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ART OF INSULATION AND FIREPROOFING

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This invention relates to the art of insulation and has particular reference to the incorporation of a fire resistant material into a mat produced in accordance with the disclosure of United States Letters Patent to Edwin H. Wenzel and Maximillian P. Janisch, No. 1,718,507, dated June 25, 1929.

The insulating mat to which this invention particularly relates is pneumatically projected directly upon the surface to be insulated against the passage of heat or sound. A stream of comminuted particles of fibrous material, preferably in sheets, such as paper or the like is moistened in mid air with an adhesive binder such as sodium silicate or some other material having similar characteristics. Under such circumstances, the paper or other comminuted material used in practicing the process reaches the wall surface immediately after coming in contact with the binder and consequently the binder becomes effective almost instantaneously to secure the fibrous particles in place, either against the wall or against other similar particles previously projected.

There are numerous fire proofing materials which are well known and frequently used to render other substances fire resistant. Ammonium, sodium, borax and alum salts and miscellaneous other substances are frequently used. The present invention contemplates the use of any fire proofing substance which will not interact chemically with the materials used for insulation and which is sufficiently cheap to be economically serviceable and which is free of objectionable characteristics, such as the release of ammonia sometimes occurring in the use of ammonium sulphate for this purpose.

All of the salts commonly used in fire proofing are readily soluble in water and have the property of ionization, being electrolytes. Sodium silicate, and other adhesive binders used in the above described insulating process, of which sodium silicate will be treated as a typical example, are colloids and extremely susceptible to precipitation upon the introduction of highly ionized foreign substances, even where no physico-chemical change results. The admixture of borax, ammonium phosphate, sodium tungstate, magnesium sulphate, and the like with water-glass or sodium silicate will almost incidentally produce precipitation or jelling of the colloid resulting in separation of a voluminous mass of hydrated silica. This makes it impossible to handle the sodium silicate as a liquid. It also destroys its adhesive or bonding prop-

erties, rendering it unfit for use in the practice of the process above described. These facts suggest the impossibility of using any of the well known fireproofing agents in a process where admixture with a colloid binder is essential; but the process hereinafter described is directed toward a solution of this problem which will and does permit ordinary fire proofing salt to be employed notwithstanding the use of such a binder as sodium silicate.

The object of the present invention is to provide a process in which fire proofing chemicals may be employed as effectively as if mixed with the liquid adhesive but without destroying or materially impairing the adhesive qualities of the sodium silicate or like substance used, and with results which are otherwise beneficial rather than harmful in the practice of insulating processes.

In the drawing:

Figure 1 shows in section through three stories of a factory, the elevation of an apparatus suitable for use in practicing the present invention to the point of preparing the fire proofing material for use.

Figure 2 is a diagrammatic elevation of apparatus employed in the actual use of the fire proofing material in accordance with this invention.

Like parts are identified by the same reference characters throughout the several views.

The invention contemplates the admixture of a dry salt used for fire proofing purposes with the dry comminuted paper or other like material to be employed in the insulation process. To this end the salt, preferably magnesium sulphate (because of low cost, ease of handling and absence of undesirable effects) is fed from the container 5 through hopper 6 to the chopper 7 in which papers fed from the table 8 are comminuted preparatory to delivery of the fibrous particles by the centrifuge 9 to the separator 10. In the separator the air passes off and the magnesium sulphate and paper particles thoroughly mixed in the chopping operation are fed by gravity through pipe 11 to the commercial packers 12 in which the commingled salt and paper particles are bagged for delivery to the point where the insulation is to be made. The packers 12 are similar to those commonly used for bagging bran and the like.

On the job, the salt and paper mixture is introduced into hopper 15 from which it is fed as required by the feeder 16 through a blower fan 17 which furnishes the pneumatic pressure for projecting the particles in a stream 18 from

nozzle 19 upon the wall surface 20 to be insulated. At the time the magnesium sulphate and paper particles are projected from the nozzle 19 they are entirely dry.

5 Air supplied from a compression tank 21 is led through hose 22 to the spray nozzles 23 which are also supplied with adhesive through hose 24 which leads from a tank 25 in which adhesive is subjected to pressure by air from the source
10 at 21.

The spray of liquid sodium silicate from nozzles 23 creates a mist through which the particles of paper or other fiber sheets and the crystals of magnesium sulphate or other insulating
15 salt must pass. In traversing this spray the paper and salt crystals are moistened by the sodium silicate which, for the first time in mid air is exposed to the action of the salt. Almost immediately thereafter the adhesive coated
20 paper reaches the surface upon which it is being projected and is bonded thereto.

It has been found that in the exceedingly short space of time between the admixture of adhesive and fire proofing material before the
25 adhesive functions as a binder the fire proofing material does not cause any breaking down of the colloid to such a degree as to interfere with the bonding of the paper particles to each other and to the wall. In fact it has been found that
30 the setting of the bond is not only as effective but takes place more speedily than is the case where the fire proofing material is not used. It is supposed that the fire proofing material dissolves itself in that portion of the moisture in
35 the sodium silicate which penetrates the pores of the paper and that this results in partially drying the adhesive on the surface of the paper particles, thereby promoting the hardening of the thin film of adhesive before the fire proofing
40 salt can act thereon to break down the colloid.

