

# UNITED STATES PATENT OFFICE.

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## MANUFACTURE OF CEMENT.

SPECIFICATION forming part of Letters Patent No. 747,882, dated December 22, 1903.

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*To all whom it may concern:*

Be it known that I, CARL VON FORELL, a subject of the German Emperor, and a resident of Hamburg, Germany, have invented certain new and useful Improvements in the Manufacture of Cement, of which the following is a specification.

This invention relates to the manufacture of cement from blast-furnace or similar slag by quickly cooling the highly-heated furnace-slag while in a disintegrated condition to convert the slag into a highly-cementitious material.

It has been found that if slag, such as blast-furnace slag, is quickly cooled or congealed from a molten condition in the proper manner the resulting product is a slag-clinker having highly-cementitious properties and adapted to form cement when ground. This conversion seems to depend upon the fact that furnace-slag is a mixture of calcareous argillaceous silicates, which are of a somewhat unstable character.

In carrying out this invention highly-heated furnace-slag is used, preferably in a molten condition, and is disintegrated into particles preferably by the action of a powerful jet of steam. The particles of slag may in this manner be driven through the air or fluid medium into impingement with a chilled surface, which is preferably formed with facing-plates of smooth iron. In this manner the slag striking this cooled impinging surface does not permanently adhere thereto, but falls in the shape of more or less flattened pieces into a cooling-drum or other cooling apparatus, which may be used as a conveying means to remove the treated slag. The converted slag material, which is in the form of lumps or clinker, is entirely different in structure from slag granulated in the ordinary way. This converted slag has been so changed in its chemical and physical properties that the resulting clinker is a highly-cementitious material, which may be ground and at once used as cement. Furthermore, the action of steam upon the molten furnace-slag partially desulfurizes it, since the steam acts thoroughly upon all portions of the slag. If, however, a complete desulfurization does not result by this action, the cement clinker formed by being projected against the chilled impinging

surface may be subsequently placed in water, and in such case no injurious hydration takes place as results from the granulation of furnace-slag in water.

The steam-jets have the function of mechanically projecting the highly-heated slag against the cooled impinging surface, and it is manifest that this process may be carried out in other ways without using steam-jets. Mechanical means may, for instance, be used for this purpose, such means being preferably so arranged that the molten slag is thrown therefrom and projected against a cooled impinging surface, which may take the form of a smooth drum or cylinder with cooling means inside the same, or the slag may be projected against the inside of a drum which is cooled by external means. Furthermore, such cooled impinging surfaces may be rotated or otherwise moved, and thus the adhesion of the cooled particles of slag may be more readily prevented.

It is of course understood that those familiar with this art may make many changes in the form, proportions, and number of parts of the apparatus which has been described, and, furthermore, may vary the order and number of steps of the processes set forth and may perform the steps in a different way without departing from the spirit of this invention or losing the advantages which are derived from the same.

What I claim as new and what I desire to secure by Letters Patent is set forth in the appended claims:

1. The cement process which consists in disintegrating molten furnace-slag into particles and projecting the same through a fluid medium containing steam to impinge upon a surface so as to form highly-cementitious material.
2. The cement process which consists in subjecting highly-heated furnace-slag to the action of fluid-jets containing steam to disintegrate the same into particles, and in causing the same to impinge upon a surface so as to form highly-cementitious material.
3. The cement process which consists in projecting highly-heated furnace-slag into impingement with a moving surface so as to form highly-cementitious material.
4. The cement process which consists in

projecting highly-heated furnace-slag through a cooling fluid and causing the same to impinge upon a moving surface so as to form highly-cementitious material.

5 5. The cement process which consists in subjecting highly-heated furnace-slag to the action of fluid-jets containing steam to disintegrate the same into particles and in project-

ing the same through a fluid medium so as to form highly-cementitious material. 10

In witness whereof I have hereunto set my hand in presence of two witnesses.

CARL VON FORELL.

Witnesses:

OTTO W. HELLMRICH,

T. CHRIST. HAUFERMANN.