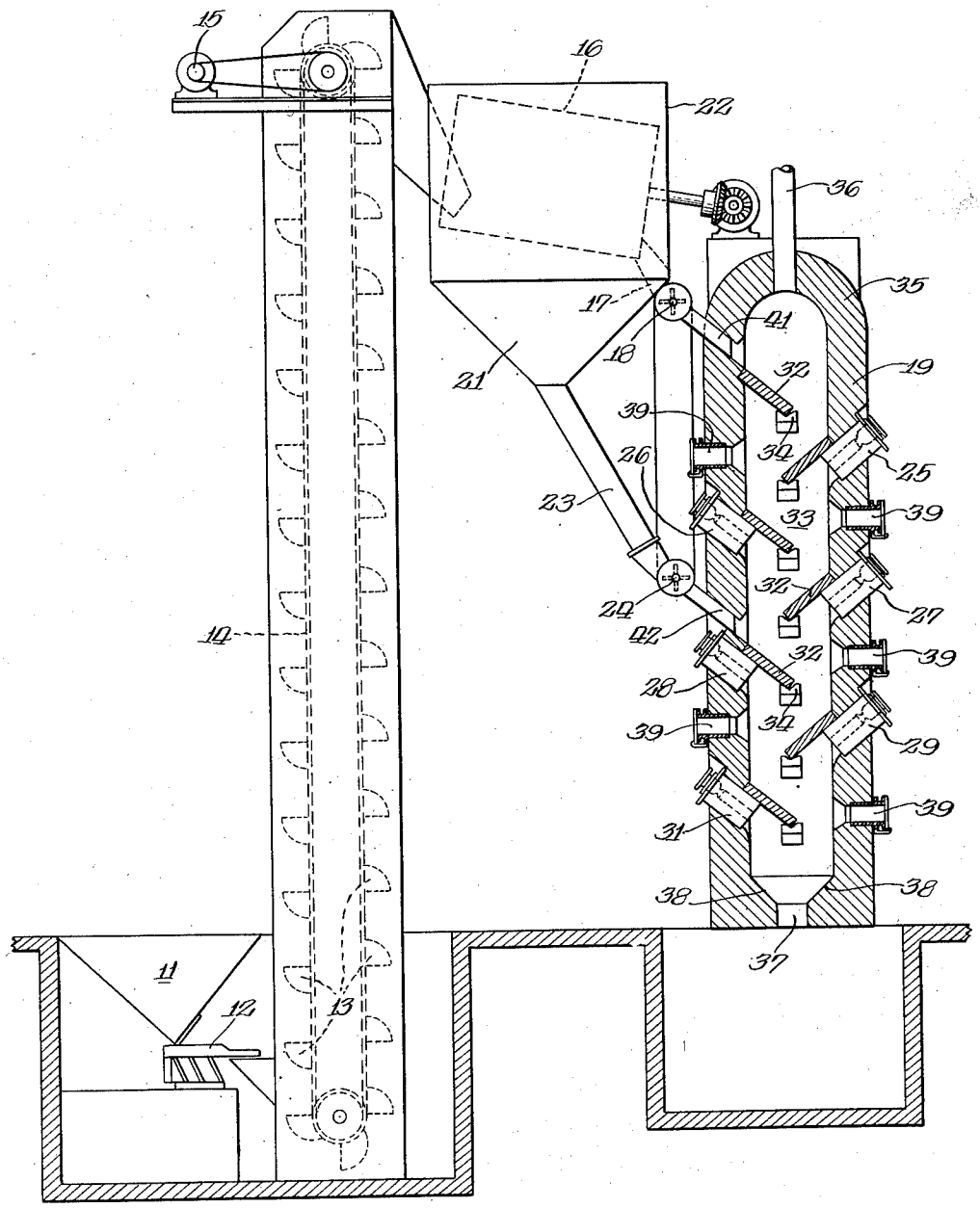
Dec. 6, 1938. J. B. MYERS ET AL 2,139,378

VERMICULITE EXPANSION METHOD

Filed Dec. 24, 1937



Inventors:-
John B. Myers,
Glenn Sucetti.
By Walter M. Fuller Atty.

Patented Dec. 6, 1938 2,139,378

UNITED STATES PATENT OFFICE

2,139,378

VERMICULITE EXPANSION METHOD

John B. Myers, Libby, Mont., and Glenn Sucetti, Chicago, Ill., assignors to Universal Insulation Company, Chicago, Ill., a corporation of Illinois

Application December 24, 1937, Serial No. 181,658

6 Claims. (Cl. 252—1)

The present invention pertains to the exfoliation or expansion of pieces of the mineral vermiculite under the action of heat for use as a heat-insulator or for other purposes.

