

E. N. TRUMP.
 APPARATUS FOR TREATING MATERIAL.
 APPLICATION FILED MAR. 11, 1902.

Fig. 1.

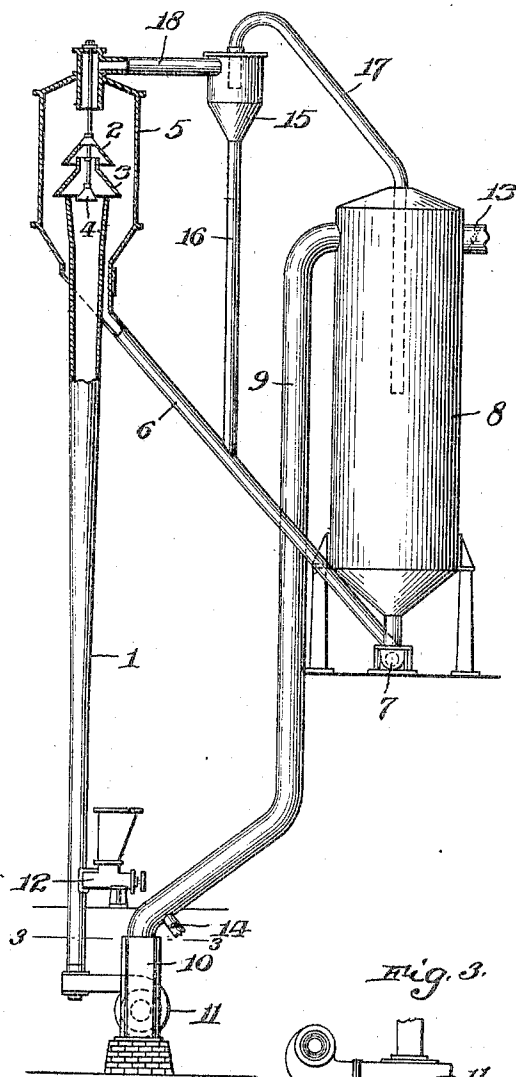


Fig. 2.

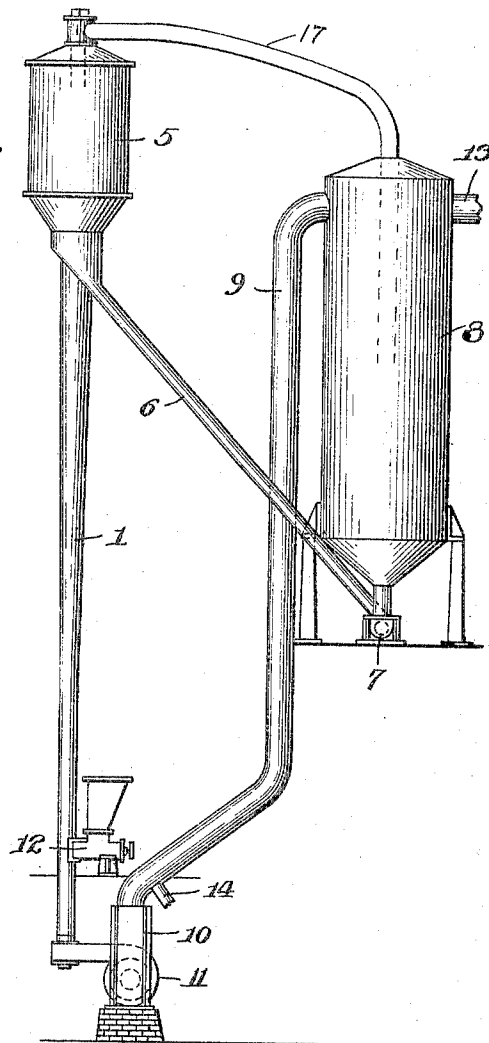
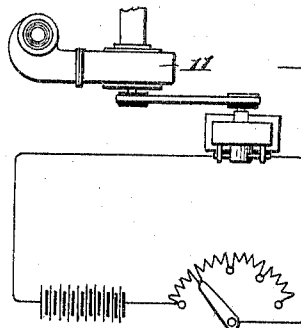


Fig. 3.



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APPARATUS FOR TREATING MATERIAL.

