UNITED STATES PATENT OFFICE.

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PROCESS OF MAKING PLASTIC MATERIAL.

969,202. Specification of Letters Patent. Patented Sept. 6, 1910.

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To all whom it may concern:

Be it known that I, WILLIAM R. SEIGLE, a citizen of the United States, and resident of Nashua, in the county of Hillsboro and State of New Hampshire, have invented new and useful Improvements in Processes of Making Plastic Material, of which the following is a specification.

My invention relates to the manufacture of miscellaneous articles out of material which is composed principally of asbestiform fiber and cement, and consists in a new process by which sheets, boards or other masses of such material are rendered amenable to plastic treatment so that curved and irregular forms may be produced.

Sheets or plates have heretofore been produced by making a wet pulp of a mixture of asbestiform fiber, cementing material and water, and then subjecting the pulp to heavy pressure in a filter press which provides for the expression of surplus water. The cementitious material employed has been in some cases magnesium oxid and in other cases hydraulic cement such as Portland cement; the usual practice being to employ equal, or approximately equal, weights of water and solid ingredients, and three parts asbestiform fiber to one part magnesium oxid, or three parts fiber to two parts Portland cement, according to the choice of cementitious material. Pulp so compounded has, in practice, been subjected to pressure of about one ton to the square inch in order to produce the boards required for fireproofing, electrical insulation, roofing, etc. These sheets as they come from the press are limp, but will not bend through any small radius without breaking; their plasticity even immediately upon withdrawal from the press is so limited that they are practically of no service except as flat sheets or plates, and are allowed to set in flat shape. While there are many uses to which such flat sheets can be and are devoted, there are many other uses and occasions which would be better served by such refractory sheets in curved or irregular forms. The method of compressing the pulp in press dies of the desired curved or irregular shape might be mechanically possible, but it is out of the question in practice; the cost of irregularly shaped or curved dies of the necessary sizes would be prohibitive even if it were feasible to handle curved masses if produced in a press.

My new method is one whereby sheets, slabs, or regular shapes of cement-asbestos are first prepared in the well known manner, with preferable and advisable modifications in composition and manipulation, and then rendered plastic, so that they can be readily shaped over forms or molds, there to set and stiffen in the desired form. The mixture of solid ingredients which I have found to be best adapted to this purpose departs from the heretofore regularly employed proportions, but is in all essential respects a mixture of the same kind, possessing similar properties, as the asbestiform fiber-cement compositions described in Norton's patents Nos. 847,293 and 929,002, dated respectively, March 12, 1907, and July 27, 1909.

Instead of employing a mixture in which the adbestiform fiber is the predominant solid ingredient, I have found that approximately equal quantities by weight of abbestiform fiber and cement yield the best results in the subsequent and final steps in the process. I have found, also, that the fibrous ingredient which appears to work best, is one composed for the most part of cleaned pulped serpentine rock, with a small content, (not over five per cent.) of longer asbestos fiber, say three eighths to one half an inch on the average. Larger proportions of long asbestos fiber tend to become matted or localized, and are not desirable.

In comparison with sheets or slabs formed by filter-pressing an asbestos-cement pulp wherein the fiber is the predominant solid ingredient, sheets formed by filter-pressing a pulp compounded as above recommended, are more plastic, possess inherently a greater capacity for bending without fracture, and lend themselves therefore to the purposes to which my new method is addressed.

Not only should the proportions of solid ingredients be modified with an eye to plasticity as the desired property, but also, the treatment of the materials in the filter press requires modifications. The application of heavy pressures such as heretofore employed, of the order represented by one ton to the square inch, compacts even a pulp such as above recommended to such a degree of density that, though measurably superior in plasticity to similarly compressed compositions in which fiber predominates over cement, it is not sufficiently plastic to serve

many of the ends which are found desirable. In order to insure the greatest possible inherent plasticity of the mass formed by the press, the maximum pressure exerted in the pulp should be much less than that heretofore employed, and yet great enough to give the mass sufficient consistency and density to permit its being handled and removed from the press without fracture. The practical minimum of pressure can hardly be prescribed definitely; pressure of one thousand pounds to the square inch has repeatedly been employed with success, and I recommend that pressure as certain to produce good results, and a safe mean between the maximum and minimum of practically possible extremes. Thus, a mixture containing substantially equal quantities of asbestiform fiber and cement, made into a pulp or dough with a quantity of water about equal in weight to the combined solid ingredients, compressed in a filter press to about one thousand pounds to the square inch, produce a sheet which is inherently more plastic before final setting, than sheets of generally similar composition but containing a larger proportion of fiber and compressed to greater density. However, even the superior plasticity inherent in sheets composed and treated as above described and recommended may be greatly enhanced by a further treatment, preliminary to the bending or molding which calls the plasticity of the sheet into requisition.

