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2,313,207

PROCESS OF MOLDING CONCRETE STRUCTURES

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Fig. 1.

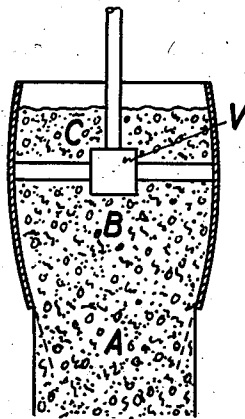
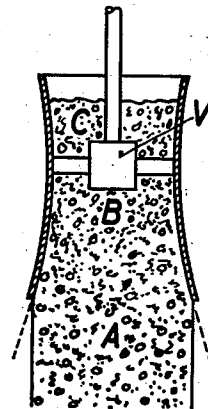


Fig. 2.



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PROCESS OF MOLDING CONCRETE
STRUCTURESNiels Rasmus Steensen, Copenhagen, Denmark;
vested in the Alien Property CustodianApplication June 3, 1939, Serial No. 277,299
In Denmark June 4, 1938

2 Claims. (Cl. 25—155)

The present invention relates to a process for the manufacture of castings of reinforced or non-reinforced artificial stone, such as concrete, by means of a mold which during the gradual progress of the pouring operation and a simultaneous vibration of the material in the mold is moved upward—preferably by sliding—on the cast article. The mold is thus of less height than the casting.

In the production of such articles, such as walls, columns, chimneys and silos, movable forms have heretofore sometimes been used which have been moved some distance upward, relatively to the casting, when the recently poured parts of the latter have become set. It has in fact heretofore been considered necessary in the pouring of articles for which such substances as cement, plaster of Paris, hydraulic lime and the like are used as a binder that the forms or the mold, as the case may be, should not be removed from the castings before the latter have become set. This means that in the pouring of the articles concerned, it has been necessary to work rather slowly, all depending on the setting period of the materials used.

The present invention, however, renders it possible to avoid awaiting the setting of the mass before the mold is moved, and thus the advantage is attained that the work of pouring can be accelerated very considerably. The distinguishing feature of the process according to the invention consists in that the mold is moved at a speed adjusted in such a manner, relatively to the vibration, that, owing to the vibration, the lower parts or laminae or layers of concrete or other material which are still in the mold have attained such a high degree of compression (compacting of the grains) that these lower parts, or layers, without the assistance of the binding agent, can support themselves, before they are exposed or laid bare, during the continued upward motion of the mold. The said lower parts or layers of concrete or other material, which are still in the mold or forms and being already compressed, will in the mold or forms not be subjected appreciably to the vibrations and motions resulting from the vibration, and consequently the already uncovered layers or parts below the mold or forms likewise will not be subjected to transmitted vibration.

When using the process according to the invention, the forms do not have to be taken apart whenever a pouring has been performed, but the forms may be moved gradually upward simultaneously with the vibration, after which the

pouring of a new supply of material to the top of the forms takes place. The supply of material may also be continuous, in such a manner that the pouring process becomes perfectly continuous.

Because of the vibration there will be no difficulty in pulling the forms upward along the cast article, as the forms will easily slide thereon, and the forms will not need any taper or conicity in order to produce slip, as would be the case according to the known processes according to which the forms are not removed until the setting has taken place.

By following the process according to the invention, columns and walls belonging to the supporting structures of buildings, telegraph poles and other engineering supporting structures may be constructed at the place where they are to be erected, in such a manner that any transportation of the cast articles to the site of use can be avoided.

By fitting the mold with a core the casting may be given an internal cavity. Thus a hollow post or telegraph pole may be constructed, or a wall may be made, with cavities of the same kind as in the ordinary hollow walls made from bricks, which has not been possible according to the previously used methods, because it has been difficult to cause such a small core to be moved upward together with the mold, as such small cores have a tendency to become pinched in the material during the setting.

