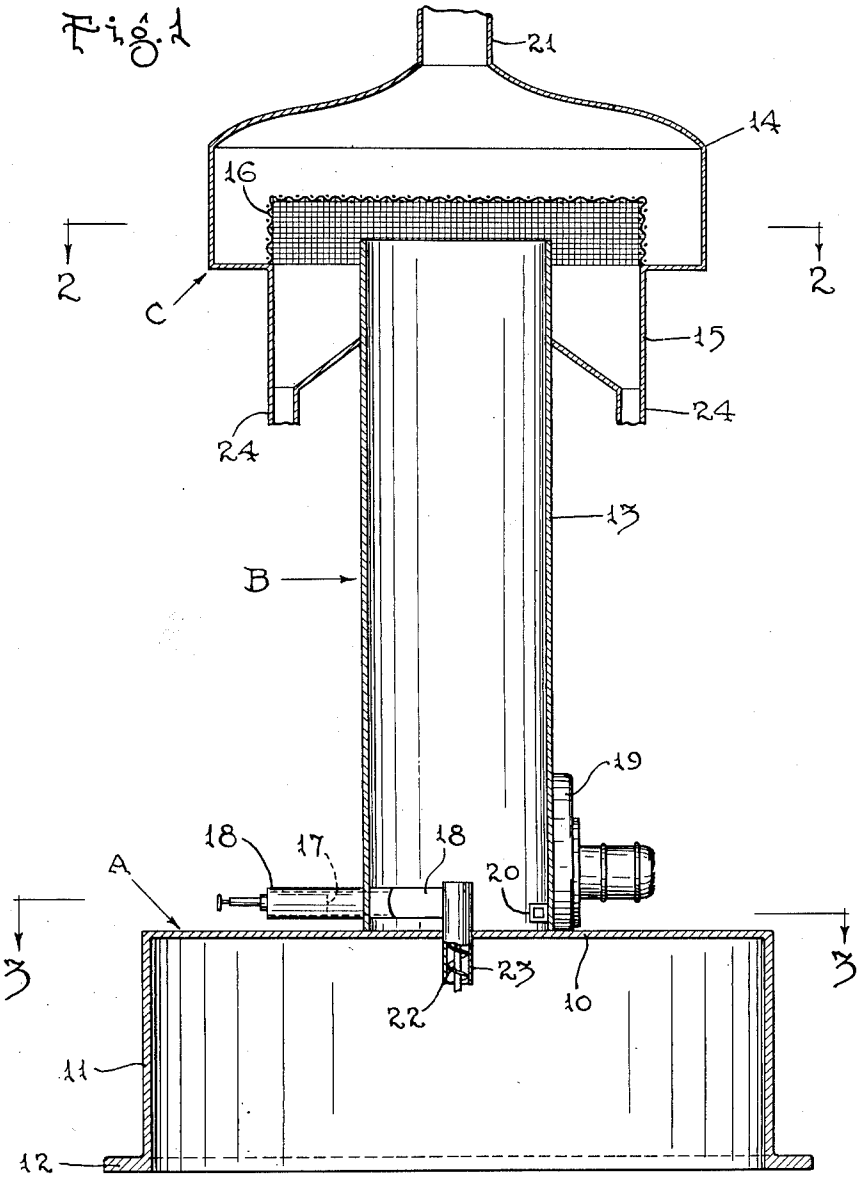
Jan. 16, 1940. C. H. BUTLER 2,187,538

METHOD OF EXFOLIATING VERMICULITE AND SIMILAR MINERALS

Original Filed Dec. 17, 1936 2 Sheets-Sheet 1

Fig. 1



Inventor

Clarence H. Bulter

By Banwell + Lagaard

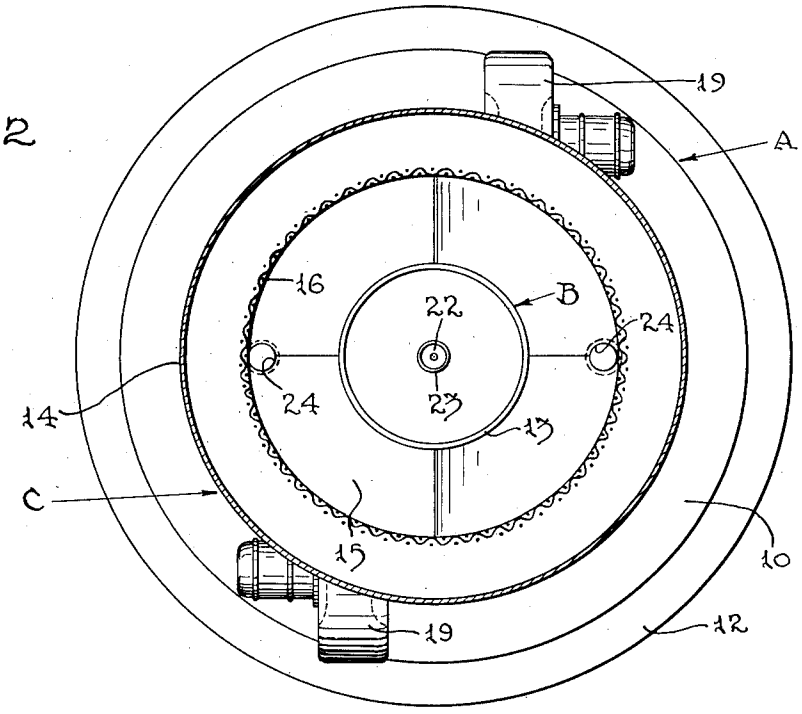
Attorneys

Jan. 16, 1940. C. H. BUTLER 2,187,538

METHOD OF EXFOLIATING VERMICULITE AND SIMILAR MINERALS