To obtain the best results, the internal structure of the sheet, and the physical relationship of its component particles should be such as to yield the greatest mobility of one particle over the other, consistently with the integrity of the sheet as a whole. When the mass compounded as above recommended is subjected to a pressure sufficient to insure the concrete integrity of the sheet, but insufficient to produce the maximum density possible in such a sheet, the resulting product will be found capable of absorbing water to a degree inversely proportionate (roughly speaking) to its density. I believe that this bibulousness of the sheet when taken from the press is due to the fact that although apparently saturated with water when in the press, the mass utilizes part of its contained water immediately in the process of hydration, or setting, (which undoubtedly is initiated the instant that the solid ingredients are mixed with water,) and that the mass is almost immediately ready to absorb more water, provided its density is not such as to oppose such absorption.

Whatever may be the correct explanation of the phenomenon, the capacity of such a comparatively lightly compressed body to absorb water immediately after removal from the press is manifest, and it is equally manifest that the introduction of additional water to the sheet after formation renders it decidedly more plastic than before such water was added. The sheet or slab, drenched and freshly saturated with water may be bent or pressed into curved and irregular shapes over suitable forms, and presently sets in the form thus given to it. The degree of saturation with additional water may vary; within the limits of possible plasticity the amount of water added or introduced to the sheet should be proportionate to the degree of plasticity to be required of the sheet. For bending in easy, large curves, little water need be added, for bending or molding in curves of short radius or irregular forms, as much water should be added as the mass will absorb. Quick treatment and manipulation is essential to success; not more than fifteen minutes should be allowed to elapse between the removal of the sheet from the press and its assumption of final form.

In summary, the process which I have invented is exemplified as follows: Mix equal parts by weight of asbestiform fiber and cement—either magnesium oxid or hydraulic (Portland) cement—and make a wet pulp with this mixture and a quantity of water equal in weight to the solids. Introduce the pulp immediately to a filter press, and compress it into a sheet, reaching a maximum pressure of about one thousand pounds to the square inch. As soon as this maximum pressure is reached, open the press, withdraw the sheet thus formed, and play water on it with a hose for about a minute, then take the wet sheet to the mold or form over which it is to be wrapped or molded, and bend or knead it into shape, leaving it on the mold or form to set. By this means cylinders, cones, conoids, cylinders merging into cones, and many other forms may be readily produced.

What I claim and desire to secure by Letters Patent is:

1. The process of manufacturing articles composed principally of asbestiform fiber and cement which consists in making a pulp of asbestiform fiber and cement with water, subjecting the wet pulp to filtration pressure sufficient to insure the concrete integrity of the mass while insufficient to produce such density in the mass as will prevent it from subsequently absorbing water to a substantial degree, then causing the compressed mass to absorb water, then altering the shape of the mass and finally allowing it to set in the desired final shape.

2. The process of manufacturing articles composed principally of asbestiform fiber and cement which consists in making a pulp of one part fiber, one part cement, and two parts water, by weight, subjecting the wet pulp to filtration pressure sufficient to insure the concrete integrity of the mass while

insufficient to produce such density in the mass as will prevent it from subsequently absorbing water to a substantial degree, then causing the compressed mass to absorb water, then altering the shape of the mass and finally allowing it to set in the desired final shape.

3. The process of manufacturing articles composed principally of asbestiform fiber and cement which consists in making a pulp of asbestiform fiber and cement with water, subjecting the wet pulp to a filtration-pressure of about one thousand pounds to the square inch, then causing the compressed mass to absorb water, then altering the shape of the mass and finally allowing it to set in the desired final shape.

4. The process of manufacturing articles composed principally of asbestiform fiber and cement which consists in making a pulp of one part fiber, one part cement, and two parts water, by weight, subjecting the wet pulp to a filtration-pressure of about one thousand pounds to the square inch, then causing the compressed mass to absorb water, then altering the shape of the mass and finally allowing it to set in the desired final shape.

Signed by me at Boston, Massachusetts this tenth day of December 1909.

WILLIAM R. SEIGLE.

Witnesses:

CHARLES D. WOODBERRY,

JOSEPHINE H. RYAN.