Oct. 1, 1935. E. S. HURRELL 2,016,039

THERMAL INSULATION AND METHOD OF MAKING THE SAME

Filed April 7, 1932

Fig. 1.

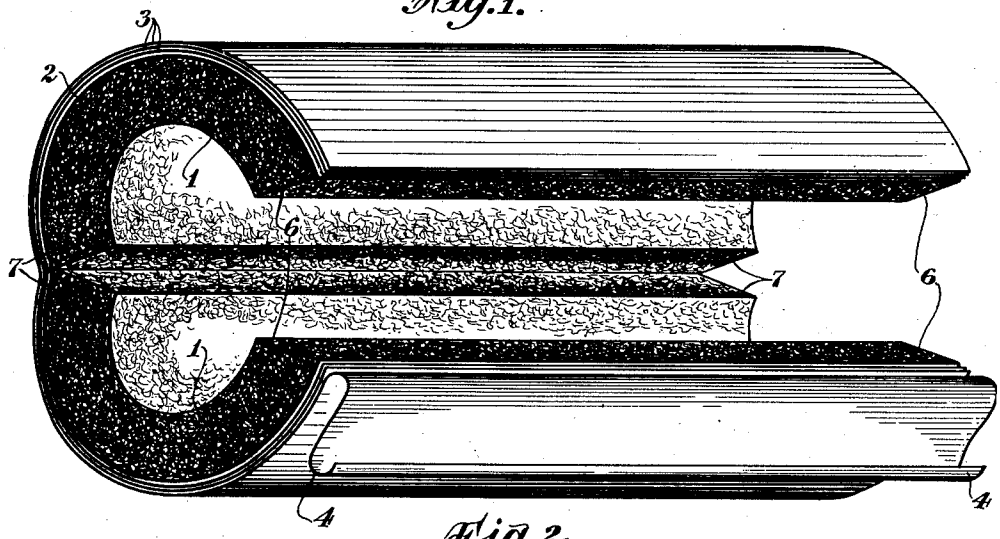


Fig. 2.

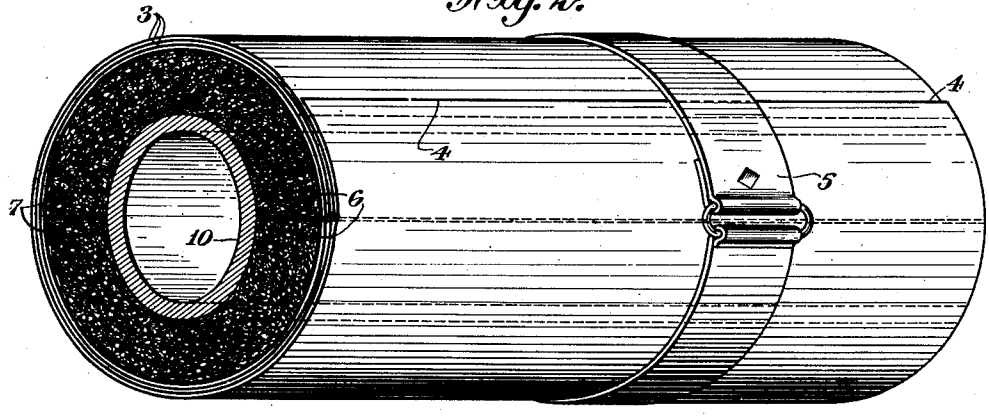
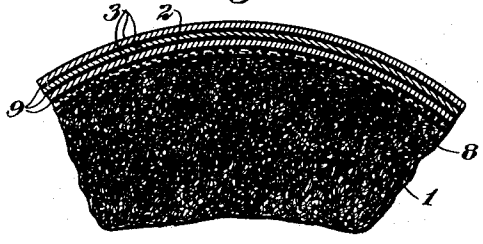


Fig. 3.



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THERMAL INSULATION AND METHOD OF MAKING THE SAME

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4 Claims. (Cl. 154—28)

This invention relates to thermal insulation and method of making the same, and particularly to a thermal insulating article with an integral waterproof jacket. The invention pertains especially to an article comprising a relatively thick layer of thermal insulating material, a thin sheet of fabric secured to a surface of the layer of thermal insulating material, and a sheet of waterproof material secured to the outer surface of the said fabric.

A preferred embodiment of the invention is 85% magnesia pipe covering to the outer surface of which is adhesively secured a thin sheet of wool felt with a sheet of asphalt-impregnated asbestos paper adhesively secured to the outer surface of the wool felt.

An object of the invention is to provide a weatherproof or waterproof insulating article. Another object is to provide a thermal insulating article with a waterproof covering adhered to the material comprising the inner portion of the insulating article in such manner as to minimize the entrance of water between the outer waterproof cover and the material comprising the inner portion of the insulator. Another object is to provide an interlining material adapted to be adhesively secured to a firm surface of a layer of thermal insulating material on one side and to be adhesively secured on the other side to a waterproofing sheet or layer. Other objects and advantages will appear from the detailed description that follows.

