

C. F. MORRILL.
 PROCESS OF MAKING STONE CONCRETE STRUCTURES.
 APPLICATION FILED AUG. 12, 1905.

963,734.

Patented July 5, 1910.

2 SHEETS, SHEET 1.

Fig. 1.

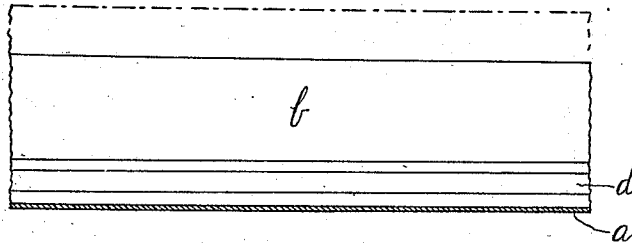


Fig. 1^a.

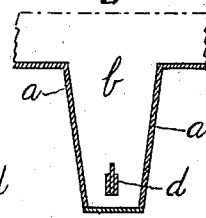


Fig. 2.

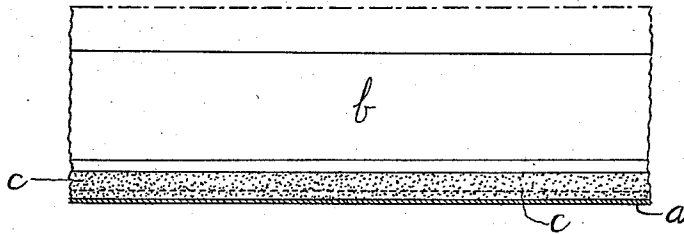


Fig. 2^a.

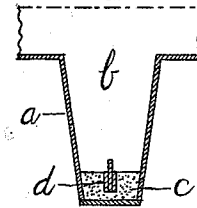


Fig. 3.

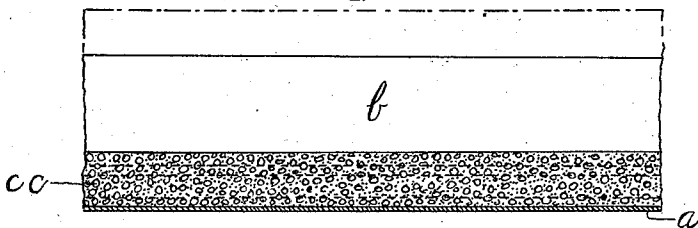


Fig. 3^a.

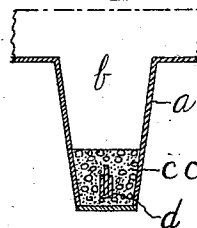


Fig. 4.

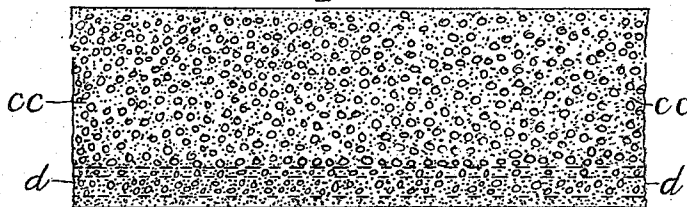
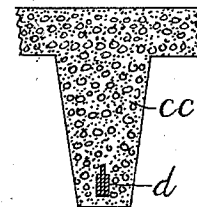


Fig. 4^a.



