Aug. 16, 1938. W. E. CARSON 2,127,287

MAKING ROCK WOOL PREPARATIONS

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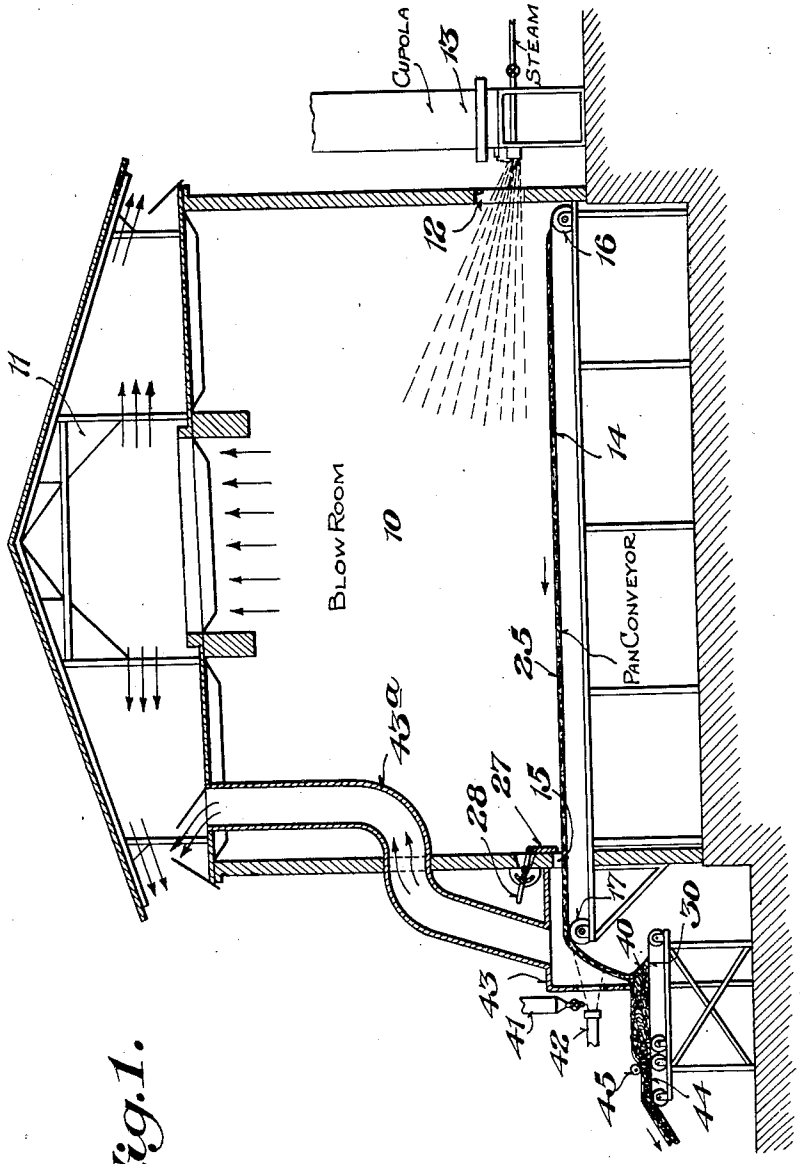


Fig. 1.

