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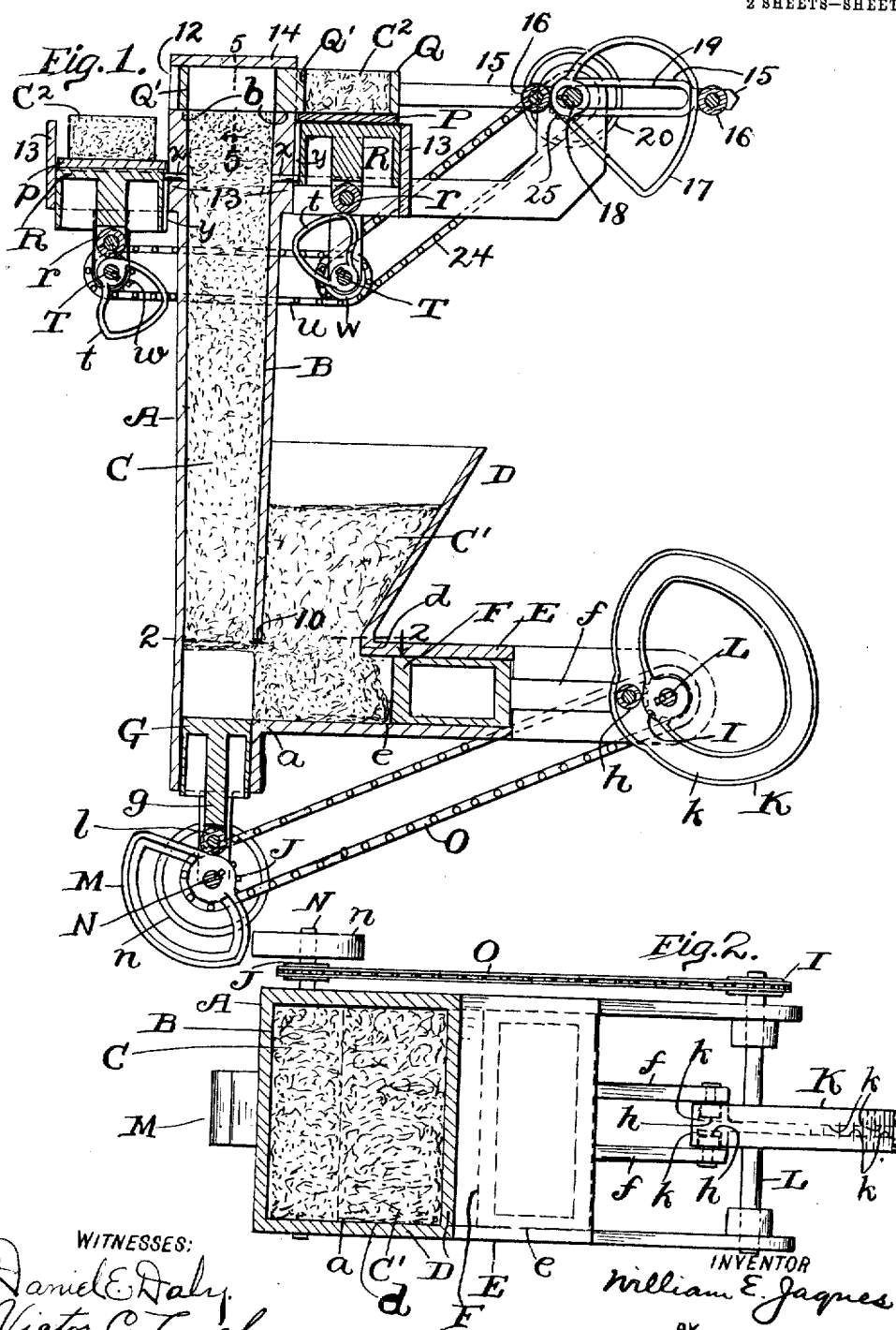
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W. E. JAGUES.

ART OF MANUFACTURING CEMENTITIOUS PRODUCTS OR ARTIFICIAL STONE.

APPLICATION FILED FEB. 15, 1904. RENEWED JULY 2, 1906.

