valve-controlled inlet and outlet means for the agent.

7. In an apparatus for treating materials, the combination of a stack, a blower for delivering a treating agent into the lower extension of the stack and a feed for delivering material into the stack above the intake of the agent, and means for adjustment with respect to said elements whereby an aeriform current of decreasing vertical velocity is induced through the material to suspend the same until treated, a separator-chamber inclosed within the stack, conducting means for the agent leading from near the upper part thereof and conducting means for the material leading from the separator-chamber.

8. The combination of a drier-stack gradually increasing in diameter with its height, a separator-chamber inclosed within the stack, means for creating a blast of treating agent through the stack and external conducting means for the agent from the upper part of the stack back to the lower part of the stack.

9. The combination of a drier-stack gradually increasing in diameter with its height terminating in an enlarged chamber or drum at its upper extension, a separator-chamber inclosed within the drum, means for creating a blast of treating agent through the stack and external conducting means for the agent from the drum back to the lower part of the stack.

10. The combination of a drier-stack gradually increasing in diameter with its height, a separator-chamber inclosed within the stack, means for creating a blast of treating agent through the stack and means for conducting material when dried from the separator-chamber.

11. The combination of a drier-stack gradually increasing in diameter with its height, a separator-chamber inclosed within the top of the stack, means for creating a blast of treating agent through the stack and means connected with the separator-chamber for carrying off finished material and means for returning treating agent from the top of the stack back to the bottom of the stack.

12. The combination of a drier-stack gradually increasing in diameter with its height, means for inducing an upward current of treating agent therein, means for feeding material thereto, and an adjustably-supported separator-chamber inclosed within the stack and open thereto.

13. In an apparatus for treating materials, the combination of a stack of increasing area of cross-section toward its upper extension, means for inducing an upward current of treating agent therein, means for feeding material to be treated into said stack, a separator-chamber inclosed within the stack, a conductor connected therewith for carrying off the finished material and external conducting means leading from the separator-chamber for returning the treating agent back to the lower portion of the stack.

14. In an apparatus for treating materials, the combination of a stack of increasing area of cross-section toward its upper extension, means for inducing an upward current of treating agent therein, means for feeding material to be treated into said stack, a separator-chamber inclosed in the upper part of said stack, a conductor connected with the separator-chamber for carrying off the finished material,

an external conductor for said agent, leading from the top of the separator-chamber to the lower part of the stack and a heater connected therewith.

15. In an apparatus for treating materials, the combination of a treating-chamber, regulatable means for introducing into said chamber material to be treated, means for inducing an upward current of treating agent so as to entirely suspend the whole mass of material during the period of treatment and to transport the same as it becomes treated, a separator-chamber inclosed in the upper part of the treating-chamber for receiving the transported material and separating it from the treating agent.

EDWARD N. TRUMP.

Witnesses:
J. D. PENNOCK,
MAE HOFMANN.