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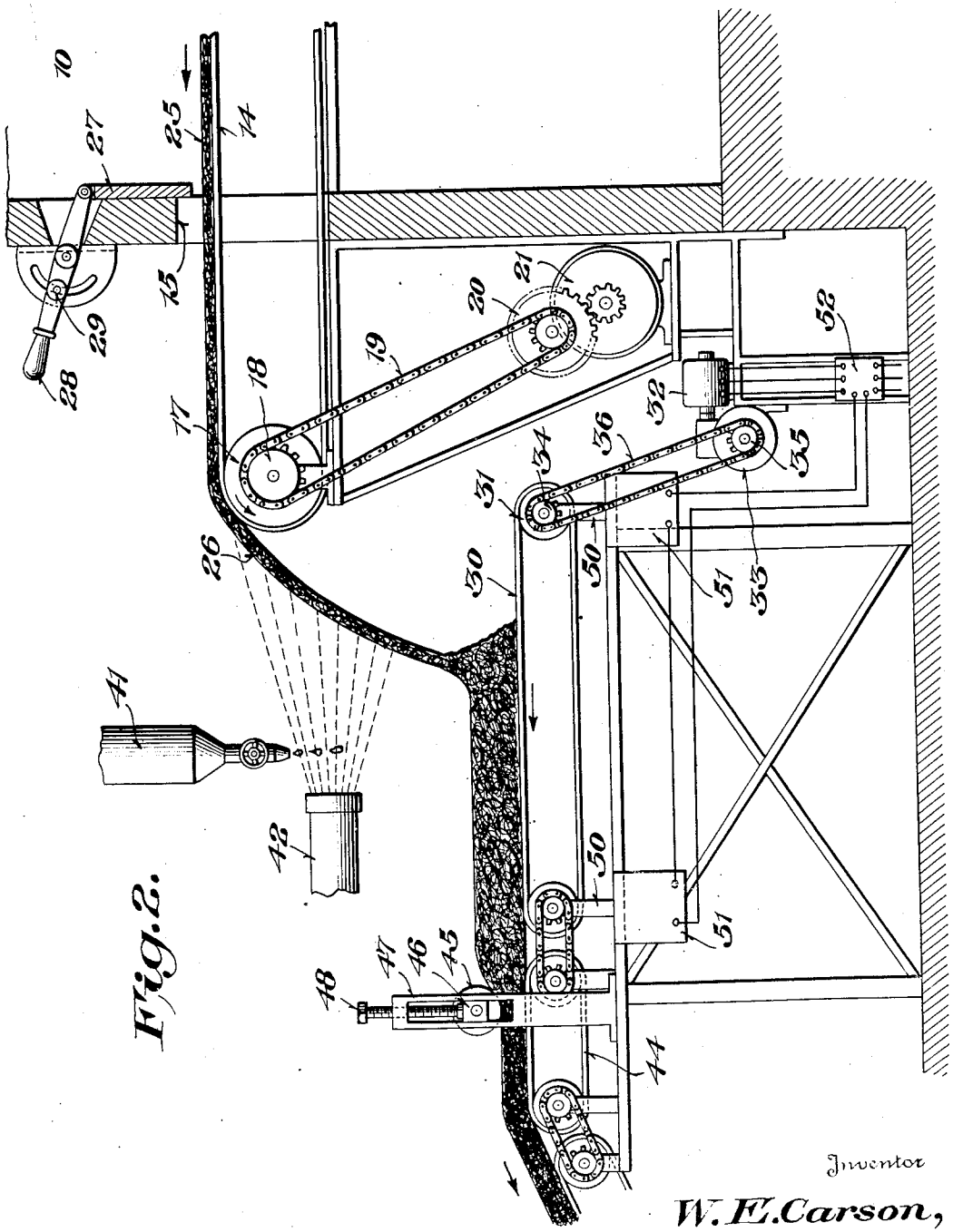


Fig. 2.

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Patented Aug. 16, 1938

2,127,287

UNITED STATES PATENT OFFICE

2,127,287

MAKING ROCK WOOL PREPARATIONS

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Application July 2, 1936, Serial No. 88,667

3 Claims. (Cl. 154—27)

This invention relates to making rock wool preparations; and it comprises a method wherein molten slag or rock is subjected to a blast of air or steam to produce fibers carried in aerial suspension by the blast, the blast being directed into a large quieting chamber to cause settling of the suspended fibers, the fibers are collected and removed as they settle, the loose fibrous collection is caused to fall in a cascade on a moving carrier, being blown with steam or air jets during the fall and forming a layer of substantial thickness wherein the fibers are interpenetrating and stratification is minimized, and the layer or cohesive blanket thus formed is compacted and cut into bats or the like, adhesive being usually applied to the disaggregated fiber mass during its fall and with the jet blowing; and it further comprises as an organization of apparatus elements, a roomy chamber, means for spraying molten rock or slag therein to form rock wool and means for withdrawing wool therefrom at such rate as to prevent accumulation of a thick or deep layer in the chamber, carrier means outside the chamber and receiving the rock wool as a cascade falling thereon, means for blowing jets of steam or air into the wool during its fall and means for compressing the rock wool on said carrier into a firm cohesive layer or blanket; all as more fully hereinafter set forth and as claimed.

In making rock wool, molten silicates are sprayed into a chamber by a steam jet, being blown into loose fibers in aerial suspension. The molten silicates are sometimes produced by melting a high silica limestone with additional silica in a cupola with the aid of coke and an upward blast of air. The chamber in which the wool is formed is kept hot to prevent condensation of steam and is roomy enough to permit maintenance of a tolerably quiescent atmosphere. The fibers as they are produced settle to the bottom of the chamber and, in ordinary practice, accumulate as a layer on a slowly moving conveyor carrying the layer to exit. Conditions are so arranged that the layer emerging is of the proper thickness for forming a blanket to be cut into bats. Sometimes there are compacting rolls within the chamber; sometimes the blanket is compacted as it emerges. In any case the blanket is formed in the chamber. Much of the rock wool produced is marketed for heat insulation of houses in the form of bats which are slipped into the walls.

