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UNITED STATES PATENT OFFICE

653,077

ALEXANDER D. ELBERS, OF HOBOKEN, NEW JERSEY.

PROCESS OF TREATING MINERAL WOOL.

SPECIFICATION forming part of Letters Patent No. 653,077, dated July 3, 1900.

Application filed October 23, 1899. Serial No. 734,546. (No specimens.)

To all whom it may concern:

Be it known that I, ALEXANDER D. ELBERS, of Hoboken, in the county of Hudson and State of New Jersey, have invented a new and useful Improvement in Processes of Treating Mineral Wool, of which the following is a full, clear, and exact description.

My invention relates to the conversion of mineral wool into elastic bricks, sheets, sectional pipe-coverings, and similar moldings.

The invention consists in making elastic mineral wool moldings in the manner hereinafter specified, and it also consists in the new articles of manufacture thereby produced.

Though mineral wool has been used for insulating heat and cold and sound for over twenty years past few devices have thus far either been made known or put into operation whereby this material can be applied in a practical and marketable manner, excepting to pack or stuff it in its loose state into the spaces that are to be deafened. In applying it in its loose state to boilers and steam-pipes it has to be held in place by a jacket or casing especially provided for that purpose, which mode of application costs about twice as much or more than the wool itself, and in deafening walls it has to be forced into narrow spaces that must be boarded up as the work of stuffing progresses, a manipulation that has to be performed with great care if the work is to prove satisfactory. Moreover, such deafenings are apt to sag considerably when they get wet, and for the following reasons: In applying ordinary mineral wool it is usually stuffed to a density of about eighteen pounds to the cubic foot. It then contains about nine volumes of air to one volume of solid substance, and consequently can absorb about three times its own weight of water, which is more than it can sustain without settling. Hence such deafenings may become seriously damaged in roofs and walls by leakage during heavy rains, and pipe and boiler coverings are apt to become affected in a similar way by the condensation of escaping steam. All of these disadvantages are obviated by my invention, which renders it possible to apply mineral wool in its most desirable state of compression and consistency, as well as in shapes that are suitable for the intended application. If, for instance, a wall-space is to be lined three feet in the clear between timbers or joists and three inches deep, the wool may be applied in the shape of elastic bricks nine by four by three inches in size, of which twelve will be required for a course one foot high, or thirty-six for a square yard. A brick of that size will weigh nearly one and three-quarters pounds, or at the rate of one-quarter of an ounce per cubic inch and twenty-seven pounds to the cubic foot, and at that weight it will contain nearly five and one-half volumes of air to one volume of solid substance, at which density the material attains about its highest degree of efficiency as a non-conductor. In laying the bricks they are to be pressed against each other rather tightly, and then the courses will stay in place and may be carried up to the ceiling without being boarded up. The bricks may also be cemented together by wetting their contacting surfaces with a suitable agglutinating solution, but this is not necessary if the deafened spaces are later on to be lathed or boarded up. For covering boilers the wool can be molded into sheets that are sufficiently pliable to be bent to the required curvature, and for covering pipes it can be molded into semicircular sections about a foot long that are easily fastened upon the pipes with a piece of string or wire. For all of these applications it is essential that the moldings should be somewhat elastic (as otherwise they could not be joined tightly by merely pressing them together) as well as sufficiently tough to withstand rather rough usage, the latter property being especially desirable for the commoner or cheaper products, such as the bricks, because they may then be shipped in bulk, thereby saving the important item of package; and the novelty of my invention consists chiefly in the discovery of the method by which such results can be produced.

The agglutinating properties of more or less diluted solutions of silicates of soda and potash are well known, and even the solutions of caustic alkalies and their carbonates have similar though less pronounced effects on such compositions as mineral wool consists of. It might therefore be considered a very simple matter to convert mineral wool into molded material of the desired properties by reducing it in admixture with such solutions

to a wet pulp, pressing the latter in molds, and drying the moldings; but even the finest mineral wool is not sufficiently plastic for such treatment, because it contains a large amount of shot or sand-like particles that are intimately intermixed with or adhere to the fibrous parts. If such a mass is stirred in the wet state, the shot separates by gravity and collects in spots, and the plasticity of the mass becomes thereby reduced to such an extent that it will not hold together after molding unless it has been treated with an agglutinating solution of such strength that the moldings will become hard and brittle in drying. Moreover, a mineral-wool pulp that has been completely saturated with a solution becomes too compact to yield moldings of sufficient lightness.

I now proceed to describe how my invention can be carried out.

