No. 633,312. Patented Sept. 19, 1899.

P. C. HAINS, JR. & C. R. WEAVER.

PROCESS OF MAKING CONCRETE.

(Application filed July 18, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

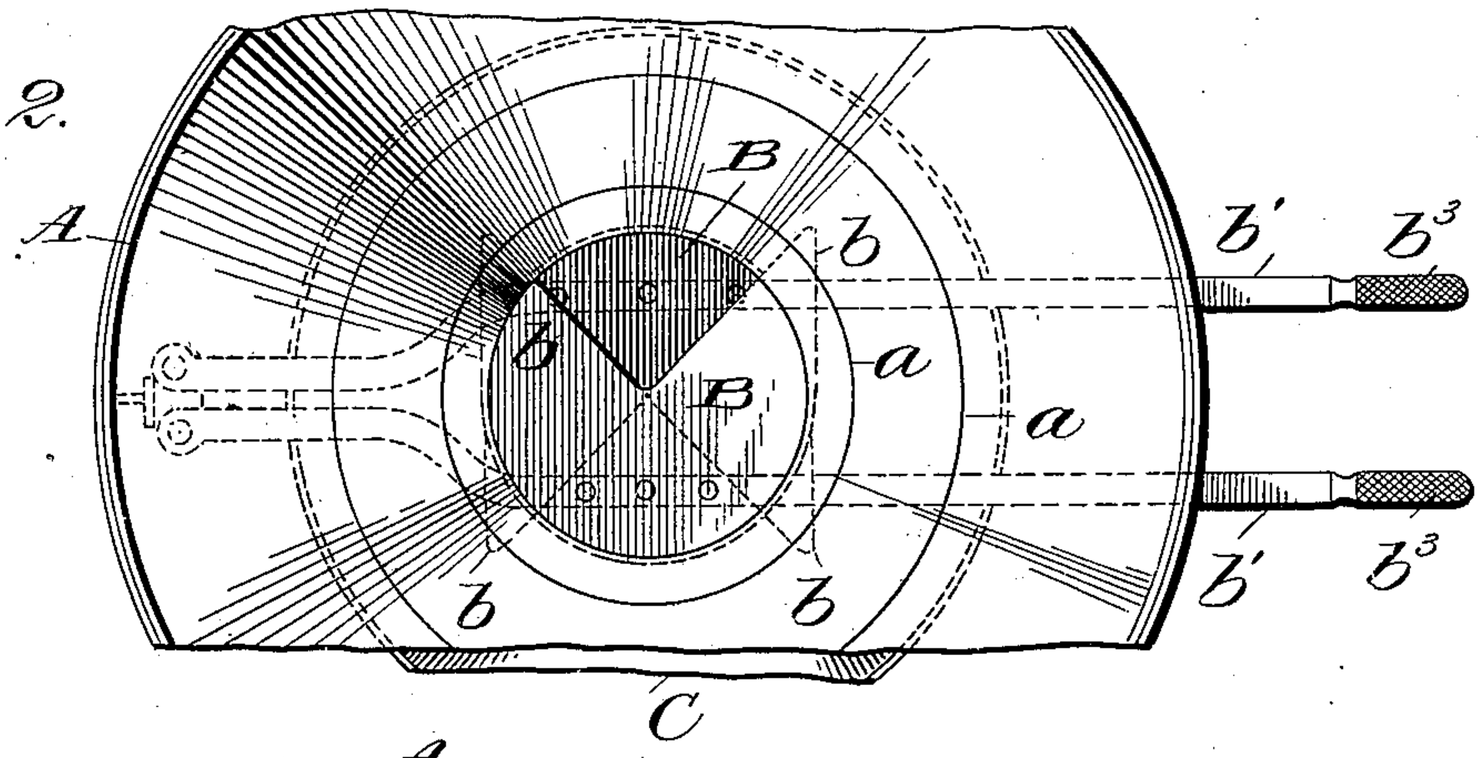
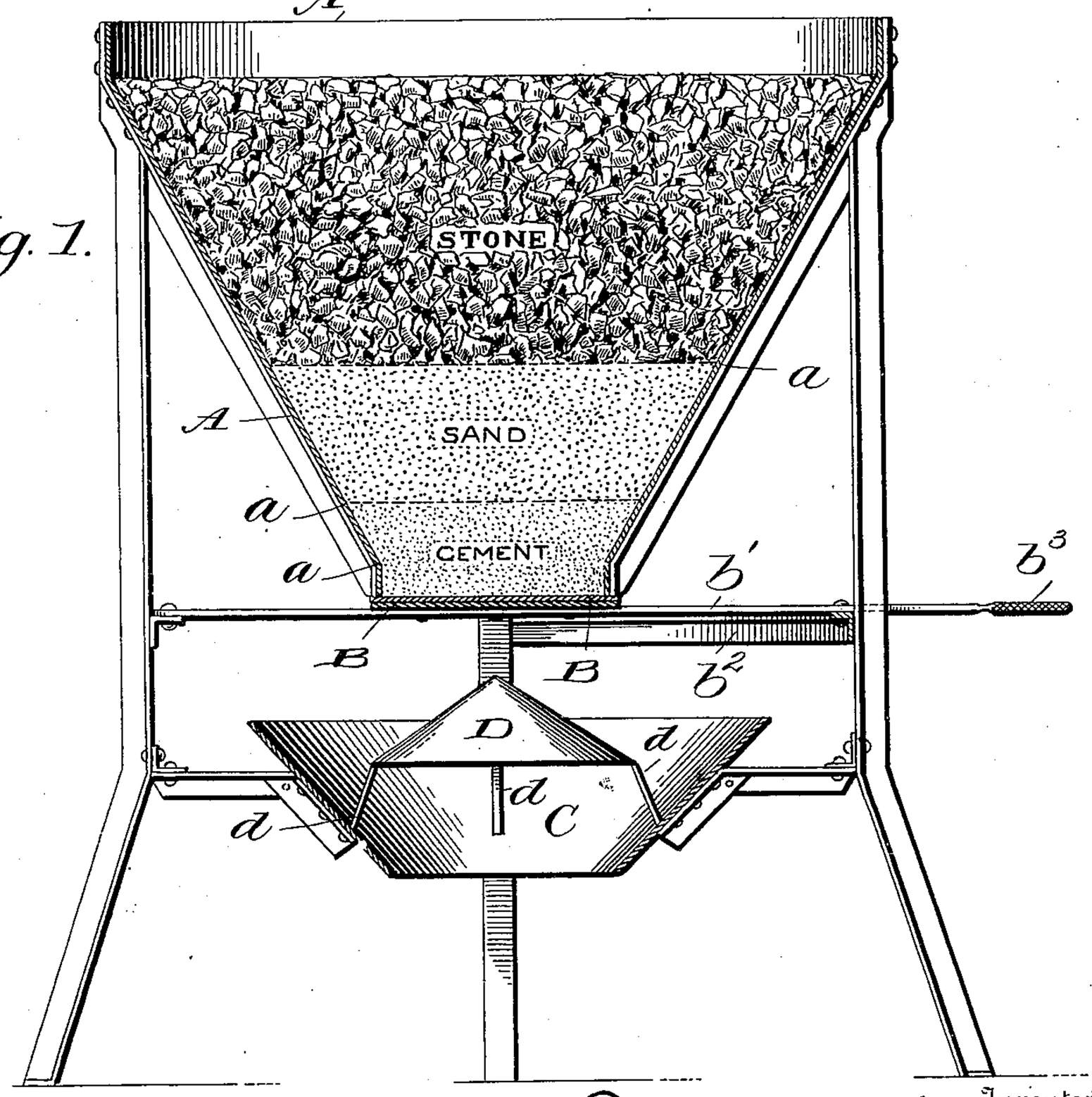