Heretofore, difficulty has been experienced in heat swelling or distension of such vermiculite particles in a furnace, in that to secure ample expansion of the larger particles, the pieces of smaller size have been unduly raised in temperature producing undesired friable small particles, and, if less heat were employed to save such smaller pieces from over-heating, the larger pieces were not fully exfoliated or puffed.

One outstanding or leading object or aim of the present invention is to provide a process or method for expanding vermiculite ore particles of various sizes in such manner that the large and the small particles are given separately controlled heat treatment, whereas by the old methods no attempt has been made to perform the procedure by selecting heat treatment of the ore pieces of different sizes.

As a result of such earlier processes, the smaller particles were invariably over-expanded, producing brittle or frangible small particles, or, if less heat treatment were resorted to, the larger pieces of ore were not fully or thoroughly swelled or enlarged.

Accordingly, in order to overcome the disadvantages incident to the practice of the prior art processes, the novel and improved method of providing a uniformly expanded product consists in separating the large and small particles by screening prior to their introduction into the expansion-chamber of the heated furnace, admitting the larger vermiculite particles into one portion of the furnace wherein they will receive the maximum heat treatment and admitting the smaller particles into another portion of the furnace wherein they will receive a separately-controlled heat treatment of lesser or lower degree than the larger particles, whereby all of the mineral particles treated are given approximately the same degree of expansion thereby affording substantial uniformity in the final product.

Furnaces of various types and styles may be employed for practicing the new and beneficial procedure, but, by way of example only, one such appliance is illustrated in the accompanying drawing, in which the single view is a substantially-central vertical-section through the furnace or ore-heating apparatus.

In this appliance, vermiculite ore from a hopper 11 is fed by a vibratory-feeder 12 to the buckets 13 of an upright, endless elevator 14 operated by an electric-motor 15, or by any other approved driving means, such elevator delivering the ore into an inclined, rotary screen 16 which feeds the larger particles incapable of passing through the meshes of the screen through a chute 17 and rotary vane feeder 18 into the interior of the top of the furnace, characterized as a whole 19, the smaller particles which pass through the revoluble screen passing by gravity through the hopper-shaped bottom 21 of the casing 22 housing the screen and through an inclined conduit 23 and rotary vane feeder 24 into the furnace at a lower level than the entrance thereinto of the larger particles.

Such screen and the two feeders referred to may be rotated by any suitable means not shown in detail.

The furnace, which may be rectangular in horizontal cross-section, is provided in two of its opposite vertical walls with a number of sloping gas or other suitable burners 25, 26, 27, 28, 29 and 31, each having directly above it a downwardly-inclined, refractory-tile baffle 32 supported at its inner end, near the center of the upright furnace heating-chamber 33, on suitable blocks 34 and at its outer end at the wall.

The dome top 35 of the furnace has a discharge or outlet port connected to a delivery flue 36 for the escape of the products of combustion and the bottom has an outlet 37 through which the exfoliated vermiculite is delivered being guided thereto by the sloping walls 38, 38.

In addition, the furnace is equipped with a numer of peep-holes 39, 39 through which the operation of the furnace may be readily observed.

As will be readily understood, the larger vermiculite particles entering the furnace through the upper inlet passage 41 and the smaller particles admitted into the furnace through the lower admission conduit 42 slide down the upper surfaces of the opposed, inclined baffles by gravity and descend in a zig-zag or tortuous course down to the bottom of the furnace without coming too directly in contact with the burners or their flames by reason of the shielding action of the baffles, such descent of the vermiculite being in opposition to the upward travel of the heated products of combustion in the furnace.

The gas-burners in the upper section of the heating-chamber are adjusted for the expansion of the larger particles and the burners in the lower portion of the expansion-chamber below the entrance point of the finer particles are regulated for the correct and desired exfoliation of the finer particles of ore, it being apparent that,

by reason of the upright relation of the furnace, the heat developed by the lower burners assist in heating the larger particles in the upper part of the heating-chamber, thus affording a conservation of the developed heat.

The stream of coarser and smaller particles of exfoliated vermiculite descend by gravity to the bottom of the expansion-chamber from which they may be removed by a screw-conveyor or they may be allowed to slide down the incline to an elevator-boot, neither of which structures it is necessary to illustrate as they constitute no part of the present invention except that, of course, it is essential to convey the expanded vermiculite away in some appropriate manner and preferably to a hopper and associated dust-collector.

