Sept. 23, 1941. W. E. CARSON 2,256,665

APPARATUS FOR RECOVERING ROCK WOOL

Filed Aug. 24, 1939

Fig. 1.

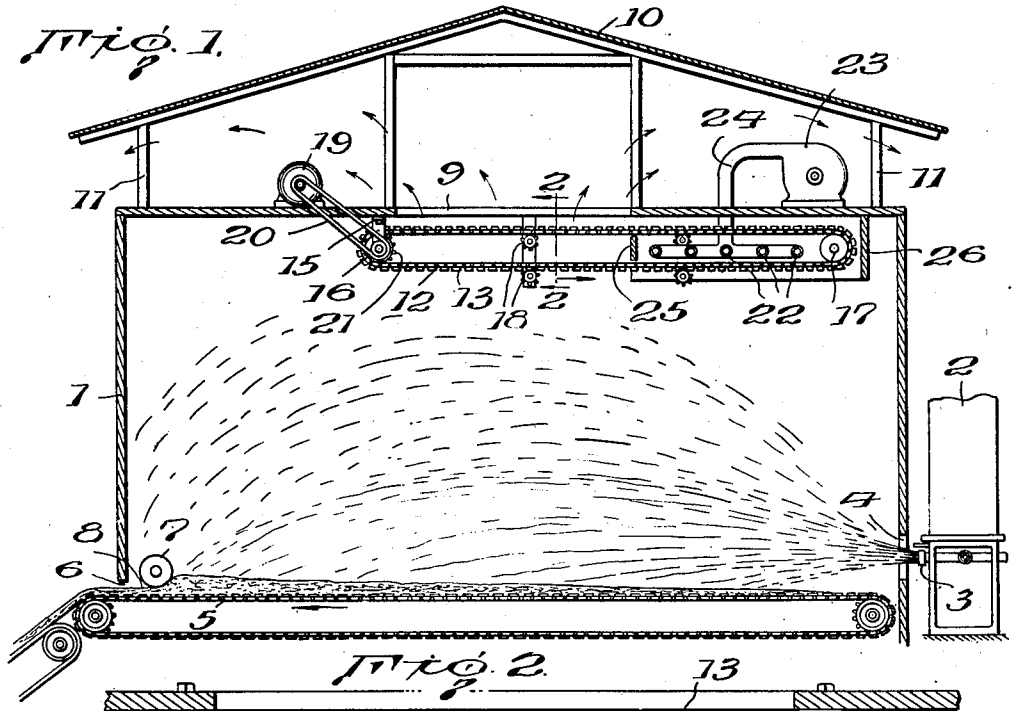


Fig. 2.

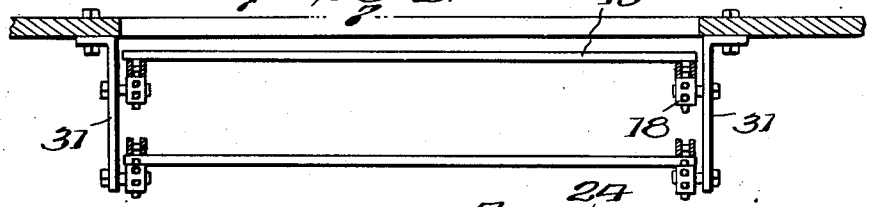


Fig. 3.

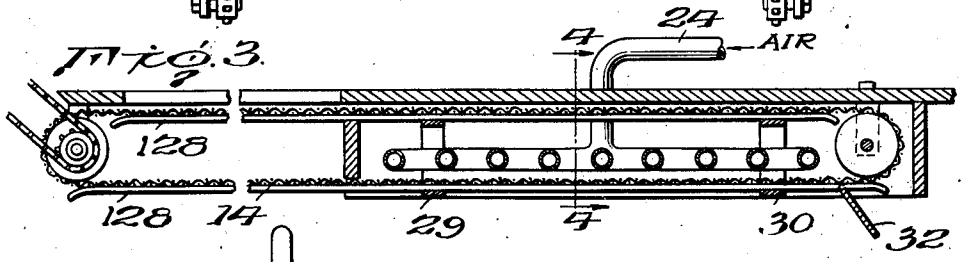
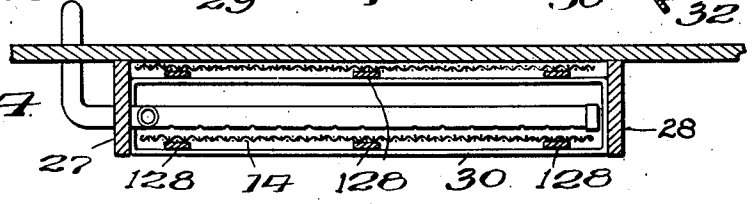


Fig. 4.