Fig. 1.



Witnesses

L. C. Hills

L. D. Knigotwy.

Inventors

Peter C. Hains Jr. and

Charles R. Weaver

By Whitaker & Wood Attorneys

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Fig. 3.

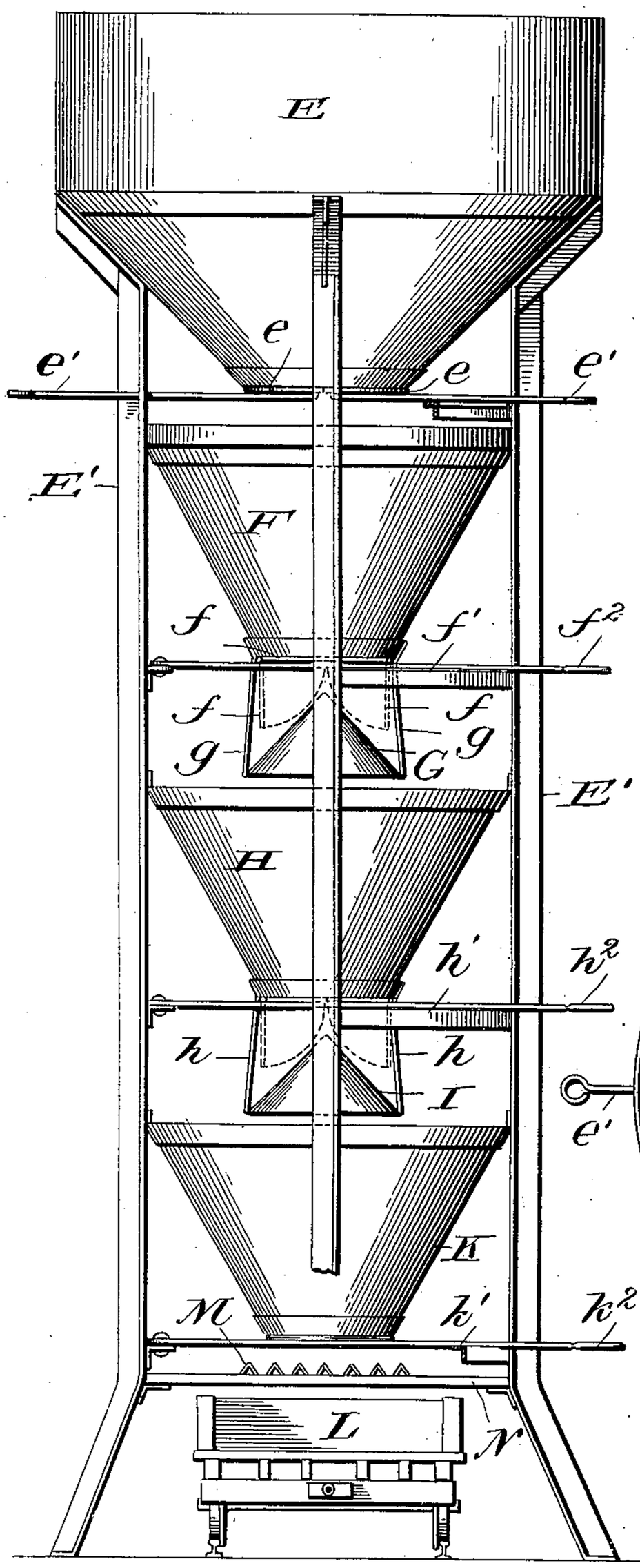


Fig. 4.