2 SHEETS—SHEET 1.



WITNESSES:
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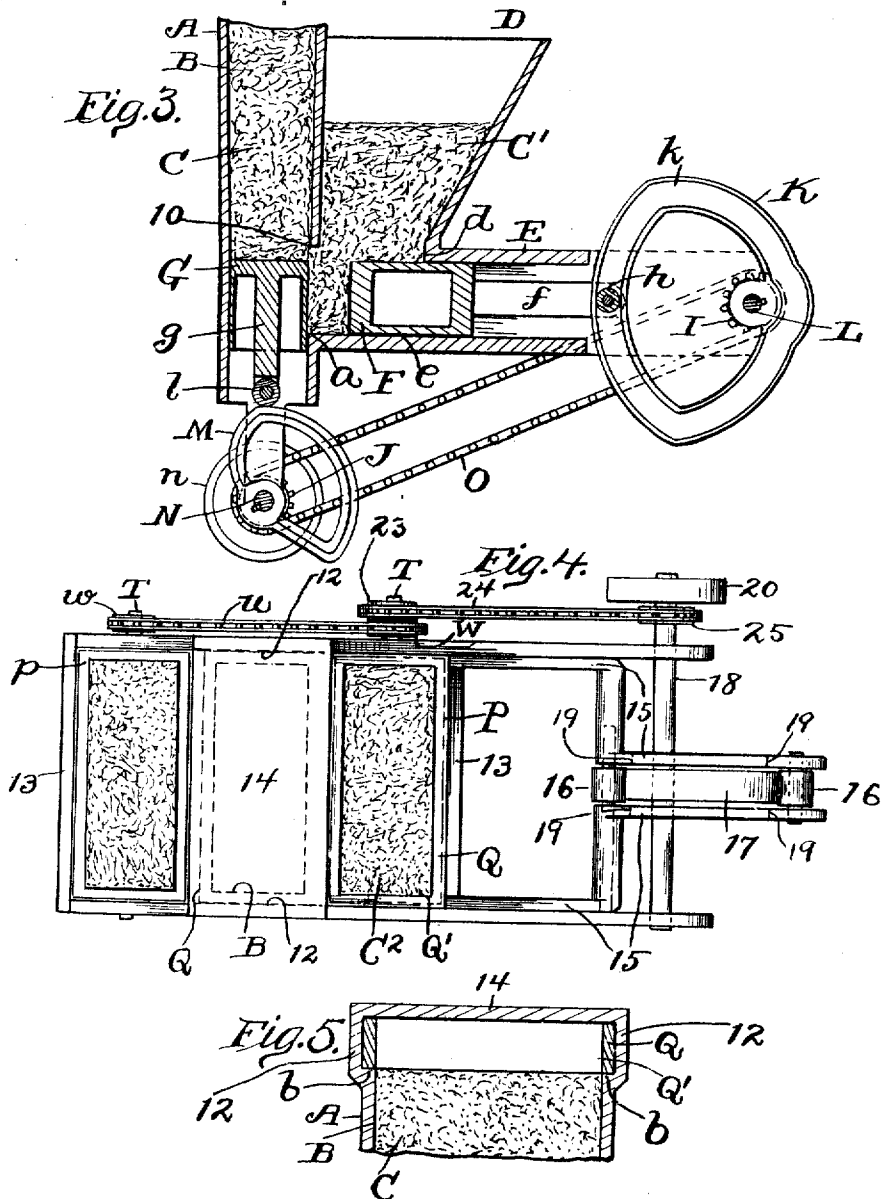
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UNITED STATES PATENT OFFICE.

WILLIAM E. JAKUES, OF GRAND RAPIDS, MICHIGAN.

ART OF MANUFACTURING CEMENTITIOUS PRODUCTS OR ARTIFICIAL STONE.

No. 829,013.

Specification of Letters Patent.

Patented Aug. 21, 1906.

Application filed February 15, 1904. Renewed July 2, 1906. Serial No. 324,491.

To all whom it may concern:

Be it known that I, WILLIAM E. JAKUES, a citizen of the United States of America, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in the Art of Manufacturing Cementitious Products or Artificial Stone; and I 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 pertains to make and use the same.

This invention relates to improvements in the art of manufacturing products of cementitious material or artificial stone.

One object of this invention is to make cementitious products or artificial stone whose constituent particles are closely compacted.

Another object is to form a vertically-arranged column of moist and unset cementitious material, to elevate the said column intermittently by successive additions of cementitious material to the lower end of the column, to remove sections successively from the upper end of said column, and to facilitate the separation of the said sections from the upper end of the column.

Another object is not only to compact cementitious material added to the lower end of the column from below, but to utilize also the weight of the cementitious column in compacting the material thus added to the said column.

Another object is to prevent any waste of moisture or cementitious slurry gravitating from the lower end of the cementitious column and to utilize such moisture or cementitious slurry in connection with fresh, moist, and unset cementitious material fed to the lower end of the said column.

With these objects in view and to the end of realizing advantages hereinafter appearing this invention consists in the novel steps or process hereinafter described, and pointed out in the claim.