The belief is prevalent that the strongest felt which can be made of rock wool is that which is naturally formed by the gentle and gradual pressure that the material exerts as it falls in the chamber into which it is blown by the steam jet.

I have found there is little justification for this belief since the fibers falling slowly out of a quiescent atmosphere are mostly parallel, overlying each other, and no substantial interlacing of fibers develops as the air escapes in the internal settling of the collected fibers. Nor does mechanical compacting aid in this. There is no felting in the usual sense and as a matter of fact all layers or blankets made in this manner are distinctly stratified; there are layers with no engagement or union between them. Using a slowly moving conveyor, as is the usual practice, extending through the length of a chamber, a thin layer deposits on one end and this builds up as the conveyor goes on until there is finally a thick layer. On tearing apart the blanket there is observed a stratification corresponding to this mode of formation; cleavage planes, so to speak.

Little mechanical strength is required in a bat for heat insulation but there must be some: the bat must be strong enough to withstand shipping and handling as well as being pushed into place in a hollow wall. Better strength is one of the results achieved in the present invention.

I have found that stronger bats can be made by some degree of rearrangement, amounting to intermixing, of the fibers after collection and prior to forming the blanket giving end-to-end interlacing of the fibers. While most rock wool fiber is quite brittle and shatters readily yet it is feasible to rearrange the settled fibers a little; enough to produce interlacing of the fibers. The result is a blanket giving bats of considerably greater strength. In the present invention this is done. The fibers falling out of the atmosphere in the hot chamber are removed by a swiftly moving conveyor, are blown with steam or air jets with or without adhesive liquid and are delivered as a freely falling cascade to another conveyor of regulated, slower speed according to the delivery; the cohesive blanket being formed on the second conveyor by simple pressing. The result is that the purely parallel or manifold layer arrangement of the fibers in the usual bats is replaced by an intermingling and interlocking arrangement.

Under the stated conditions usual in the art, there is little opportunity for observation or control of the progress of blanket formation in the hot room. The conveyor is caused to move slowly in order to permit accumulation of a sufficient thickness of wool on it prior to exit. And difficulties with the supply of steam or of molten

rock may not be apparent for half an hour or so; not until the slowly moving blanket emerges from the chamber. Another source of difficulty is scaffolding and lodging. Often the conveyor undercuts a path through an accumulation of wool.

In the present invention I limit the functions of the hot room to the production of the wool, endeavoring to remove the wool as fast as it falls, or substantially so. I employ a rapidly moving conveyor, moving at such a rate as to preclude accumulation in the chamber and withdrawing the wool as a constant thin stream. usually letting it drop from the conveyor as a sort of cascade or falling stream. With the quick delivery of the wool from the chamber the difficulties as regards time lag in adjusting the supply of molten rock and steam disappear. The wool emerges from the chamber soon after it is produced and is blown by steam or air jets as it falls. The fibers are rearranged. The speed of the second conveyor is adjusted according to the supply of wool from the first conveyor cascading on it.

The wool accumulates on the second carrier and forms a blanket which, by reason of the rearrangement and agitation incident to the blowing and cascading, is better felted and more uniform than the layer formed on the primary conveyor in the usual practice. The layer or blanket on the second conveyor is more open textured or "lofty" than is desirable and I customarily pass it under a compacting roll or equivalent means adapted to apply a small pressure. Too much pressure and too much compaction are undesirable. The heat insulating value of a rock wool bat is largely dependent on its open texture. Stiffness being usually desirable, a small amount of a suitable adhesive binder, such as dilute silicate of soda is sprayed on the cascading fibers with the blowing. For most purposes, less than 1 per cent of silicate of soda suffices to give sufficient stiffness. Where stiff board-like products are wanted, the amount of adhesive can of course be increased. But in making insulating bats this is not usually desirable.

Operating in the way described I can secure blankets of standardized density and compactness uniform at all points; a result difficult to secure where collecting and bat formation are simultaneous and strictly interdependent, as is the case in the ordinary practice.

In the accompanying drawings there is shown, more or less diagrammatically, one apparatus organization useful in practicing the invention. In this showing,

Fig. 1 is a view partly in vertical section and partly in elevation, of the complete apparatus including the hot blow room, and

Fig. 2 is a view in elevation of the fiber delivering and bat forming apparatus.