Original Filed Dec. 17, 1936 2 Sheets-Sheet 2

Fig. 2



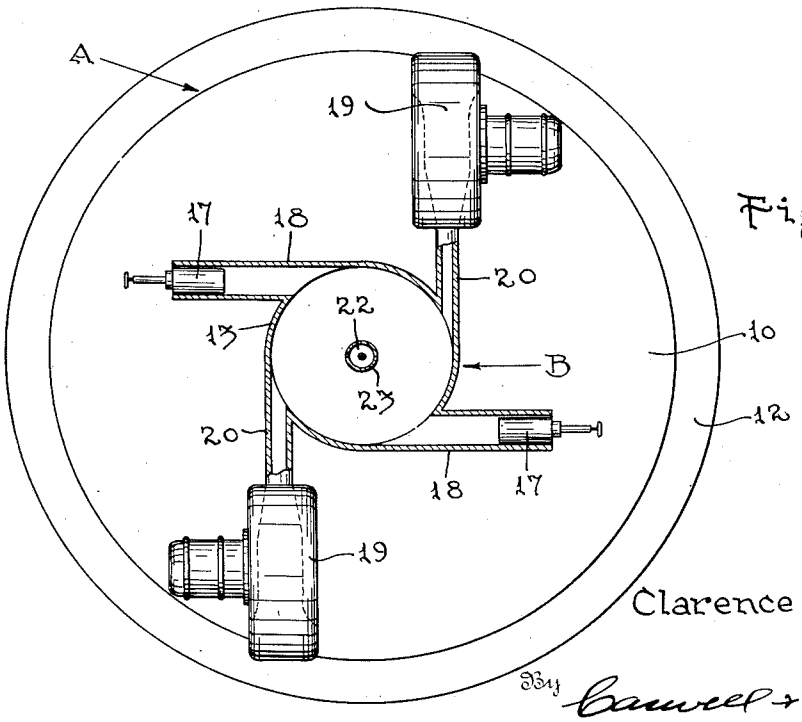


Fig. 3

Inventor

Clarence H. Butler

By Cauwell & Lagaard

Attorneys

Patented Jan. 16, 1940

2,187,538

UNITED STATES PATENT OFFICE

2,187,538

METHOD OF EXFOLIATING VERMICULITE AND SIMILAR MINERALS

Clarence H. Butler, Minneapolis, Minn., assignor to Amalgamated Minerals Corporation, Minneapolis, Minn., a corporation of Minnesota