Apparatus suitable for use in carrying out the improved steps or process which constitute the subject-matter of this application is illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation, largely in section, of the said apparatus. Fig. 2 is a top plan of the lower portion of the apparatus, partly in section, on line 2 2, Fig. 1. Fig. 3 is a side elevation, largely in vertical section, of

the lower portion of the apparatus. In this figure the plunger G is shown in its upper position and the plunger F appears in its inner position. Fig. 4 is a top plan of the upper portion of the apparatus. Fig. 5 is a vertical section on line 5 5, Fig. 1.

Referring to the said drawings, A designates a vertically-arranged hollow column, shaft, or tube wherein a moist and unset cementitious column is formed. The part A will hereinafter in this specification be referred to as a "shaft," in whose interior passage-way B cementitious material is accumulated to form the cementitious column C. The passage-way B extends from within the lower end to the upper end of the shaft A. The cementitious column C, composed of moist and unset cementitious material, is elevated and elongated within the shaft A by the addition to the lower end of the column of moist and unset cementitious material. The drawings illustrate the formation of and manner of elevating the column C, and sections or pieces are successively removed from the upper end of the said column, as will hereinafter appear.

At one side of and adjacent to the lower end portion of the shaft A is a hopper D, which is supplied with the moist and unset cementitious material C', which is to be fed and added to the lower end of the cementitious column C, formed within and by the said shaft.

A desirable cementitious mass used in making cementitious products or artificial stone is a concrete or mixture having any suitable cementitious substance—such, for instance, as hydraulic cement—as an ingredient and comprising also sand and moisture in suitable proportions. The cement or cementitious substance and water are first mixed together, so as to form a cementitious slurry. Then this slurry is added to the sand in suitable proportions—as, for instance, in the proportion of one part, by weight, of the slurry to two parts of sand. Then the cementitious slurry and the sand are thoroughly mixed together.

The hopper D is provided at its lower end with a downwardly-discharging opening or outlet *d*, which connects with the interior chamber *e* of a horizontally-arranged case E, and a plunger F snugly fits within and is capable of reciprocation endwise of the chamber *e* and feeds cementitious material from the hopper D into the interior passage-way B

of the shaft A through a lateral charging aperture or inlet *a*, with which the said shaft is provided at the discharging end of the chamber *e*. The shaft A extends far enough
5 below the case E to accommodate the location and operation of a plunger G, which fits snugly within the lower end of the said shaft and is capable of reciprocation vertically.

The charging aperture or inlet *a* of the shaft A extends upwardly from the bottom of the chamber *e* and the full width of the said chamber, as shown in Fig. 2. The aperture *a* establishes communication, therefore,
10 between the passage-way B and the chamber *e* and preferably extends upwardly far enough above the chamber *e*, as at 10, (see Figs. 1 and 3,) to establish communication also between the outlet *d* of the hopper D and the said passage-way.

The plunger F is operated in any approved manner and has outwardly-projecting arms *f*, which (see Figs. 1 and 2) are provided with rollers *h*, arranged horizontally and in line
15 endwise and at a right angle to the path of the said plunger, which rollers engage with cam-forming grooves *k*, formed in a cam-wheel K, which is operatively mounted upon a suitably-supported shaft L, which is arranged horizontally and at a right angle to
20 the path of the said plunger.

The plunger G is operated in any approved manner and has a depending stem *g*, which is provided at its lower and free end with a roller *l*, arranged horizontally and at a right
25 angle to the path of the plunger G. The roller *l* engages the cam-forming peripheral surface of a cam-wheel M, which is operatively mounted upon a suitably-supported horizontal shaft N, which is arranged parallelly with the first-mentioned shaft L and
30 operatively provided with a driving-wheel *n*. The plunger G obviously lowers by gravity and is elevated by the cam-wheel M.

An operative connection between the two shafts L and N is established and comprises an endless chain O, leading over and operatively engaging sprocket-wheels I and J, which are operatively mounted on the shafts L and N, respectively.

The arrangement of the parts and the trend of the cam-forming surfaces of the cam-wheels K and M are such that the plunger G in its lower position, as shown in Fig. 1, has its upper and pressure-exerting face flush with the bottom of the chamber *e*; that during the first portion of the dwell of said plunger in its lower position the plunger F is in its
35 outer position; that moist and unset cementitious material is fed from the hopper D into the chamber *e* in advance of the plunger F; that the plunger F is actuated forwardly or inwardly to feed the material fed in advance of the said plunger through the aperture or inlet *a* into the passage-way B and onto the
40 plunger G; that the plunger G remains in its