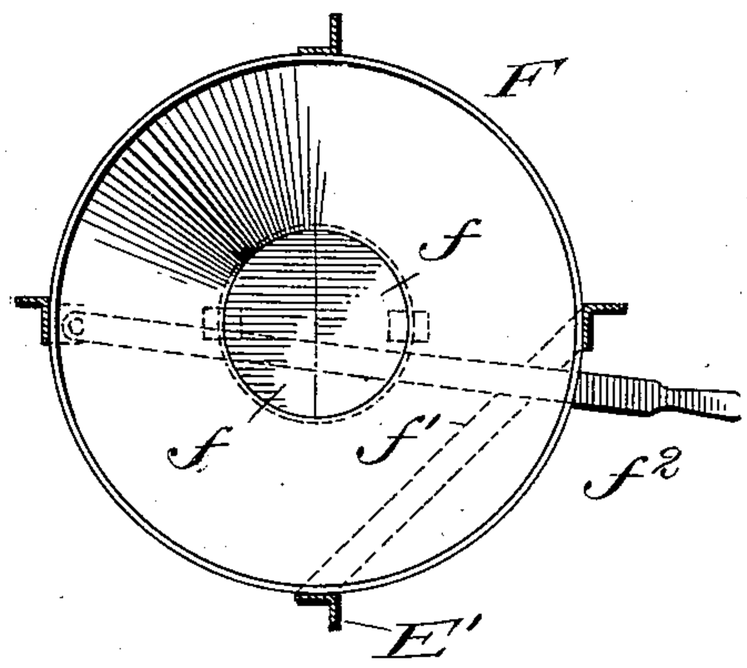
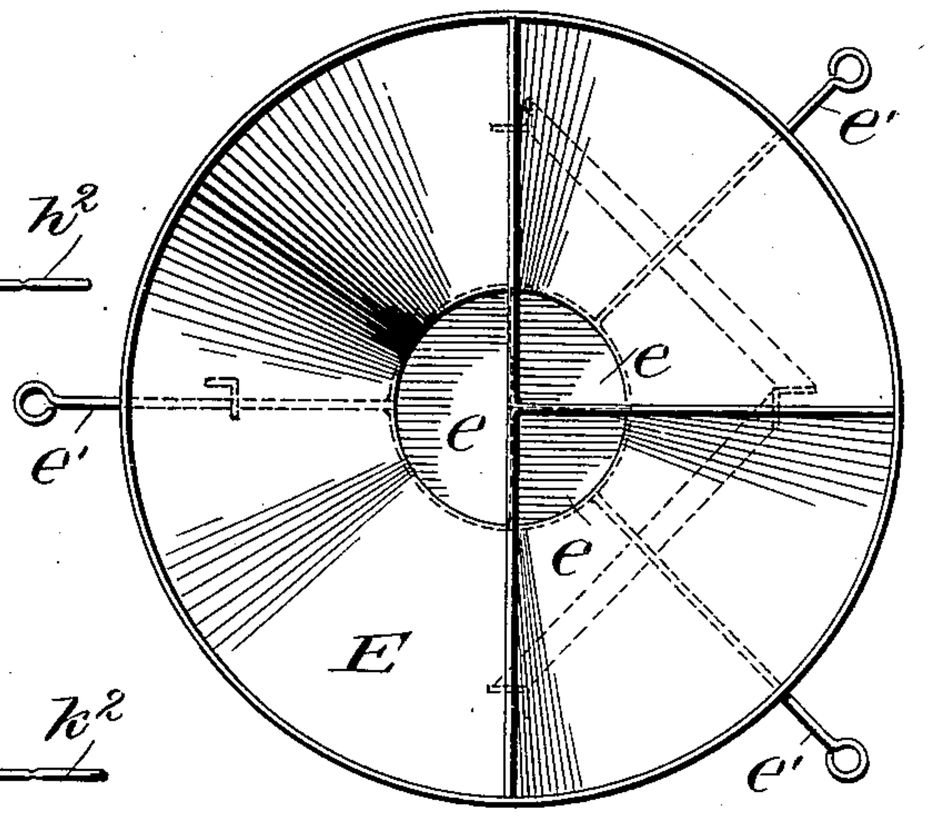


Fig. 5.



Witnesses
L. C. Hills
J. D. Kingsbury

Inventors
Peter C. Hains Jr. and
Charles R. Weaver
By Whittaker & Prosser Attorneys.

UNITED STATES PATENT OFFICE.

PETER C. HAINS, JR., AND CHARLES R. WEAVER, OF BALTIMORE, MARYLAND; SAID WEAVER ASSIGNOR TO SAID HAINS.

PROCESS OF MAKING CONCRETE.

SPECIFICATION forming part of Letters Patent No. 633,312, dated September 19, 1899.

Application filed July 18, 1898. Serial No. 686,280. (No specimens.)

To all whom it may concern:

Be it known that we, PETER C. HAINS, Jr., and CHARLES R. WEAVER, citizens of the United States, residing at Baltimore, State of Maryland, have invented certain new and useful Improvements in Processes of Making Concrete; and we 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 appertains to make and use the same.

Our invention consists in the novel features hereinafter described, reference being had to the accompanying drawings, which illustrate one form of apparatus for carrying our invention into effect, and the invention is fully disclosed in the following description and claims.

Referring to the said drawings, Figure 1 represents a vertical sectional view of an apparatus for carrying our invention into effect. Fig. 2 is a partial top plan view of the same. Fig. 3 is a side elevation of a modified form of the apparatus shown in Fig. 1. Fig. 4 is a partial top plan view of the gravity mixing-chamber. Fig. 5 is a partial top plan view of the supply-receptacle.