SPECIFICATION forming part of Letters Patent No. 788,741, dated May 2, 1905.

Application filed March 11, 1902. Serial No. 97,875.

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 Material, 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 an elevation of my device, showing the upper extension of the stack and the surrounding separating-chamber in vertical section. Fig. 2 is an elevation of my device with the supplemental separating-chamber 15 omitted and conductor 17 leading directly from the top of chamber 5 to the top of chamber 8. Fig. 3 is a sectional view on line 3 3

of Fig. 1 with the heater omitted and a rheostat-controlled motor added diagrammatically.

Similar numerals refer to similar parts throughout the several views.

The stack 1 is preferably of uniform cross-section as to its lower extension and then of gradually-increasing area of cross-section toward its upper extension and opening at the top in a slightly-accentuated increase of area of cross-section. Above the opening surrounding the stack are the series of baffles 2, 3, and 4. The upper extension of the stack and the baffles 2, 3, and 4 are inclosed in the separating-chamber 5, which has a funnel-shaped or downwardly-converging bottom opening into an inclined conductor 6, leading to conveyer 7, which is at the bottom of and communicates with the dust-chamber 8. A conducting-pipe 9 leads from the upper extension of the dust-chamber 8 to the heater 10, which is connected by the fan or blower 11 to the bottom of stack 1. The upper part of the separating-chamber 5 is connected with the upper part of dust-chamber 8 by conductor 17, as shown in Fig. 2, or by conductor 17, supplemental separator 15, and conductor 18, as shown in Fig. 1. A feeding device of any suitable form is connected with the lower part of the stack, as at 12, and is adapted to discharge above the intake of the treating agent. A valve-controlled outlet is provided, as at 13, for the discharge of the treating agent from the dust-chamber 8, while a valve-controlled inlet is provided, as at 14, for admitting fresh air, gas, or other agent to the heater. The blower 11 may be operated by a rheostat-controlled electric motor, so as to regulate the force or velocity with which the treating agent is induced thereby. The feeding device 12 may also be operated by a rheostat-controlled electric motor similar to that shown for operating the blower for regulating the speed with which the material is fed into the stack.

In Fig. 1 I show a conducting-pipe 18 leading from the top of separating-chamber 5 to a secondary separator 15, which has a funnel-shaped bottom opening into the downwardly-extending conductor 16, which discharges into the conductor 6. The conductor 17 connects

separator-chamber 15 with dust-chamber 8 and projects a considerable distance downwardly through the top of each chamber—that is, conductor 17 receives from about the central portion of chamber 15 and discharges in the central portion of chamber 8.

In Fig. 2 I show the secondary separator 15 omitted, the conductor 17 leading directly from the top of chamber 5 through the top of chamber 8.

The operation of my device is as follows: Taking, for example, the apparatus constructed as shown in Fig. 1, the material is fed into the stack 1 at 12 and encounters the upward current of treating agent induced into the bottom of the stack by blower 11. The rate of feed and the force of the current of treating agent are so adjusted with respect to each other as to maintain the suspension of the material in the treating agent until the material begins to decrease in specific gravity, when it is gradually carried upward in the stack 1. Inasmuch as the area of cross-section of the stack is less at its lower extension, the vertical velocity of the current of the treating agent will be greater there than in the upper portion of the stack, where the area of cross-section is greater and the current of treating agent becomes more dispersed, and thus loses its vertical velocity. By this loss of vertical velocity of the current, due to the gradually-widening spiral course consequent upon the increasing area of cross-section of the stack toward its upper extension, it results 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 indicated, by the proper adjustment of the above-mentioned factors of initial speed of current, rate of feed, and cross-section and longitudinal dimensions 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 dry material is delivered at the top entirely free from any of the unfinished portions of the material.

The whirling or spiral course of the current of treating agent produced by the construction as shown most plainly in Fig. 3 is useful for causing a greater agitation of the material to be treated and a more thorough commingling of the treating agent with its particles. It is also to be noted that where the current has an upward spiral course the heavier material—that is, the moist or unfinished material—will be driven to the outer side of the current and against the walls of the chamber, while the finished or lighter materials will assume an inner position, the wet or unfinished displacing or forcing out of the outer portions of the current the material that has become finished or dried—that is, the moist material, being heavy, will always seek the larger circle and force the dry material away. Thus the spiral current insures the position of the moist material at all times for the most efficient treatment. In this respect the said current may be appropriately termed an “operating agent.”