A material that is widely used in thermal insulation is a composition comprising basic magnesium carbonate and asbestos, such as so-called 85% magnesia. This 85% magnesia consists of approximately 85 parts by weight of basic magnesium carbonate and 15 of asbestos fibers. It is conventional to make 85% magnesia by a process comprising mixing, in wet condition, basic magnesium carbonate with asbestos fibers and pumping the resulting slurry to molds with filtering sides. Thus water is removed from the slurry, by means of the filtering sides of the mold, and the solid content of the slurry is shaped approximately to the form desired. A common form into which the 85% magnesia is shaped is one adapted for use in covering pipes, such as steam pipes that are to be insulated. For this purpose the 85% magnesia is usually applied in the form of semitubes, which semitubes are fitted together around the steam pipe in a manner known to those skilled in the art.

The importance of keeping insulation dry is well understood and numerous attempts have been made to protect 85% magnesia insulation from the entrance of water. Thus, there have been provided independent waterproof sleeves which can be slipped over 85% magnesia pipe covering. In use, these sleeves may be adjusted at will, as in such manner as to cover the joints at the ends of adjacent sections of pipe covering. Also, there have been provided waterproof jackets or sheets that can be secured to the insulation by stapling at intervals or binding against the insulation by means of wrapping with wire. It will be observed that neither of these expedients prevents the entrance of moisture, as in the form of moist air, between the waterproofing layer and the inwardly disposed thermal insulating material. There has been difficulty heretofore in adhering a waterproof covering continuously to the surface of the so-called 85% magnesia. Thus, adhesives that penetrate asphalt-saturated rag felt or roofing paper do not secure a good anchorage in the magnesia. Other types of pipe covering that have been described comprise a material adapted to resist moderate temperatures, such as asbestos paper or 85% magnesia, with a relatively thick surrounding layer of organic fiber, such as wool felt or eel grass. It will be understood that organic fibers will not withstand as high temperatures as 85% magnesia will withstand.

A preferred embodiment of the present invention is illustrated in the drawing in which

Fig. 1 shows a perspective view of a section of tubular pipe covering partly opened for insertion around a pipe to be insulated.

Fig. 2 shows a perspective view of the same insulation after application around a section of pipe, cementing the flap in place over the joint, and placing a securing band around the outside of the section of pipe covering.

Fig. 3 shows an enlarged end view of a portion of the thermal insulating article of the type shown in Figs. 1 and 2.

In the various figures, like reference characters indicate like parts.

The insulating article comprises a relatively thick layer of insulating material 1, which is suitably 85% magnesia, a relatively thin sheet of wool felt 2 adhesively secured to the firm outer surface of the insulating material, and, on the outside, waterproof asphalt-impregnated asbestos paper 3 which is adhesively secured to the outer surface of the wool felt. The insulating material 1 is divided into two semitubular halves, as illustrated. Each of these two halves has an edge 6 and an edge 7 which, when the insulation has been installed around a pipe, abut with the cor-

responding edges of the other half to give two longitudinal joints or zones of contact. The sheets of wool felt 2 and waterproofed asbestos paper 3 are adhesively secured over the outer edge of the zone of contact of the edges 7 and provide a structure which may be opened like a hinge. The wool felt and asbestos paper, in the article as shipped to the user, do not cover the joint between the edges 6. The fact that this joint or zone of contact is not covered permits opening of the tubular pipe covering and application around the pipe 10 that is to be insulated. The outer layer of waterproof paper has a free portion 4 adapted to extend, as a flap, over the joint between the edges 6 and to be adhesively secured over such joint or zone of contact after the insulation has been installed around the pipe 10. The installed pipe covering may be encircled by the band 5.

In the enlarged view of a fragment shown in Fig. 3 there may be seen, in addition to the parts already described, the adhesive material 8, which secures the wool felt 2 to the thick layer of insulating material 1, and also the adhesive material 9, which secures the outer layers, consisting of waterproof asbestos paper, to the outer surface of the wool felt, or to an outer surface of a lower layer of the waterproof asbestos paper when more than one layer of such asbestos paper is used. It should be understood that the thickness of these layers of adhesive is exaggerated in Fig. 3, for clearness of illustration. As a matter of fact the adhesive constitutes a very thin layer, except for that part of the adhesive which penetrates one or more of the two materials that are adhesively secured to each other.