In the drawings, Fig. 1 shows the rock wool making apparatus, including a hot blow room or spray chamber **10** having a monitor top **11** for exit of gases and an opening **12** in one end wall, through which is blown molten rock issuing from a cupola **13** by means of steam jets in the usual manner forming the rock wool. The wool fibers thus formed fall in the chamber, and are caught on an endless conveyor **14** extending the length of the chamber and projecting outside thereof at the end opposite the cupola, through an opening **15**. The conveyor is carried at the ends on rolls **16** and **17**, and is driven through a sprocket **18** connected to the outer roll (Fig. 2), chain **19** and speed-reducing gearing **20** operated by a motor **21**. The conveyor is driven at a rather high rate of speed; the speed being advantageously made sufficient so that the rock wool fibers are carried out practically as soon as they are formed, as a thin layer **25** which cascades off the conveyor in free fall and as shown at **26**. Other things being equal, the thickness of the layer formed is inversely proportional to the speed of the second conveyor.

An adjustable gate **27** is provided at opening **15**, to minimize leakage of gases and vapors from the hot room. The gate can be raised and lowered by a lever **28** and locked in position by a bolt and nut **29** as shown.

The cascade of fibers is caught on a collecting conveyor **30**, carried at the ends on rolls **31**, and driven by a motor **32** with speed reducing mechanism **33**, through the agency of sprockets **34** and **35** and chain **36**. This collecting conveyor is operated at a rate slower than the chamber conveyor, so that the fibers cascading thereon build up into a thick, coherent mass as shown at **40**. As the fiber mass falls from conveyor **14** to conveyor **30**, it is blown with steam or air carrying a spray of silicate of soda or dilute water glass solution. For this purpose one or more containers **41** for the silicate solution each having a valved outlet are provided together with pressure nozzle **42** blowing a plurality of jets of steam or air carrying a spray of silicate solution into the fiber mass as indicated. A housing **43**, having an inlet opening for the blowing jets is provided, as shown (Fig. 1). This housing has an outlet conduit **43a** for carrying off steam. The blowing operation aids in disaggregating the fibers into a loose fluffy mass.

The fiber mass **40** slowly travels along and comes off the collecting conveyor on to a third conveyor **44**. Means are provided at this point for compressing or flattening the fiber mass somewhat to form a compressed blanket giving bats of standardized density. Such means are shown as comprising a roll **45** engaging the top of the fiber mass, journaled at each end in a block **46** arranged for sliding in supports **47** and adjustable vertically by screws **48**. This roll is spaced from conveyor **44** a distance equal to the thickness desired in the final bat.

The fiber mass leaving conveyor **44** may now be cut into bats in any of the usual ways.

Assuming the slag blowing operation to be constant and uniform in character, and the various conveyors to be moving at constant rate, the final bat will be of uniform thickness and density. With careful supervision it is not difficult to realize these conditions. However, to compensate for fluctuations in the fiber forming operation, I find it convenient to provide means for keeping a substantially constant weight of fibers on conveyors **30** even if the rate of fiber feed thereto varies. One convenient means for doing this is shown diagrammatically in Fig. 2. The end rolls **31** for conveyor **30** are carried on supports **50**, mounted on electrical poidometers **51**; that is to say, devices adapted to give an electrical response varying according to the weight applied thereto. The electrical response from the poidometers is applied to control means **52** adapted to control the speed of motor **32**. The poidometer means are arranged to reduce the speed of the motor when the weight of the fibers on the conveyor falls below a predetermined value, and to increase the speed of the motor when the weight rises above a predetermined value.

What I claim is:—

1. Apparatus for making rock wool articles comprising a chamber, means for forming rock wool fibers in aerial suspension and blowing them into the chamber, a conveyor receiving such fibers and arranged to be driven at such rate that only a thin layer of fibers exists thereon during operation, a collecting conveyor below the exit end of the first conveyor and arranged to receive fibers falling off the end of the first conveyor as a thin cascade, means for projecting horizontal jets of air or steam against the falling fibers to disaggregate them, said collecting conveyor being arranged to be driven at a slower rate than the first conveyor to allow building up of a layer of fibers thereon, and means for forming the layer into bats.

2. A method of making rock wool articles which comprises subjecting molten rock or slag to the action of a steam blast to produce fibers suspended in the blast, causing the fibers to settle in a large chamber, collecting and withdrawing the settled fibers from the chamber at a rapid rate, causing the collected fibers to fall freely through the air in disarranged condition as a thin cascade, blowing steam or air against the cascading fibers to disaggregate them in their fall, collecting the fibers as a blanket at a relatively slow rate as they fall and compressing the blanket into a coherent bat.

3. The method of claim 2 wherein adhesive is blown into the cascading fibers along with the jets of air or steam.

WM. E. CARSON.