The object of our invention is to take measured quantities of cement, sand, stone, and water, place them in a suitable receptacle in such a manner that by discharging them therefrom by gravity the thorough mixing of the various materials will be effected without the necessity of agitation by hand or by any mechanical means, thus greatly facilitating and expediting the preparation of concrete and at the same time securing the most thorough and perfect mixing of the ingredients possible.

In carrying out our process we provide a receptacle which we term a "gravity-mixer," in which the solid materials necessary for the formation of concrete are placed in horizontal layers one above the other. In the drawings, Figs. 1 and 2, we have shown a gravity-mixer A, constructed, preferably, in the form of an inverted truncated cone and provided at the bottom with a discharge-aperture, which is of less diameter than the top of the receptacle and which is closed by one or more doors or gates, as hereinafter described. The receptacle or mixer A is provided with indications, preferably in the form of lines *a*, marked around the interior face of its side walls to indicate the height of each layer of the materials, which are disposed in horizontal layers one above the other. We have found by experiment that the best results are obtained by placing the dry cement in a layer at the bottom of the mixer, the sand in a layer above the cement, and the granulated or broken stone in a layer above the sand, the indicating-lines serving to indicate the depth of each layer, and therefore the proper proportion of each ingredient.

In the form of apparatus shown in Figs. 1 and 2 we have shown a pair of horizontally-sliding plates B B for closing the discharge-orifice of the mixer, said plates or doors being each of the form shown in Fig. 2, each plate being of substantially the form of a half-circle with lateral extensions *b b*, which overlap the other plate. Each plate B is secured to an operating-arm *b'*, pivoted at one end to the supports for the mixer and having its other end adapted to slide on a horizontal bar b^2 of said supports and provided with a handle b^3, by which it can be moved. When the doors are moved in opposite directions away from each other, a small central opening will be formed between the extensions *b b* of the two plates, which can be increased in size by moving the plates farther apart until the entire discharge-aperture is uncovered.

Below the mixer A we prefer to provide devices against which the materials will strike and be separated and then thrown together again in order to assist in commingling the materials. These devices may be varied to a considerable degree, and we do not desire to limit ourselves to the exact forms of such devices herein shown and described. In Figs. 1 and 2 we have shown a downwardly-tapering collecting-ring C in the form of an inverted truncated cone, above which is a cone D, supported therefrom by means of suitable feet or supports *d d*, so that the material falling from the discharge-orifice of the mixer will strike upon the cone D and be deflected outwardly and will then slide off of said cone into the collecting-ring C, thus insuring thorough mixing of the ingredients. We may in

some instances dispense with these devices for interrupting the flow of the materials; but in general we prefer to employ some form of devices for this purpose.

In carrying our process into effect the solid materials are placed in the gravity-mixer A, as hereinbefore described, in horizontal layers and the required quantity of water is then poured into the mixer. The water will thoroughly wet the crushed stone (which is an important point in the making of concrete) and will penetrate through the sand to the cement. As soon as the top portions of the cement are moistened the water will be held back from the portions beneath for a considerable period, so that the lower portions of the cement will remain entirely dry. The doors B B are then opened so as to provide a discharge-orifice of the desired diameter and the material will at once begin to run through the said orifice from the bottom of the mixer in a narrow stream. The material adjacent to the top of the mixer and directly over the aperture will fall through the aperture, thus forming a central passage through which the material will continue to run until the mixer is entirely emptied. It will thus be seen that the portions of cement, sand and stone, and water will be continually mixed and mingled as the material passes from the mixer, and falling upon the cone C and collecting-ring D will be perfectly mixed together. From the collecting-ring the concrete ready for use will be delivered to a car or into a suitable receptacle, as desired.

We prefer in opening the doors B B to separate them at first, so as to provide a comparatively small aperture and to gradually increase the size of the aperture by further separating the doors as the operation proceeds until the entire discharge-aperture is uncovered before the mixer is emptied. We may, however, simply uncover the entire aperture at once by throwing the doors widely apart at the outset, if preferred, and obtain good results.