The thickness of the layers of materials used may be varied within limits. However, it is preferred to have the main body of insulating material, such as 85% magnesia, represent most of the total thickness of the insulating article. Thus, for a layer of 85% magnesia that is three-fourths of an inch thick, there may be used a backing sheet of wool felt, as illustrated at 2, that is thin, say approximately one-fiftieth of an inch thick. The wool felt interlining is covered, in turn, with thin asphalt paper sheeting, such as sheeting of about the same thickness as the wool felt. It is suitable to use a plurality, as, for example, three layers of such sheeting on the outside of a single layer of the wool felt. In general, the wool felt may well be not more than a tenth and suitably approximately one-thirtieth of the thickness of the layer of 85% magnesia.

This use of a relatively thin layer only of felted organic fibers behind a relatively thick layer of insulating material such as 85% magnesia is quite desirable. It provides that most of the volume of the insulation shall be taken by 85% magnesia, for example, which is not only relatively inexpensive and effective as an insulating material but also resistant to moderate temperatures such as those obtained by steam lines even when carrying steam at temperatures up to about 500 degrees Fahrenheit. The thick layer of magnesia protects from decomposition the organic fibers of the wool felt which, in the structures of the present invention, are spaced near the outside of the insulating article and well away from the object that is insulated.

On the other hand, even a thin layer of a flexible and water-permeable fabric, such as wool felt, is adequate to permit adhesively securing it by means of an aqueous cementing material to the firm outer surface of the 85% magnesia insulation and also to permit adhesively securing an outer sheet of waterproofing material, such as asphalt-impregnated asbestos paper, to the flexible and water-permeable fabric. In fact the water-permeable felt, as well as the outer waterproof material, should be so thin as to be flexible and to yield readily, along the hinge-like joint at the edges 7 of the pipe covering, without causing breakage of the magnesia when the tubular section is opened. For the same reason, the kind and quantity of adhesives 8 and 9 used should be such as to ensure yieldability of the covering felts.

The cement or adhesive used in the layers 8 and 9 is suitably an aqueous solution of water glass. Such an aqueous adhesive penetrates satisfactorily the water-permeable felt.

In making the improved article containing 85% magnesia as the thick layer of insulating material, there is first prepared, in conventional manner, semitubular sections of 85% magnesia pipe covering. These sections are sized or painted on the outer surface with a solution of 30° Bé. silicate of soda solution, partly in order to prevent excessive absorption of silicate in the subsequent application of the layer of wool felt. Two sections are then put together so that the edges 6 and 7 abut to form longitudinal joints. The wool felt is then adhered, by means of 40° Bé. silicate of soda solution, to the sized surface of the 85% magnesia. So applied, this wool felt readily absorbs the silicate cement and adheres to the previously sized section of insulation material, the cement thus being caused not only to adhere thoroughly to the wool felt but also integrally unite with the water-soluble sizing material impregnated into the magnesia. The wool felt and magnesia are then dried, to remove the water added with the adhesive. As the outer, waterproof material, there is used impregnated asbestos paper, suitably one containing 6 pounds of asbestos paper stock, dry weight, and aproximately 3 pounds of asphalt impregnating material for each 108 square feet. Before application, this impregnated asbestos felt or paper is warmed to approximately 120 deg. F., to soften or increase the pliability of the paper that is otherwise relatively stiff, that is, stiffer than the wool felt used as the interliner. The warmed asphalt and asbestos paper is then treated with 40° Bé. silicate of soda solution and wrapped to a thickness of 3–4 plies around the tube consisting of 85% magnesia and the outwardly adhered layer of wool felt. An additional two inches or so of width of the asphalt and asbestos paper is allowed for a lap. This lap is not applied with silicate of soda during fabrication but is left free to be cemented down later. The fully wrapped section is now placed in a dryer for the purpose of removing the water applied in the silicate solution. As the article cools to atmospheric temperature, subsequent to the drying operation, the asphalt in the paper is hardened and the paper is thereby stiffened. The waterproof wrapping and the interlining sheet of wool felt is then cut lengthwise, on one side only, at the joint between the edges 6 of the two pieces of semitubular 85% magnesia. This cutting allows the section to be opened up, with one zone of contact of the edges of the two semitubes covered with felt and sheeting acting similarly to a hinge, for application around a pipe. After such application the lap mentioned above is adhesively secured over the other zone of contact of the edges of the semitubes. In this manner there is made a watertight joint, as well as an insulating

article that has an integrally united waterproof covering adhesively secured to the principal body of insulating material in such manner as to minimize the penetrability by water and the entrance of moisture between the waterproof covering and the insulating material. While such a product would not withstand immersion or soaking of an end in liquid water, the product is weatherproof to a substantial degree and represents an important advance over an insulating article comprising 85% magnesia pipe covering with a surrounding waterproof covering stapled to the magnesia or tied thereto with wire, in such manner as to leave spaces between the covering and the surface of the 85% magnesia. It should be added that the band **5**, placed around my improved pipe covering, after the lap **4** is cemented into position, is not absolutely necessary but does decrease the chance of tearing or loosening the flap **4**.