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APPARATUS FOR RECOVERING ROCK WOOL

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1 Claim. (Cl. 209—2)

This invention or discovery relates to apparatus for recovering rock wool; and it comprises, in a rock wool making chamber of the type having means for projecting molten rock as fibers therein and having a gas escape opening at the top, the improvement comprising a substantially horizontal belt-like moving screen, extending in part over the opening for pickup of fibers, and in part beyond said opening, means for subjecting said latter part of the screen to a flow of gas under pressure to detach fibers and cause them to drop into the chamber, and means for driving the screen at such rate as to permit accumulation of a thin layer of fibers on the part of the screen extending over said opening; all as more fully hereinafter set forth and as claimed.

In the manufacture of rock wool by the blow chamber process, molten rock drops into high pressure steam jets and is disintegrated into fine fibers which pass forward and become relatively uniformly distributed throughout the chamber. To collect the fibers, it is necessary to check the forward movement of the blast and this is accomplished by introduction into a large volume of relatively quiet air and steam, either or both, maintained in the blow chamber. The fibers which are now dispersed through a large volume settle out quietly and slowly, and collect at the bottom of the chamber, while gases and vapors escape through an opening in the top of the chamber. The finest and most valuable fibers, however, are slow to settle and tend to pass outward with the gases escaping through the ventilator in the roof and are lost. The escaped fiber creates a nuisance in and around the plant.

The roof opening must be large enough to avoid building up of any substantial pressure behind it in the chamber. In practice the opening is relatively large so that escape of steam and air is gentle and the temperature in the chamber is usually maintained a little above the condensation point of water vapor.

Even with gentle escape of chamber gases there is always considerable loss of suspended fiber and as a consequence the atmosphere surrounding the plant is laden with fibers of rock wool.

I have found that a traveling screen of suitable mesh arranged to traverse the opening of the blow chamber can be operated to filter the escaping chamber atmosphere of suspended fiber without imposing any substantial back pressure in the chambers. The fiber collects on the screen in the form of a hanging blanket which is held in place by the unbalanced chamber pressure. When the screen carrying such a blanket be removed from the opening and subjected to a reverse flow of air or steam, at balancing or slightly greater pressure than chamber pressure, the blanket drops and falls quietly away from the screen.

Conveniently the screen may consist simply of wire cloth or of a plurality of spaced metal bars fabricated or secured together to form a continuous flexible band, the whole being mounted belt fashion on suitable drums with sprockets and guides and adapted to be driven continuously at a slow speed, like that of a belt conveyor, across the opening in the roof of the blow chamber. Fiber in the escaping steam and air is caught on the screen and gradually forms a thin layer of wool which continues to collect and build up without imposing much back pressure on the chamber. Before the blanket is thick enough to impose any substantial frictional resistance to the escape of gases through it, the screen with the layer of collected wool is continuously moved away from the opening to a point where a reversed flow of clean air or steam, under low pressure, meets it. The blanket drops at a point away from the escaping current and falls quietly to the bottom of the chamber from which it is removed together with the collected rock wool by the usual traveling belt conveyor.

Operating in the way described, substantially all of the fiber that would otherwise escape is recovered, and relatively clean air or vapor only escapes from the chamber.

In the accompanying drawing is shown, more or less diagrammatically, an organization of apparatus elements useful in the invention. In this showing:

Fig. 1 is a view partly in vertical section and partly in elevation of the complete apparatus;

Fig. 2 is a detail vertical sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a detail vertical sectional view of a modified form of filter conveyor in which wire screening is used; and

Fig. 4 is a vertical sectional view taken along line 4—4 of Fig. 3.

Referring to the drawing, wherein like numerals indicate corresponding parts throughout the several views, the rock wool blow chamber is designated generally by the numeral 1. As is customary with such a chamber, molten rock from a cupola 2 is blasted by means of high pressure steam or air discharged from a suitable nozzle arrangement 3 through an opening 4 in the lower portion of one end of the chamber. The blast disintegrates the molten rock into fine fibers which are blown into the chamber much as in

the manner illustrated. The heavier fibers settle to the bottom of the chamber into a traveling conveyor belt 5 and are continuously removed through an opening 6 in the wall of the chamber opposite the blast. A roller 7 located in the chamber immediately ahead of opening 6 smooths and levels off the layer of discharged fiber 8. Air and steam entering the chamber with the blast are vented generally through an opening 9 in the top of the chamber, which is covered over by a roof 10 spaced from the top of the chamber and open to the surrounding atmosphere around its sides as at 11. Rising steam and air flow substantially the course indicated by the small arrows in Fig. 1.