The finished material, which is delivered at the top of the stack 1 against the baffles 2, 3, and 4, is in large part separated thereby from the treating agent and falls to the bottom of chamber 5 through conductor 6 to conveyer 7, while the treating agent is carried through the top of chamber 5 over to the dust-chamber 8 or over to the secondary chamber 15 and then to dust-chamber 8, as shown in Fig. 1. Where the treating agent is carried through conductor 18 to secondary separator 15, there is a further separation of material from the treating agent. This material descends through conductor 16 to conductor 6, thence to conveyer 7, while the separated treating agent is carried through conductor 17 to dust-chamber 8, where a further and final separation of material from the agent takes place. The treating agent is returned from the dust-chamber 8 through conductor 9 to heater 10 and is forced from heater 10 through blower 11 back to the bottom of stack 1, and thus is completed the cycle of operation.

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 heterogeneous 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, a series of communicating chambers forming a

closed circulatory system, a vertical stack as one of said series of chambers, a separator-chamber surmounting and inclosing the top of said stack and means for causing an upward current through said stack of an agent for operating upon and transporting the material.

2. In a drying apparatus, the combination of a stack, a blower and a feed, and means for adjustment with respect to said elements whereby an aeriform current of decreasing vertical velocity is induced through the moist material to suspend the same until dried and a separator-chamber surmounting the stack.

3. In a drying apparatus, the combination of a stack, a blower and a feed, and means for adjustment with respect to said elements whereby an aeriform current of decreasing vertical velocity is induced through the moist material to suspend the same until dried, a separator-chamber surmounting the stack, conducting means for the agent leading from near the upper part thereof and conducting means for the material leading from approximately the lower part thereof.

4. The combination of a drier-stack gradually increasing in diameter with its height, a separating-chamber surmounting and inclosing the top of the stack and external conducting means from the separating-chamber back to the stack.

5. The combination of a drier-stack gradually increasing in diameter with its height and open at the top, a baffle surmounting said opening, a separating-chamber surmounting and inclosing the top of said stack and the baffle and external conducting means between the separating-chamber and stack.

6. The combination of a drier-stack gradually increasing in diameter with its height, a separating-chamber surmounting and inclosing the stack, and means for conducting material when dried, from the separating-chamber.

7. The combination of a drier-stack gradually increasing in diameter with its height, a separating-chamber inclosing the top of the stack, and means connected with the separating-chamber for carrying off finished material and for returning treating agent to the stack.

8. 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 the material thereto, a separating-chamber surmounting and inclosing the top of the stack and a supplemental separating-chamber connected between the first separating-chamber and the lower portion of the stack.

9. In an apparatus for treating material, the combination of a stack of increasing area of cross-section toward its upper extension, means for inducing an upward current of treating agent therethrough, means for feeding material to be treated in said stack, a separating-chamber surmounting and inclosing the top of said stack for separating the finished material from the treating agent, conveying means connected therewith for carrying off the finished material and conducting means connected with the separator for returning the treating agent back to the stack.

10. In an apparatus for treating material, the combination of a stack of increasing area of cross-section toward its upper extension, means for inducing an upward current of treating agent therethrough, means for feeding material to be treated in said stack, a separating-chamber surmounting and inclosing the top of said stack for separating the finished material from the treating agent, conveying means connected therewith for carrying off the finished material and a conductor and heater connected between the separating-chamber and the lower portion of the stack for heating and returning said agent to the stack.

11. In an apparatus for treating material, the combination of a treating-chamber, regulatable means for introducing into the chamber material to be treated, means for inducing an upward current of treating agent so as to continuously suspend the whole mass of material in the chamber during the period of treatment and to transport the same as it becomes treated, and a separating-chamber surmounting and inclosing the top of the treating-chamber for receiving the transported material and separating the same from the treating agent.

EDWARD N. TRUMP.

Witnesses:

EDWARD HARSHAW,
MAE HOFMANN.