It has been found that a current of air is desirable for the specified purpose of elevation since vermiculite particles are more plastic and do not shrink after bagging when conveyed by an air stream, and the rock impurities, if any, accompanying the expanded material being too heavy to be raised by the air, drop as the lighter expanded material is elevated and carried away, thereby affording the elimination of the rock impurities.

The number of burners employed in the furnace and the regulation or adjustment of the heat developed thereby are such that practically all of the vermiculite particles, regardless of their differences in size, are expanded in approximately the same degree in a reducing atmosphere.

Some of the outstanding features of and prominent benefits accruing from the employment of the new procedure may be mentioned as follows:

(*a*) the screening process inserted in the crude ore flow which permits a division of the ore as to size thus allowing separate heat treatment;

(*b*) a method of treatment whereby the larger ore particles are expanded under greater heat and/or a longer heat period than the finer particles;

(*c*) a mode of procedure by which the smaller ore particles are expanded under less heat and a shorter cycle than the coarser particles;

(*d*) a treating method by virtue of which the smaller ore particles can be made to have substantially the same measure or standard of plasticity as the larger ore pieces through different heat intensity and different time through a manual control of heat and air under reducing furnace atmospheric conditions; and

(*e*) a method of treatment which permits preexpansion under lower heat of large and small ore particles with a final expansion with greater heat and complete expansion in a concluding heat application.

From what precedes, it will be understood that by modification of the action of the various burners substantial differences in the process of expansion may be had, in that the larger particles may be exfoliated quickly under a high degree of heat or more slowly under a lesser amount of heat applied for a longer period and the action of the heat on the smaller particles as to time and intensity is subject to adjustment and change.

The exfoliation of the larger ore pieces may be effected very suddenly so that during the latter portion of their gravity descent, they may not be materially affected by the lesser heat which is expanding the finer or smaller pieces, or they may be more slowly acted upon so that their complete expansion is not fully accomplished until they reach the lower portion of the furnace.

The invention as defined by the appended claims is not limited to all of the details herein set forth and various changes may be resorted to without departure from the heart and essence of the invention and without loss of any of its material benefits and advantages.

It may be desirable to obtain a greater range of selective heat treatment than is afforded by dividing the stream of particles into two sizes as illustrated by the above design. This is accomplished by screening the mixture of sizes over a multi-deck screen which would divide the mixture into three or more sizes. Each size could be given its correct heat treatment by introducing them at various points or levels of the heating cycle.

We claim:

1. In the process of heat-expanding vermiculite ore, the steps of introducing the larger vermiculite ore particles into a heated expansion furnace at a point to receive maximum heat treatment therein, introducing the smaller vermiculite ore particles into the furnace at another point to receive less heat treatment therein than that to which said larger ore particles are subjected, and removing the heat-expanded particles from the furnace, whereby to obtain approximately the same degree of expansion for all of the ore particles treated thus tending to uniformity of the product resulting from the treatment of various sizes of ore particles.

2. The process set forth in claim 1 in which said larger and smaller ore particles are substantially simultaneously introduced into the furnace and substantially simultaneously acted upon by the heat in the furnace.

3. The process set forth in claim 1 in which said furnace is substantially-upright and said smaller particles are introduced thereinto at a lower level than the point of introduction of said larger particles.

4. The process set forth in claim 1 in which said larger and smaller ore particles are substantially simultaneously introduced into the furnace and substantially simultaneously acted upon by the heat in the furnace and in which the furnace is substantially-upright and said smaller particles are introduced thereinto at a lower level than the point of introduction of said larger particles.

5. The process set forth in claim 1 in which said ore particles are caused to travel downwardly in a zig-zag path by gravity while undergoing the expansion.

6. In the process of heat-expanding vermiculite ore, the steps of size-grading the ore stream to a heated expansion furnace, introducing the larger graded ore particles into the furnace at a point to receive therein the maximum heat treatment, substantially simultaneously introducing the smaller graded ore particles into the furnace at another point to receive less heat treatment than that of, but substantially simultaneously with that of, said larger ore particles, and removing the expanded particles from the furnace, whereby to obtain approximately the same degree of expansion for all of the ore particles treated, thus tending to uniformity of the product resulting from the treatment of various sizes of ore particles.

JOHN B. MYERS.
GLENN SUCETTI.