In the patent above referred to, mention is made of the advantage of having the adhesive binder as dry as possible at the moment of engagement
45 of the coated particles with each other. Apparently the use of a fire proofing salt as magnesium sulphate in the manner herein disclosed promotes this desirable objective. In any event it is observed that the insulating mat sets more speedily
50 when the salt is used than when it is not and the adherence of the particles to each other and to the wall is not weakened, this result being contrary to what might be expected in any admixture of magnesium sulphate with sodium silicate.

The proportions of the fire proofing chemical employed are not important to the result. The
55 chemical may be used in any proportions desired for the proper fireproofing effect within the range permitted by such secondary factors as cost. From fifteen to twenty-five per cent of the chemical as compared with the weight of paper used
60 gives a very substantial fire proofing effect, the fire resistance of the paper mat being sufficient for all practical purposes. The mat produced when this amount of chemical is employed doubtless
65 contains some precipitation of silicate and is slightly more rigid and firm than a mat produced with lesser quantities of fire proofing salt, or none at all. For most purposes this rigidity is an asset rather than a liability.

70 While the disclosure relates particularly to a process of fire proofing a mat of this character, the same process may obviously be employed in the use of salts for other purposes such as sodium fluoride or the like which would repel vermin.
75 The process is directed broadly, therefore, to the

admixture of any colloid adhesive binder with any salt calculated to destroy the colloid, under such circumstances that the mixture occurs directly on the surface of the material to be bonded and under conditions such that the breaking down
80 of the colloid, if any, will be insufficient to impair its value as a binder, and will actually facilitate the set of the mat and rigidify it.

I claim:

1. The process of mixing a salt with solid particles and a liquid binder therefor subject to
85 breakdown when mixed with said salt, which process consists in projecting such particles in a previously prepared admixture with said salt upon the surfaces to which said particles are to be
90 bonded and the treatment of said particles and salt in the course of such projection and substantially at the point of contact of said particles with said surfaces with relatively small quantities of
95 said binder whereby said binder is immediately thereafter employed as a bond for said particles.

2. The process of incorporating a salt in a mat of solid particles and a binder subject to breakdown in solution with said salt, which process
100 consists in the previous admixture of said particles with said salt, the pneumatic projection of the mixture of said particles and salt upon the surface upon which said mat is to be formed and the projection of said binder in the form of a
105 spray in the path of pneumatic projection of said mixture.

3. The process of incorporating a fire proofing salt in a solid matter made up of fibrous particles and a colloidal binder subject to break down when
110 mixed with said salt, which process consists in treating said particles with said salt, projecting the mixture of said particles with said salt upon the surface to which said mat is to be applied and spraying the mixture of particles and salt with the binder in a substantially continuous operation
115 in which said binder is rendered effective as a bond for said particles prior to material breakdown in the presence of said salt.

4. The process of incorporating a fire proofing salt in an insulating mat made up of fibrous particles mounted with an initially liquid colloid binding
120 material subject to breakdown in the presence of fire proofing salts, which process consists in the preliminary mixture of the fibrous particles with the salt in dry form, the projection of such mixture upon the surface to be insulated and the spraying of the binding material in the path of projection of such mixture, whereby it is simultaneously applied to the salt and to said particles
125 and immediately thereafter employed as a bond for said particles and before such breakdown of said binder can occur.

5. The process of building an insulating mat upon the surface to be insulated, which consists in pneumatically projecting directly upon said
135 surface particles of insulating material and a dry salt previously mixed therewith, and the spraying of liquid binder in the path of projection of such material upon said surface, whereby to treat said particles superficially with said binder in the presence of said salt, said salt being adapted partially to withdraw the water from said binder whereby to facilitate the setting thereof.

6. The process of constructing a fire resistant
145 insulating mat directly upon the surface to be insulated, which consists in a preliminary mixture of fire proofing salt with fibrous particles of insulating material in dry form, the pneumatic projection of the dry mixture toward the surface
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to be insulated and the spraying of a liquid binder in the path of projection of said material, whereby superficially to coat said particles in the presence of said salt, said salt having the faculty of absorbing a portion of the moisture of said binder, whereby to facilitate the setting thereof.

7. The process of constructing a fire resistant insulating mat directly upon the surface to be insulated, which consists in a preliminary mixture of fire proofing salt with fibrous particles of insulating material in dry form, the pneumatic projection of the dry mixture toward the surface to be insulated and the spraying of a

liquid binder in the path of projection of said material, whereby superficially to coat said particles in the presence of said salt, said salt having the faculty of absorbing a portion of the moisture of said binder, whereby to facilitate the setting thereof, said binder being of a colloidal nature subject to breakdown when mixed in solution with salt but adapted to avoid breakdown owing to the limited time of contact of said binder and said salt before the speedy setting of the bond of said particles upon said surface.

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