

UNITED STATES PATENT OFFICE.

WILLIAM H. BUTLER, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN LININGS FOR SAFES AND OTHER FIRE-PROOF STRUCTURES.

Specification forming part of Letters Patent No. **152,598**, dated June 30, 1874; application filed June 16, 1874.

To all whom it may concern:

Be it known that I, WILLIAM H. BUTLER, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Linings for Safes and Fire-Proof Structures; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

In order that my improvement, which possesses all the valuable properties of the linings or fillings for fire-proof structures heretofore known, without their defects, may be clearly appreciated, I will here state that all the earths which are the best non-conductors of heat and a number of organic substances have been employed in combination with water and salts containing water of crystallization for linings of fire-proof structures. These have served the purpose of their design with various degrees of completeness.

The qualities requisite for the best lining or filling for a fire-safe are, that the body or main material shall be of the best non-conducting and incombustible material known; that it shall hold water in some form which, when it is subjected to a high heat will pass off gradually in the form of vapor or steam, to carry off heat not only from the interior of the safe, but to reduce the temperature of the outer iron casing, and protect it from burning and melting; that, also, in the last-named condition, acid vapors shall not be liberated with those of the water and cause corrosive damage, not only to the metallic part of the safe, but to the interior contents or property placed there for preservation; that the lining shall not rust the iron inclosure with which it is in contact; that it shall not give off moisture and thereby cause dampness within the safe or vault, causing books and other valuables to mildew or mold; that it shall not shrink or expand to such an extent, in the one case, as to strain the sides of the safe, or, in the other, as to leave vacant spaces; that it should give firmness and solidity to the structure.

All these qualities should be permanent to the filling or lining during the natural use of the safe or structure.

Previous to my improvement which I am about to describe, there was no lining or filling known or used which possessed all the qualities essential to a proper lining, as those I have above mentioned. One of the first inventions of fire-safe filling or lining for which Letters Patent were granted by the United States was that of Mr. Fitzgerald. This consisted of plaster-of-paris mixed with sufficient water to cause it to set or harden, and the interposition of sheets of mica between it and the iron walls, with which the mixture would otherwise come in contact. He also mixed mica with the plaster while it was in the pasty condition, so that when it hardened the mica became a part of the lining. There had not, previous to the improvement which I shall herein describe, been a better lining than that of Mr. Fitzgerald's, except that the inner chamber inclosed by it was damp, and property placed within it became damaged from this cause. After a time, however, when it stood in a warm, dry atmosphere, it lost the larger portion of its water, and then became impaired in fire-proof quality. A serious difficulty was that it rusted the iron of the safe rapidly, rendering the iron worthless. The various inventions since made in linings have been for the purpose of remedying the defects found in the use of the Fitzgerald lining. It was to remedy the dampness of the interior of the safe mainly that dry clay, plaster-of-paris, dry and other earthy substances were employed with lumps of alum and other crystalized salts holding a large proportion of their weight of water of crystallization, to be given off or liberated in case of fire. A number of patents have been granted by the United States for this class of linings for fire-proof safes, and they are each and all a kind of compromise with the defects of the Fitzgerald filling which I have above described. Plaster-of-paris and calcined clay both absorb moisture from the atmosphere, and become damp during a time proportionate to the dampness of the atmosphere in which they are

placed. The alum or other deliquescent salt becomes gradually dissolved when mixed with plaster or cement, and then absorbed by the earth of the lining, when the rusting of the iron walls commences, and ultimately a damp and rusty safe is the result of the slow but certain process. In case of fire, too, the acids evolved from the salts with the water cause damage to the property stored in the chambers of the safe, even when the heat has not been sufficient to reach it. There is no better non-conductor of heat that is incombustible than plaster-of-paris, which it is practicable to use for the lining of fire-proof structures. Therefore, in my improvement, I prefer this material as the basis or main ingredient of the lining, and I have retained in my improvement all the valuable qualities of the invention of Mr. Fitzgerald, and have remedied all its defects.

I take powdered or ground gypsum, calcium sulphate, and heat it till its water has passed off and it becomes plaster-of-paris. I next make a heavy solution of calcium chloride in water, and mix it with the plaster-of-paris in quantities sufficient to form a plastic mass—density of 15° to 30° of the alkali glass will answer; this I place between the walls of the inner chamber of the safe and the outer walls or outside inclosure. The plastic mass is made to fill all the interstices, and after a few hours it sets or hardens firmly, adding to the solidity of the safe, and holding sufficient water to be given off slowly in the form of vapor or steam in case it is subjected to fire, and thereby reducing the heat interiorly, and preventing the outer iron walls from burning and melting. The calcium-chloride solution does not rust iron, and when in this condition it does not part with any of its water; therefore the inner chamber of the safe is dry; and however long the safe may have been used, its walls will not have become porous from rust, nor will the lining have lost its water, and the safe will have remained what is termed a "dry safe."

I prefer the lining precisely as I have just described it; but for some purposes calcined clay, kaolin, and other earths which will not be acted upon by the chloride, or which will not affect it, but which will remain neutral and permanent, may be mixed with the plaster-of-paris, dry, and the mixture treated with the solution of calcium chloride precisely as when the plaster-of-paris is used alone.

I will here add that I have obtained very good results from the use of hydraulic cement, or that of Esopus, and the Berlin cement, used alone with the calcium-chloride solution, and

by mixing them with the plaster-of-paris, and proceeding as I have described in the other cases. These cements, however, are not as good non-conductors of heat as plaster-of-paris, nor do they hold as large a quantity of solution of calcium chloride. I will here mention that I have made linings of calcined clay and calcium-chloride solution alone: but such does not set, and the solution gradually settles to the bottom of the lining, creating inequality of moisture in the lining. This, however, I have partly remedied by placing partitions or strips at short intervals in the lining, so as to form a series of shelves, which prevent the solution from finding its way below them. There are some cases, as that of large vaults, where the expense of the structure is of the first consideration, that this method will answer the purposes of its design very well. I have also constructed linings for safes by substituting asbestos for plaster-of-paris, and proceeding with it precisely as I have just above described for clay alone. I have also mixed asbestos with plaster-of-paris, and proceeded as in the case when plaster-of-paris was alone employed. None of these last-described fillings are so completely adapted to all the conditions a lining is required to answer to as that of plaster-of-paris alone, used with the solution of calcium chloride; and, therefore, as I have previously stated, I prefer this to either of the others.

I find paper-pulp, charcoal, dry sawdust of wood saturated with calcium-chloride solution, and mixed plaster hydraulic cements in proper proportions to allow them to set, will stand a great degree of heat; also prevent rust and resist evaporation.

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

1. The fillings or linings for fire-safes, vaults, and other fire-proof structures, formed of calcium chloride in combination with an absorbent or absorbents, substantially as described.

2. The use of calcium chloride with plaster-of-paris, clay, lime cements, asbestos, or other earthy or organic materials which will not decompose the chloride, substantially as described.

In testimony that I claim the foregoing, I have hereunto set my hand this 9th day of March, 1874.

WILLIAM H. BUTLER.

Witnesses:

HENRY H. MORRISON,
J. M. TIGHE.