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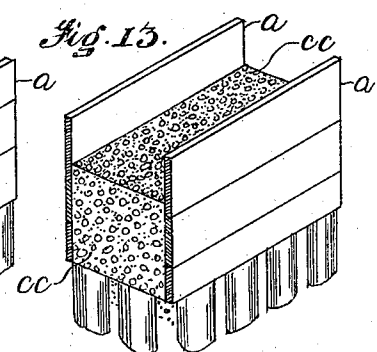
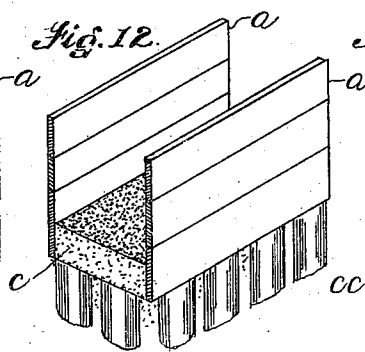
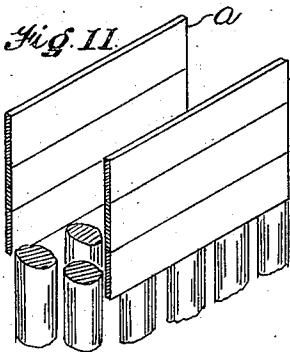
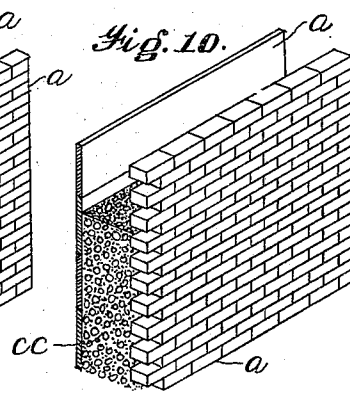
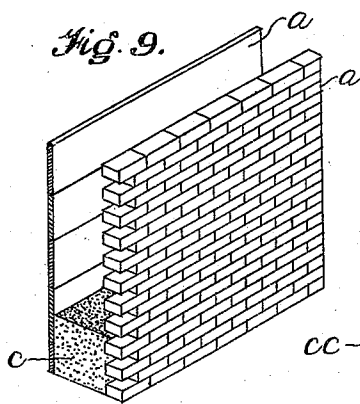
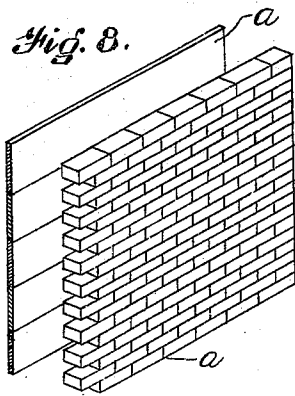
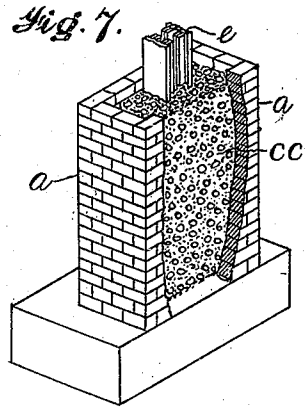
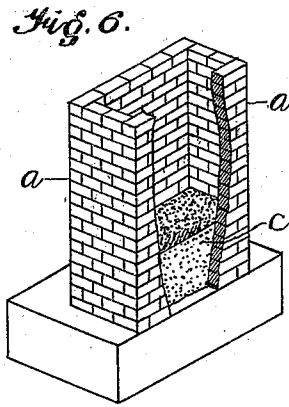
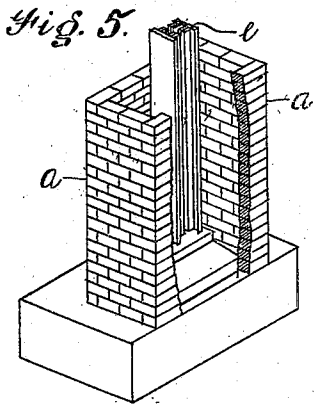
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

CHARLES F. MORRILL, OF BOSTON, MASSACHUSETTS.

PROCESS OF MAKING STONE-CONCRETE STRUCTURES.

963,734.

Specification of Letters Patent.

Patented July 5, 1910.

Application filed August 12, 1905. Serial No. 273,875.

To all whom it may concern:

Be it known that I, CHARLES F. MORRILL, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Processes of Making Stone-Concrete Structures, of which the following is a specification.

