

UNITED STATES PATENT OFFICE.

JAMES M. WILLCOX, OF PHILADELPHIA, PENNSYLVANIA.

MANUFACTURE OF PORTLAND CEMENT.

SPECIFICATION forming part of Letters Patent No. 333,370, dated December 29, 1885.

Application filed November 5, 1885. Serial No. 181,958. (No specimens.)

To all whom it may concern:

Be it known that I, JAMES M. WILLCOX, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Portland Cement, of which the following is a specification.

My invention is designed more particularly to meet a difficulty that has been experienced in the practice of the process of manufacturing Portland cements, which is the subject of Letters Patent No. 293,329 of January 22, 1884. In the practical use of the method of molding by compression dampened or slightly-moistened cement-making materials as set forth in said Letters Patent great difficulty was experienced in getting the molded balls or lumps sufficiently hard and resistant to enable them to withstand properly the subsequent operations. The handling to which they were necessarily subjected, the shoveling, and the operation of filling kilns with them, as well as the weight upon them in the kilns caused too much breakage and disintegration for successful and profitable manufacture. It became apparent to me therefore that it was of prime importance to mix with the cement-making material a substance in the nature of a binding medium which should impart the requisite hardness and solidity to the molded balls or lumps, and that it was of equal importance to obtain a substance of this character which could be readily and conveniently mixed with the cement-making material.

None of the substances named in the Letters Patent above referred to, or in Letters Patent No. 274,288, of March 20, 1883, answered the foregoing conditions. The hydrocarbons specified in the Letters Patent last named mixed readily with the cement-making powder, but the molded lumps were crumbly, friable, and did not possess the requisite strength to withstand the effects of handling, &c. I found that it was necessary to have as the binding medium a substance which by the application of moderate heat would be rendered soft and fluid enough to mix readily with the cement-making powder; but which, also, on cooling would become hard and tenacious. Such a substance I have found in pitch, both vegetable and mineral, asphalt, and like

substances, resins are perhaps somewhat too brittle to be wholly available, but, by mixing with them oil in proper proportion, they may be rendered sufficiently tenacious.

I prefer pitch. By properly heating it, pitch becomes sufficiently soft and fluid for thorough and perfect mixing with the powder. It hardens and becomes tenacious on cooling, so that lumps or balls molded from cement-making material in which pitch is used as the binding medium possess the requisite hardness and strength for the subsequent processes of manufacture. It is also desirable that the binding medium should be finally gotten rid of in such a way as not to adulterate the cement by permanent admixture therewith. Pitch meets also this requirement in practical kiln-burning. I find that as the intense heat of a burning kiln is carried upward through the mass or charge the pitch at the near approach of the fire becomes volatilized in great measure if not entirely, and is driven out at the top of the kiln in clouds of dense yellow smoke.

Of the kinds of pitch in ordinary use I prefer that obtained from the pine-tree and that obtained as a distillation from gas-tar. Both of these are good and cheap enough to be used in the manufacture of hydraulic cements. Both are soft and fluid when warm, and hard and solid when cool. Any tenacious substance, however, which possesses this double character would, as above intimated, answer as the binding medium, and if it volatilizes when exposed to the high heat of the kiln it is all the better adapted for my purpose.

In practicing my invention, the cement-making powder is run from the mill where it is ground into a mixer, where it meets and is mixed with the pitch (or binding medium of like character) supplied in fluid condition from a tank which is properly heated, so as to maintain the pitch in proper condition for the mixing operation. The proportion of the binding medium used may vary within wide limits. I generally use it in the proportion of, say, from three to four per cent., by weight, of the powder. During the mixing operation care should be taken that the mass does not chill, otherwise the material would ball up.

To maintain the mass at a proper heat, I find it desirable to introduce steam-pipes or a steam-coil into the mixer; also to prelimi-

narilly heat the water, which is customarily added (in the proportion of about four or six per cent., by weight) to the mass in the mixer.

After the prepared material is well mixed
5 it is, while still heated, molded by hard pressure into balls or lumps. The molding operation takes place preferably between rotating surfaces, and is performed by the aid of machinery, such as described in my Letters Patent
10 Nos. 309,117 and 309,118, of December 9, 1884. It is very essential that the prepared powder molded in these machines should be maintained at a proper heat, because, should
15 it become cool, it will ball up and gum the molding-rolls, so as to impede, and in fact stop, the operation of the machine.

After the balls or lumps have been molded and are allowed to cool, they become very hard, tough, and resistant, so that they can
20 withstand satisfactorily the subsequent handling, &c., to which they are subjected.

The operation of converting the balls into manufactured cement can be conducted as prescribed in Letters Patent No. 292,329, of January
25 22, 1884, or in any other suitable way.

Having now described my improvement and the manner in which the same is or may be carried into effect, I state in conclusion that I do not claim, broadly, mixing a combustible with
30 cement material prior to the calcining operation. Indeed what I have in view is a binder rather than a combustible, and the fact that in my case the binder may also be a combustible is simply incident to the peculiar character of
35 the binder, which I prefer to make use of. On the other hand, I do not desire to be understood as restricting myself to pitch or other binder hereinbefore specifically named, my

improvement contemplating and embracing any binding medium, which fluid under moderate heat will harden, solidify, and become tenacious on cooling. 40

What I claim, therefore, as new and of my own invention is as follows:

1. The admixture, with powdered cement-making material, of a binding medium, substantially such as specified, which will be made soft and fluid by heat and will harden and solidify when cooled, substantially as and for the purposes hereinbefore set forth. 45 50

2. The combination, with powdered cement-making material, of pitch or equivalent substance, which, while becoming soft and fluid under moderate heat, and becoming hard when cooled, will volatilize under the temperature of the kiln in which the material is subsequently
55 burned or calcined, substantially as and for the purposes hereinbefore set forth.

3. The improvement in the art of making hydraulic cements consisting in mixing with
60 the powdered cement-making material a binding medium, substantially such as specified, which will soften and become fluid when heated and will harden when cooled, then molding by compression the mixture while still
65 heated into balls or lumps, and subsequently calcining said balls or lumps and again reducing the same to powder, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 2d day of November, 1885. 70

JAMES M. WILLCOX.

Witnesses:

WILLIAM L. FRY,
MICHAEL J. GLENNEN.