I prefer to treat the mineral wool at or near the works where it is made in order to be able to obtain it without much handling direct from the collecting-chambers into which it is blown. This is almost a necessity, because the vitreous fibers break at every handling, so that when once packed for shipment in bags or barrels they form lumps of different degrees of compactness and then cannot be loosened again like cotton or other organic fiber, to be made up into a uniform material. The wool can be easily taken out of the collecting-chambers in rather uniform layers, compressed to a density of about ten or twelve pounds to the cubic foot, which is about the best condition for pressing it into molds. For articles of compact form and plane surfaces, such as bricks, the mold need only consist of a rectangular frame open at top and bottom and resting on a flat tray. More complicated forms need not be here considered, because any practical molder will readily know how to construct them after becoming acquainted with the peculiarities of the material, as herein described. The brick-molds may be made either of wood or of sheet metal. Their depth should be about one-sixth more than that of the moldings that are to be turned out, and they should be perforated or provided with small holes on all sides for the purpose of allowing the air to escape more freely while the wool is being compressed in them. The wool should be pressed in by hand until it will bulge out a little when the pressure is relaxed. After a mold has been filled in that way it is to be reversed in order to see whether the bottom surface has become uniform or whether it requires some more stuffing. When the contents are in good shape, about as much of the agglutinating liquor is poured into the tray as the weight of the compressed wool amounts to. The liquor is rapidly soaked up, especially if the mold is once reversed, so that both open surfaces become exposed to capillary action. If the mass is slightly pressed while this action is progressing, the liquor penetrates the whole mass without filling its interstices completely. Hence only from one hundred to one hundred and twenty-five pounds of liquor are required for impregnating one hundred pounds of mineral wool, whereas nearly two hundred pounds would be required to saturate that quantity completely. When the contents of the mold are thoroughly moistened, they are subjected to a slight pressure, which is best performed with a lid or plunger that fits into the mold in order to reduce the thickness of the molding to the desired dimensions. The brick is then pressed out of the mold and placed on a board for preliminary drying, and after an hour or two it may be taken to a drying-room, where it will loose all of its moisture within three or four hours, provided the temperature of the room is kept up to about 300° Fahrenheit. The dried brick is then ready for use, and, if properly made, of sufficient toughness to be shipped in bulk.

It stands to reason that the required manipulations may be varied in various ways and that some of them may be performed by well-known mechanical and automatical appliances.

The agglutinating liquor I prepare, by preference, from the liquid silicate of soda of commerce, which usually consists of from forty-five to forty-seven per cent. of the anhydrous substance and from fifty-five to fifty-three per cent. of water. Calling this, for short, a "fifty-per-cent. solution," I find that by reducing it to a one-per-cent. solution (by mixing one pound with forty-nine pounds of hot water) I obtain a liquor that has sufficient agglutinating power to answer the purpose of binding compressed mineral wool, and with a two-per-cent. solution I have made bricks that retain their shape after having been immersed in hot water (212° Fahrenheit) for three hours. A four-per-cent. solution is apt to render the surfaces of the moldings too inelastic. Stronger solutions are apt to render them quite stiff and brittle, and as my invention consists in making elastic mineral-wool moldings I claim, therefore, only the use of highly-attenuated agglutinating solutions and, in the case of silicate of soda, solutions having a lower specific gravity than 1.05.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The herein-described method of making elastic mineral-wool moldings, which consists in compressing loose mineral wool as evenly as practicable to a suitable density, in molding the compressed wool in the dry state, in thoroughly permeating the moldings with a suitable agglutinating solution without saturating them fully with it, and in drying the moldings thus prepared.

2. The herein-described method of making elastic mineral-wool moldings, which consists in compressing loose mineral wool as evenly as practicable to a suitable state of density,

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in molding the compressed wool in the dry state, in bringing each molding in contact with about as much of an agglutinating solution as it is to absorb, and in furthering the capillary action of the solution by subjecting the absorbing mass to slight pressure until it is thoroughly permeated by the solution, and in drying the moldings thus prepared.

3. The herein-described method of making elastic mineral-wool moldings, which consists in compressing loose mineral wool as evenly as practicable to a suitable density, in molding the compressed wool in the dry state, in thoroughly permeating the moldings with a highly-attenuated solution of alkaline silicate without fully saturating them with it, and in drying the moldings thus prepared.

4. The herein-described method of making elastic mineral-wool moldings, which consists in compressing loose mineral wool as evenly as practicable to a suitable density, in molding the compressed wool in the dry state, in thoroughly permeating the moldings with a solution of silicate of soda of less than 1.05 specific gravity without fully saturating them with it, and in drying the moldings thus prepared.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALEXANDER D. ELBERS.

Witnesses:
J. FRED. ACKER,
JNO. M. RITTER.