The object of my invention is to make stone concrete of maximum strength in tension, compression and shear and that is more effective in combination with metal, as in steel-concrete girders, beams and floor construction and that is entirely free from voids with which stone concrete is more or less honeycombed by the present method of manufacture.

Stone concrete made by my improved method insures a dense and solid concrete, of uniform and maximum strength, according to the material used.

I will now describe the present method of making stone concrete and the disadvantages and objections arising therefrom, that my improved process may be more apparent.

According to the present method, predetermined proportions of Portland cement, sand, water and crushed stone, or other aggregates, are mixed together and molded, as a whole, within a centering form or mold, with the object of producing a solid concrete body, as a girder, beam, or wall in building construction; but in practice it is found that this object is not attained. There is a tendency to use too large a proportion of crushed stone, but when such is not the case, it is found that when the concrete as now made is molded and tamped within the centering form, or mold, that parts of the crushed stone come in contact with each other at many points in such shape as to form interstices within the concrete body and between the exterior portion of the concrete body and the centering form, or mold, thus proportionately reducing the strength of the molded body; and when steel tension or compression chords are used, as in girder and beam construction, the crushed stone in contact with the metal forms interstices and prevents a close union between the plastic portion of the concrete and metal; and when the metal is located in the lower part of the molded body, near the bottom of the centering form, or mold, as required in small beams and like construction, the crushed stone in contact with the

metal tension chords and centering mold forms interstices that prevents the plastic portion of the concrete from firmly uniting with the steel chord at all points with consequent diminution of strength in the steel-concrete girder or floor beam.

It is a well-known fact, among workers in concrete construction, that concrete is not uniform in strength with the same care and attention in manufacture and when like material is used, which can be readily accounted for by the irregular formation of voids within the concrete body by the crushed stone, with consequent loss of strength in concrete construction, as herein described. And further, according to the present method of making concrete, the crushed stone being the larger bulk, the plastic portion of the concrete separates and adheres to the stone and often becomes partially set before it can be molded within the centering form, or mold, thus reducing the strength of the molded concrete. None of these objections arise in my process of manufacture, which I will now proceed to describe.

My invention consists of making stone concrete by first mixing together accurate proportions of Portland cement, or other cementitious material, sand and water, thus making a plastic composition of the proper consistency, which is then molded in single layers within the required centering form, or mold, as for a girder, beam or in wall construction, then crushed stone, or other aggregate of similar nature and purpose, are tamped within the plastic material to the extent that no more crushed stone or other aggregate can be embedded therein; the plastic material being displaced by the crushed stone or other aggregate excepting that portion remaining between the crushed stone that unites with it and forms a solid mass of stone concrete; then another layer of plastic material is added and the process repeated until the centering form, or mold, is entirely filled with a solid mass of stone concrete of the form desired. By this method of manufacture the plastic material unites with and envelops the steel chords, as used in girder, beam and floor construction, while the later addition of crushed stone or other aggregate displaces the plastic material only to the extent of the size of the solid aggregate embedded therein; the plastic material firmly uniting with the crushed

stone, thus forming a solid body of stone concrete. This process of manufacture is of equal advantage in concrete construction where steel is not required, and insures a solid product of uniform strength and capacity which cannot be obtained by the usual process of manufacture.

This invention is illustrated by the accompanying drawings, Figures 1 to 13 inclusive.

Figs. 1 and 1^a represent longitudinal and transverse sections of a centering form, or mold, for a girder or floor beam for building construction. This centering form, or mold, is shown with beveled sides, but may be square or of any desired shape, and is designated by the letter *a*. The letter *b* represents space within the centering form wherein the concrete is molded. The letter *d* represents a steel tension chord located within the centering form *a*.

Figs. 2 and 2^a represent in sections the centering form, or mold, *a* with the addition of a layer of plastic material *c* molded therein; the plastic material *c* partially enveloping the steel tension chord *d*.

Figs. 3 and 3^a represent in sections the centering form, or mold, *a* with the plastic material molded therein, as described in Figs. 2 and 2^a, with the further addition of crushed stone or other aggregate embedded and tamped within the plastic material, forming the first layer of stone concrete which is denoted by the letters *c c*.