As heretofore explained, the steam and air atmosphere in the chamber is full of light, feathery-like fibers of rock wool and to prevent these fibers from escaping through opening 9 a traveling filter screen 12 is provided across the opening on the inside of the chamber. The filter may consist of a series of closely spaced metal bars or slats 13 arranged belt fashion as shown in Figs. 1 and 2, or it may consist simply of a belt, continuous band, conveyor-like arrangement formed of suitable mesh wire screen fabric 14, as shown in Figs. 3 and 4. For purposes of cleaning the filter of a collected layer of fiber, the filter belt is arranged to extend some distance beyond the opening at one side, as shown, where it is subjected to a reversed flow of air or steam, as will presently be described.

The filter is supported or hung from the top of the chamber by means of strap hangers 15 carrying drums 16 and 17 around which the filter belt is passed at each end, and small sprocket guide wheels 18 supported on brackets 31 over which the screen passes to prevent sagging. The filter belt is driven by means of a motor 19 conveniently located on the top of the chamber and connected by means of a belt or chain 20 to rotate drums 16 around which the filter is passed. Sprocket wheels 21 on the ends of the drums engage suitable openings or chains attached to the sides of the filter belt to give positive movement or travel of the belt.

As shown, the filter belt is adapted to be driven in a counter-clockwise direction, and fiber in the escaping air and steam is caught on the under side of the lower half of the belt, and conveyed beyond the opening to a point beneath a series of low pressure air or steam jets 22. In Fig. 1, the numeral 23 represents a fan for delivering low pressure air through tubing 24 to these jets. In order that a slight pressure in excess of chamber pressure may be built up inside the belt over the layer of rock wool found on the under side of the belt, there is provided vertically disposed partitions 25 and 26. Partition 25 is arranged within the filter adjacent the side of opening 9, while partition 26 is positioned on the outside of the filter closely adjacent drum 17. The sides of the filter are also closed as by vertical partitions 27 and 28, which, being connected at their ends with partitions 25 and 26 provide a sort of low pressure compartment through which the filter moves. This low pressure compartment is open at the bottom but closed at the top by the top wall of the chamber, and at the sides by the partitions as shown.

In the form of the invention illustrated in Figs. 3 and 4, a wire screen fabric is used to form the filter. In this modification the screen is supported from sagging by means of skids 29, running lengthwise of the filter belt or in the direction of travel, so as not to interfere with the collection of the fiber. The skids are suitably supported as at 29 and 30 by hangers attached to the top of the chamber.

In operation the filter belt is continuously driven at a suitably slow speed, so that as the lower portion of the filter approaches opening 9 from drum 16 there is formed immediately thereon a thin layer of rock wool fiber filtered out of the air and steam or water vapor passing through the opening at this point. As the belt continues to travel, the layer of collected fiber increases and thickens until it reaches the opposite side of the opening. At this point it enters the low pressure filter screen cleaning compartment, and as it progresses through the compartment it gradually reduces the size of the opening in the bottom, thus increasing the pressure of air discharged by the fan 23 through jets 22 into the compartment. When the pressure in the filter cleaning compartment rises to slightly above the pressure in the blow chamber, the blanket drops as a unit and falls without substantial dissociation to the bottom of the blow chamber. Thus it will be seen that discharge of wool from the filter screen occurs substantially periodically and in slugs which fall to the bottom of the chamber without disintegrating and mixing with the atmosphere of the chamber.

A scraper or knife edge 32 can be arranged as shown (Fig. 3) if desired to assist in removal of the rock wool fibers from the traveling conveyor. It is sometimes convenient to rely on the scraper alone for detachment of the fibers; the pneumatic detachment system being dispensed with in such cases.

The filter screen may be cleaned of collected wool at any point in the blow chamber, as desired, but advantageously cleaning is done out of range of the incoming blast of steam and fiber, to prevent readmixture of collected fiber with the blast. If desired, the filter may be cleaned at a point remote from the blow chamber to give a uniform particularly high quality grade of wool.

What I claim is:

In a rock wool chamber into which molten rock is projected forming rock wool fibers collected therein and provided with an opening in the top for escape of a stream of gases and vapors: means for recovering fibers carried in the stream, without imposing substantial back pressure on the chamber, comprising a continuous substantially horizontal belt-like moving screen disposed adjacent the top of the chamber, having a fiber pickup portion extending transversely across and covering the opening and a fiber removal portion extending beyond said opening, fiber detaching means operating on said removal portion of the screen at a zone well removed from said top opening, said means including conduit means for delivering a flow of gas under positive pressure above the lower side of the belt-like moving screen whereby to cause release of fibers from the screen, and driving means for the screen constructed and arranged to move the lower side thereof toward the detaching means at a slow rate permitting accumulation of a thin fiber blanket on the screen for removal, whereby fibers blown up toward the opening are filtered out against said thin traveling fiber blanket, the rate being sufficiently rapid to prevent accumulation of an excessive thickness of fibers on the screen.

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