In Figs. 3, 4, and 5 we show a device for carrying out our process in practically a continuous way, which is desirable when the material is to be furnished with great rapidity and in very large quantities. In these figures, E represents a supply-tank which is provided with suitable compartments for storing stone, sand, and cement, each compartment being provided with a separate discharge-orifice closed by a cut-off plate or door *e*, provided with an operating-lever *e'*, by which it is controlled. The supply-receptacle is shown as supported by a suitable framework E' E'. We may, however, employ a series of separate supply-receptacles instead of a single receptacle provided with compartments, as will be perfectly obvious. Beneath the receptacle E is a gravity-mixer F of the form shown in Figs. 1 and 2, except that in this instance we have shown the discharge-orifice of the mixer provided with a pair of downwardly-swinging hinged semicircular doors or gates *f f*, which are held in closed position by a closing-bar *f'*, pivoted to the framework and provided with a handle f^2. (See Figs. 4 and 5.) Beneath the discharge-orifice of the mixer F is an interrupting-cone G—in this instance supported by rods *g g* from the mixer—upon which the material falls as it leaves the mixer, and below the cone G is a collecting chamber or receptacle H of substantially the size and shape of the mixer F. The collecting-chamber H is provided with a delivery-orifice, also closed by a pair of hinged gates or doors *h h*, similar to the gates *f f* and held in position by the bar *h'*, having a handle h^2. Below the receptacle H is a storage-tank K, provided with a discharge-orifice and a closing gate or gates K, controlled by a hand-lever *k'*, having a handle k^2, and a cone I is also interposed between the receptacle H and tank K. From the storage-tank K the concrete is delivered to one or more cars L, by which it is conveyed to the points where it is to be used. In Fig. 3 we have shown one collecting-receptacle interposed between the gravity-mixer and the storage-tank and two interrupting-cones, so that the material is agitated and collected twice before reaching the storage-tank. It is obvious that we might use a greater number of collecting-receptacles and cones, if desired or found necessary. We have also shown interrupting devices between the storage-tank K and the car L, consisting of a series of horizontally-disposed pieces of angle-iron M M, with their angular edges uppermost, and a second series N N, placed at right angles to the first. This form of interrupting device gives good results and we may employ it instead of the cone C and collecting device D, (shown in Fig. 1,) or the cones shown in Fig. 3, or in addition thereto, if found desirable.

In the use of the form of apparatus illustrated in Figs. 3, 4, and 5 the materials will be drawn from the supply tank or receptacle one at a time and delivered in layers in the mixer, after which the water is added and the material discharged in a narrow stream in a mixed condition from the bottom of the mixer, as previously described. As soon as the mixer is emptied it can be filled with another charge, while the concrete already formed can be passed to the storage-tank and delivered to the cars or otherwise used. As soon as the material is removed from the collecting-receptacle H to the storage-tank the next charge from the mixer can be run into the collecting-receptacle and the mixer again filled. By this means a practically-continuous operation is carried on and the concrete can be made with great rapidity and in large quantities.

We do not claim herein the apparatus shown and described in this application for carrying our process into effect, as said apparatus forms the subject-matter of another application for Letters Patent of the United States filed by us March 27, 1899, Serial No. 710,666, and which is a division of this application.

What we claim, and desire to secure by Letters Patent, is—

1. The herein-described process of making concrete which consists in supporting the several solid materials in separate horizontal layers arranged one above another, adding the requisite amount of liquid and discharging the materials by gravity at the bottom in a narrow stream, whereby the materials will be mixed as they are discharged, substantially as described.

2. The herein-described process of making concrete which consists in supporting the several solid materials, in horizontal layers, one above each other, said layers being arranged in accordance with the fineness of the material, the most finely divided being at the bottom and the coarsest at the top, adding the requisite amount of liquid, and discharging the material in a narrow stream at the bottom by gravity whereby the several materials will be mixed as they are discharged, substantially as described.

3. The herein-described process of making concrete which consists in supporting the stone, sand and cement, in horizontal layers, the cement forming the lowest layer, adding the requisite amount of liquid, and discharging the material at the bottom in a narrow stream by gravity whereby the materials will be mixed as they are discharged, substantially as described.

4. The herein-described process of making concrete which consists in supporting the several solid materials, in horizontal layers arranged one above another, adding the requisite quantity of liquid, discharging the material in a narrow stream centrally at the bottom by gravity whereby the several materials will be mixed as they are discharged interrupting the flow of the mixed materials to spread it laterally and collecting the material after such spreading, substantially as described.

In testimony whereof we affix our signatures in the presence of two witnesses.

PETER C. HAINS, JR.
CHARLES R. WEAVER.

Witnesses:
JOHN E. MCCOLGAN,
WM. H. JONES.