Figs. 4 and 4^a represent sections of a finished stone concrete girder or floor beam, with a concrete floor homogenous therewith, as shown after the concrete had set and the centering form been removed, and was formed by adding layer after layer of plastic material with crushed stone or other aggregate embedded in each layer, as the work progressed, until the centering form was filled and the full size of the girder developed, according to my improved method, and is denoted by the letters C C.

Fig. 5 represents a brick centering form, or mold *a*, inclosing a steel column *e* used in building construction.

Fig. 6 represents the centering form, or mold *a*, shown in Fig. 5 with a layer of plastic material *c* molded therein.

Fig. 7 represents the centering form, or mold *a*, shown in Figs. 5 and 6, but entirely filled with stone concrete, formed by molding layer after layer of plastic material within the centering form, with crushed stone embedded successively in each layer, according to my improved method, the solid concrete inclosing and firmly uniting with the steel column, which it aids in support.

Figs. 8, 9 and 10 represent centering forms, or molds *a*, designed for wall construction where the same method of concrete manufacture is shown.

Figs. 11, 12 and 13 represent my improved method of concrete manufacture, as applied to pile foundation.

I will again call attention to the advantage of my process in the manufacture of stone concrete. I have already stated "that stone concrete made by my improved method insures a dense and solid concrete of uniform and maximum strength, according to the material used"; and as cement is the life of stone concrete so is the strength of stone concrete in proportion to the cement used. A good, cementitious, plastic material for making stone concrete, according to my process, is composed of one part good Portland cement and three parts sharp grain sand thoroughly mixed with water to the consistency of mortar as used for plastering ceilings and walls in building construction. The plastic material is then molded in a centering form or mold in layers for columns, girders, floors, or other construction with crushed stone successively embedded in each layer, and forming a solid body of stone concrete. Such stone concrete may be safely used at 400 lbs. per inch in compression, and in like manner with one part Portland cement and 2½ parts sand at 500 lbs., and with one part Portland cement and two parts sand at 600 lbs., and with one part Portland cement and one and one-half parts sand at 700 lbs., and with approximately proportionate resistance to compressive strains according to the proportion of cement used. I will mention that the best results are obtained in the manufacture of stone concrete by having the crushed stone clean and wet when ready for use, and this result is easily obtained by my method of embedding clean-washed crushed stone in the cementitious, plastic material, as described. I will also mention that in shallow, stone concrete beams, floors and other construction, either with or without the use of steel, that only a single layer of plastic material may be required, with crushed stone or other aggregate embedded therein, to develop the desired size.

Having described my invention I now present the following claims for Letters Patent:

1. The herein described process of manufacturing molded stone concrete, which consists in first making a cementitious, plastic material, composed of relative proportions of cement, sand and water, thoroughly mixed to a plastic consistency, and then molding this material within a centering form or mold in a layer of the required thickness; and then tamping crushed stone or other aggregate into this layer of cementitious, plastic material to the determined capacity of said material; and then tamping and compressing the combined mass and allowing it to harden until it becomes a

solid stone concrete body, all substantially as herein set forth.

2. The herein described process of manufacturing molded stone concrete, which consists of first making a cementitious, plastic material, composed of relative proportions of cement, sand and water, thoroughly mixed to a plastic consistency, and then molding the requisite quantity of this material within a centering form or mold in a layer of the required thickness, and then tamping crushed stone or other aggregate into this layer of cementitious, plastic material to the determined capacity of said material, and then adding another layer of

this material and tamping crushed stone or other aggregate thereinto, as before, and repeating the process until the molded body is made of the required size; and then tamping and compressing the combined mass and allowing it to harden until it becomes a solid stone concrete body, all substantially as herein set forth. 20

In testimony whereof I have affixed my signature, in presence of two witnesses.

CHARLES F. MORRILL.

Witnesses:

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