Original application December 17, 1936, Serial No. 116,330. Divided and this application August 11, 1938, Serial No. 224,321

7 Claims. (Cl. 252—1)

My invention relates to improvements in methods of exfoliating vermiculite and similar minerals, the present application being a division of my application for patent for Means for exfoliating vermiculite and similar minerals, which was filed December 17, 1936, under Serial No. 116,330, and which matured into Patent No. 2,129,523, September 6, 1938.

An object of the present invention is to provide a method capable of being practically carried out, such method serving efficiently in a continuously progressive process of operation properly to heat the individual mineral pieces in the general run thereof to effect the maximum uniform exfoliation of such pieces, respectively, without rendering them objectionably friable or fragile and without danger of fragmentizing the same.

Another object of my invention is to provide a method of transmuting pieces of material capable of expansion under heat, wherein the pieces of material to be treated are introduced into a helically ascending carrier of hot gases and advanced thereby to a locality determined for their recovery and at a rate commensurate with the transmutation of the respective pieces as effected by the heat of the carrier.

A further object of the invention is to provide a method of exfoliating vermiculite, wherein the mineral pieces are introduced into a columnar vortex of hot, helically ascending gases which pick up and sustain the mineral pieces while exfoliation thereof progresses and which elevates the pieces to a given level for the recovery thereof as exfoliation of the individual pieces progresses to completion.

Another object of the invention is to provide a method, as above, in which the exfoliated mineral pieces are delivered for recovery from a helically ascending gaseous carrier by centrifugal force.

The foregoing and other objects of the present invention will appear in the following description and appending claims.

The present method contemplates the creation and maintenance within lateral confines of a whirling body of progressively advancing heated gases into which mineral pieces are introduced at one locality along said body of gases and from which body of gases the heat expanded pieces are ejected by centrifugal force and collected for delivery in exfoliated state.

In the accompanying drawings, Fig. 1 is a vertical central sectional view and Figs. 2 and 3 are transverse sectional views, somewhat diagrammatical in character, illustrating a form of apparatus for carrying out the present invention, Fig. 2 being a section taken as on the line 2—2 of Fig. 1 and Fig. 3 being a section taken as on the line 3—3 of Fig. 1.

The illustrated apparatus includes a base A, body B and head C.

The base A comprises a bed-plate 10 supported by an annular wall 11 formed with an anchorage flange 12.

The body B consists of an upright tubular stack 13 having its footing on the bed-plate 10 of the base A. The head C comprises a hood 14 superimposing the stack 13, an annular hopper 15 encircling said stack, and a dome 16 of wire mesh capping the stack 13 and hopper 15.

The use of two burners and two blowers is indicated in the drawings. Burner heads 17 suitably supplied with fuel oil and air under pressure are fitted in passageways 18 leading tangentially into the stack 13 at the lower portion thereof.

Mounted on the bed-plate 10 of the base A are two blowers 19. Each blower 19 connects with a tuyère 20 directed into the lower portion of the stack 13 tangentially thereof in diametrical opposition to the tuyère of the other blower. Blasts of burning gases from the burner heads 17 and blasts from the blowers 19 combine within the stack 13 to create a columnar vortex of helically ascending heated gases which pass from the stack 13 through the wire mesh dome 16 into the hood 14 and out of the same through the flue 21 leading from said hood.

The pieces of vermiculite to be exfoliated are continuously fed into the lower portion of the stack 13 in any suitable manner, as by means of a conveyor screw 22 turning in a tubular case 23 into which the mineral pieces are suitably introduced. Or, if desired, the mineral pieces may be fed into one or both of the blower tuyères 20.