In the manufacture of smaller columns according to the invention, a pouring speed of 1 meter (about 3 feet) per minute has been attained, and the use of the process according to the invention may include a reinforcing of the cast article in the usual manner by the insertion of reinforcing rods in the known manner.

It is understood that when the pouring of for instance a column is commenced, the vibration of the material poured must be effected at once from the bottom of the column, and it is very important that the forms should be moved at a speed that is accurately adjusted, relatively to the intensity and nature of the vibration and the height of the forms, as the feature determining the speed is that the layers of concrete uncovered during the upward motion of the forms should have become able because of the vibration, to support themselves and the soft concrete lying on top, as well as the forms. On the other hand it is not necessary to delay the further upward motion of the forms until the lower layers of concrete still in the forms have

been set, as has been the case heretofore, and this very fact determines the high speed of pouring that distinguishes the process according to the present invention in comparison with the processes known heretofore, and using the same forms a far greater working capacity can be attained than according to the processes known heretofore. A further advantage of the invention is that it is not necessary to separate the forms into two pieces, for instance along two diametrically opposite generatrices, as it had to be done heretofore when the forms were removed after the setting had taken place. By the use of an undivided mold the danger is avoided that the joints of the mold might become shaken loose during the vibration.

For carrying out the process, a mold may be used as shown diagrammatically on the drawing, in which

Figs. 1 and 2 show, in section, two extreme positions of the mold during the vibration.

The mold is cylindrical, and the deformations shown are highly exaggerated. As appears from the drawing, the vibrator V is placed about one-third of the way down the mold, and the length of the latter is adjusted in such a manner, relatively to the number of oscillations of the vibrator, which practically always makes about 4000 strokes per minute, that a nodal point is formed at the bottom edge of the mold. As shown, the vibration displaces a particle of the concrete transversely or horizontally, and is propagated vertically or longitudinally of the mold. Thus the material just exposed by the mold at the bottom will not be vibrated, but will leave the mold quietly, in such a manner that the concrete parts marked A will not be exposed to vibrations. The parts marked B are just becoming compressed, and the parts marked C have just been poured into the mold, and they have commenced to become vibrated.

If the mold was extended downward along the dotted lines, its bottom edge would have a "whipping" effect, and the finished compressed, but not yet set, concrete parts A, would be shaken to such an extent that they would collapse when the mold was moved upward.

Having now described my invention what I

claim as new and desire to secure by Letters Patent is:

1. In the casting of vertical columnar structures formed of concrete or other castable material employing a closed vertically movable mold, the process of rapidly forming cast columnar structures which comprises the successive steps of pouring a substantial thickness of settable plastic mix into said vertical mold, applying rapid intense mechanical vibrations to said thickness of mix immediately after pouring and continuing said application of vibrations until the lower transverse layer of said thickness of said mix has been so highly compressed as to be self-supportable without lateral support by said mold but not long enough to permit setting of the binding agent of said mix, then raising said mold to expose said compressed self-supportable layer, pouring fresh plastic mix in the empty top part of the raised mold, and then repeating said vibration and process, said vibrations being applied at a point within the material constituting said thickness.

2. In the casting of vertical columnar structures formed of concrete or other castable material employing a closed vertically movable mold, the process of rapidly forming cast columnar structures which comprises the successive steps of pouring a substantial thickness of settable plastic mix into said vertical mold, applying rapid intense mechanical vibrations to said thickness of mix immediately after pouring and continuing said application of vibrations until the lower transverse layer of said thickness of said mix has been so highly compressed as to be self-supportable without lateral support by said mold but not long enough to permit setting of the binding agent of said mix, then raising said mold to expose said compressed self-supportable layer, pouring fresh plastic mix in the empty top part of the raised mold, and then repeating said vibration and process, said vibrations being applied about one-third of the height downward from the top of said mold, and said mold being of such height that under the applied frequency of vibration to nodal point is formed at the bottom edge of said mold.

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