When sections of pipe covering are installed around a pipe to be insulated, the adjacent sections of pipe covering form both longitudinal and end joints. The closing of the longitudinal joint by means of a flap has been described. The end joint may be made weatherproof also, by adhesively securing a strip of waterproof paper, such as asphalt-impregnated asbestos paper, around and over the end joint.

While the invention has been illustrated as applied to the weatherproofing of 85% magnesia insulation, the invention is useful with other types of insulating products. Thus there may be used other types of non-laminated insulating material as a substitute for the 85% magnesia. For example, the interlining felt as a means of adhesively securing a waterproof exterior jacket to an inner body of insulating material may be used in connection with the insulating composition made from lime, diatomaceous earth, and asbestos, as described in United States Patent 1,045,933 to Belknap, or in connection with an insulator made from magnesium bicarbonate, diatomaceous earth, and asbestos, as described in United States Patent 1,279,975 to Boeck and Jordan.

For the purpose of insulating high pressure steam lines the inner body of insulating material should have insulating efficiency and resistance to shrinkage at elevated temperatures at least equal to that of 85% magnesia, in order to prevent shrinkage or decomposition of the insulating material itself as well as of the material, such as felted organic fibers, outside the insulation.

Since the purpose of the wool felt is to provide a relatively soft membrane adapted to receive the cementing material and also to yield sufficiently to give good contact, on one side, with the firm surface of the inner body of insulating material and, on the other, with the outwardly applied waterproofing layers, other relatively soft, water-permeable materials may be substituted for the wool felt. Thus there may be used a thin sheet of unimpregnated asbestos paper, preferably made in as soft a form as is consistent with adequate strength for the purpose of holding the outer layer of waterproof material to the inner body of insulating material. Also, various sheets of felted organic fibers other than wool may be used, as, for example, hair felt.

For the outer, waterproof covering there may be used, as an alternative for the asbestos paper impregnated with asphalt, another waterproof fabric adhesively secured to the flexible and water-permeable interlining fabric. Thus there may be used rag felt or paper or wool cloth that is thoroughly impregnated with a waterproofing material, such as asphalt, tar, or a wax. However, the use of impregnated asbestos paper is preferred because of the known desirable properties of asbestos in thermal insulating compositions.

Insulating articles of other shapes than pipe covering may be made. Thus a rectangular block of 85% magnesia may be adhesively secured to one side of a sheet of wool felt, and an outer waterproof sheeting, such as asphalt-impregnated roofing paper, then adhesively secured to the other side of the wool felt. The surface of the insulating block to which the wool felt is adhered is that which during use is to be remote from the object insulated.

Since many variations from the illustrative details given may be made without departing from the scope of the invention, it is intended that variations within the spirit of the invention should be included within the scope of the claims.

What I claim is:

1. A thermal insulating article comprising a shaped firm mass of 85% magnesia, water-soluble sizing material impregnated thereinto, a thin water-permeable fabric disposed around the sized magnesia, an adhesive securing the fabric to the magnesia, being integral with the said sizing material and being thoroughly adhered to the fabric, and a waterproof sheet material continuously adhered over substantially the entire outer surface of the said fabric.

2. A tubular thermal insulating article adapted for use as covering for steam pipes, said insulating article comprising a layer of 85% magnesia, a sheet of felted organic fibers adhesively secured to the outer surface of the layer of magnesia, and a sheet of waterproof asbestos paper adhesively secured to the outer surface of the sheet of organic fibers, the thickness of the sheet of felted organic fibers being not more than a tenth of that of the layer of 85% magnesia.

3. A tubular thermal insulating article of minimized penetrability by water, said insulating article comprising a tube of 85% magnesia or the like, divided into two semitubes with edges thereof abutting in two longitudinal zones of contact, a thin sheet of felted organic fibers adhesively secured to substantially the entire outer surface of the tube of 85% magnesia, a waterproof sheet adhesively secured to substantially the entire outer surface of the sheet of felted organic fibers, the said sheets covering one of the zones of contact of the edges of the two semitubes, and a portion of the waterproof sheet adapted to extend, as a flap, and to be adhesively secured over the other zone of contact.

4. In making an insulating article comprising 85% magnesia and a waterproof covering integrally united thereto, the process which includes preparing sections of 85% magnesia insulation, coating the outer surface thereof with a sizing material of the type of a solution of waterglass, adhesively securing thereto a flexible fabric of fibers that is permeable to the said solution, providing a waterproof sheet of the type of asphalt-impregnated roofing, softening the said waterproof sheet, adhering the softened sheet to the said flexible fabric, and then increasing the stiffness of the said waterproof sheet.

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