Upon being exposed to the whirling blasts from the burners 17 and blowers 19, the mineral pieces are picked up in the vortex of hot gases, the force of the combined blasts being sufficient to buoy up and sustain the raw mineral pieces in suspension as they are fed into the stack and the temperature gradient of said blasts being sufficient to initiate the transmutation of such mineral pieces. As the said pieces expand and the surface areas thereof increase, the enlarged pieces are elevated in the helically ascending gases, the speed of their elevation depending upon the degree of expansion attained. Though

the buoying force of the whirling gases in the vortex near the top of the stack 13 is relatively diminished, it will, by design, be sufficient to lift the expanded or exfoliated mineral pieces to the lip of said stack over which such pieces are thrown by centrifugal force. While gases issuing from the stack 13 pass through the wire mesh dome 16 and thence through the hood 14 to the flue 21, the expanded mineral pieces are caught by the dome 16 from which they gravitate, first, into the hopper 15 and then to the discharge conduits 24 leading therefrom.

The diameter and length of the stack 13 and the capacities of the burners 17 and blowers 19 (temperature gradient of the burner blasts and quantity and pressure of the air blasts considered) are such that the mineral pieces, fed into the stack, will be picked up in the hot vortex, then elevated at a rate in proportion to their individual expansion, and, finally, tangentially ejected from the top of the stack upon becoming fully exfoliated. In this manner, I economically accomplish the creation and maintenance of a columnar vortex of helically progressing heated gases, which picks up the fed mineral pieces, heat treats and advances the same, in suspension, and ultimately ejects the expanded pieces, the time element being automatically regulated, since the quicker the expansion of any individual piece, the quicker its progress from the zone of greatest heat in the gaseous carrier.

The product resulting from my present highly efficient method is substantially uniform, without appreciable distortion, and is fully transmuted without being rendered friable and easily crumbled through overheating.

Variations in the method, as herein disclosed, may be made within the scope of what is claimed without departing from the spirit of my invention.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. The method of exfoliating pieces of micaceous mineral consisting in tangentially introducing hot gases into a stack near the base thereof to create a helically ascending gaseous carrier therein capable of buoying up and expanding raw mineral pieces and individually elevating the same as the expansion thereof progresses, said method including the introduction of the raw mineral pieces into the carrier adjacent to the locality of entry of said gases into the stack, and the recovery of the exfoliated pieces from said carrier at a higher elevation.

2. The method of exfoliating pieces of micaceous mineral consisting in creating a columnar vortex of helically ascending heated gases capable of buoying up and expanding raw mineral pieces and elevating the same as the expansion thereof progresses, said method including the introduction of the raw mineral pieces into the vortex at its lower portion, and the recovery of the exfoliated pieces from said vortex at a higher elevation.

3. The method of exfoliating pieces of vermiculite, said method consisting in introducing such mineral pieces into a columnar vortex of heated, helically ascending gases created under transverse confinement of limited height to exfoliate, elevate, and by centrifugal force discharge the exfoliated pieces therefrom above the terminus of its transverse confinement.

4. The method of exfoliating pieces of vermiculite consisting in introducing such mineral pieces into a columnar vortex of heated, helically ascending gases created under transverse confinement of limited height to exfoliate, elevate, and by centrifugal force discharge the exfoliated pieces therefrom above the terminus of its transverse confinement, said method consisting further in the recovery of the discharged pieces from said gases.

5. The method of exfoliating pieces of micaceous mineral consisting in introducing the pieces into a columnar vortex of helically ascending heated gases serving to exfoliate said pieces and elevate them as they expand, said method consisting, further, in recovering the elevated exfoliated pieces.

6. The method of exfoliating pieces of micaceous mineral consisting in introducing the pieces into a columnar vortex of helically ascending heated gases serving to exfoliate, elevate and discharge the exfoliated pieces by centrifugal force.

7. The method of transmuting pieces of material capable of expansion under heat, said method consisting in introducing such pieces, at one elevation, into a columnar vortex of helically ascending heated gases serving to heat the pieces and to elevate the same as they expand and to discharge the expanded pieces by centrifugal force at a higher elevation.

CLARENCE H. BUTLER.