lower position during the inward travel or feeding operation of the plunger F and adds the said material to the lower end of the cementitious column during the next succeeding upward movement of the plunger G, as
45 shown in Fig. 3; that the plunger F does not move as far as the aperture *a* during the feeding operations, so as to avoid interruption in the communication between the chamber *e* and the inlet of the hopper D and
50 so that any excess of material in advance of the plunger G can escape or return during the feeding operation of the said plunger G back into the said chamber or into the hopper; that the two plungers F and G make their return or idle strokes simultaneously or approximately simultaneously, and that the
55 plunger G in its upper position, as shown in Fig. 3, does not cover the upper end of the aperture or inlet *a* where the said inlet communicates directly with the outlet of the hopper, so that communication between the passage-way B and the interior chamber of the hopper is never interrupted and cementitious slurry or moisture gravitating from the
60 cementitious column C or displaced from the said passage-way during the feeding operations of the plunger G can escape into the hopper and into the chamber *e*, and the cementitious slurry or moisture thus displaced or escaping from the shaft A is not only not
65 wasted, but actually used to great advantage in insuring the presence of the required amount of cementitious substance and moisture in the charges of material successively added to the lower end of the cementitious column.

The shaft A tapers slightly downwardly from the horizontal plane at which sections are successively removed from the cementitious column formed in the said shaft to the path of the plunger G—that is, the passage-way B is gradually enlarged upwardly from the path of the plunger G to the horizontal
70 plane where sections are removed from the upper end of the cementitious column C, so as not only to facilitate the elevation of the said column by the said plunger during the addition of fresh cementitious material to the lower end of the said column, but to seat
75 the said column upon oppositely-arranged slightly downwardly diverging walls of the said passage-way, and thereby adequately support the column within and from the shaft A and positively prevent any descent of the said column within the said shaft.

Very desirable results have been obtained with shafts from four to six feet high above the path of the plunger G, and the material composing the upper end of the cementitious column is in a very satisfactory condition for the severing of sections from the said end of the said column.

It will be observed that by the formation and upward feeding of a cementitious column

within the shaft A the particles composing the said column are closely compacted, and the compacting of the particles of any cementitious material added to the lower end of the column is brought about not only by the plunger G in adding fresh cementitious material under pressure to the lower end of the column, but also and largely by the weight of the column.

The lower portion of the shaft A, from the upper extremity of the path of the plunger G downwardly, is uniform in cross-section and forms a guide for the said plunger.

The cementitious column during the addition of fresh, moist, and unset cementitious material to the lower end of the column is lifted into an interior chamber or compartment Q' of a reciprocating frame Q, which is movable laterally in a horizontal plane at the upper end of the shaft A. The frame Q is provided with two corresponding chambers or compartments Q', which are arranged a suitable distance apart longitudinally of the path of the said frame. Each chamber Q' preferably has the dimensions required to hold a cementitious block or section capable of being subdivided into a predetermined number of bricks on edge, and the passage-way B next below the path of the frame Q corresponds in dimensions horizontally with the dimensions transversely of the said chamber. The shaft A next below the path of the frame Q is provided (see Figs. 1 and 5) with an upwardly-facing surface b, which extends around the passage-way B and forms a bottom bearing or seat for the frame Q, which is guided during its reciprocation by two guide-forming walls 12, with which the shaft A is provided, at opposite sides, respectively, of the path of the said frame. The chambers Q' extend vertically through the frame Q, and the arrangement of the parts is such that one or the other of the chambers Q' of the said frame is exactly in line vertically and in full registry with the passage-way B, according as the said frame is in the one or the other of its positions.

Two pallets P and p are arranged a suitable distance apart longitudinally of the path of the frame Q at opposite sides, respectively, of and in close proximity to the shaft A. Each pallet rests removably upon a vertically-movable table R, which is large enough in dimensions horizontally to render it capable of adequately supporting the said pallet, and the shaft A is provided with vertically-arranged guides 13 for the said table. Each table R is provided at its under side with a roller r, which engages the cam-forming peripheral surface of a cam-wheel t, operatively mounted on a horizontally-arranged shaft T, which is suitably supported from the shaft A. Each shaft T is arranged, therefore, a suitable distance below and at a right angle to the path of the frame Q. The shafts T of the

mechanism instrumental in the operation of both tables R are operatively connected with each other by an endless chain u, leading over sprocket-wheels W and w, mounted on the different shafts T, respectively.

In Fig. 1 the frame Q is shown in position with one of its chambers Q' in full registry with the passage-way B and empty ready to receive the upper end of the cementitious column C, during the elevation of the said column during the next succeeding upward stroke of the plunger G, and the other chamber Q' of the said frame is shown occupied in the said figure by a cementitious block or section C', severed and removed from the said column and in position to descend from the engaging chamber of the said frame with the pallet P, and in the said figure the other pallet p is shown laden and in its lower position next preparatory to the replacing of the last-mentioned laden pallet by an unladen pallet.

The frame Q is provided at one end (see Figs. 1 and 4) with two outwardly-projecting arms 15, which extend longitudinally of the path of the said frame at opposite sides, respectively, of the said path and are provided with two parallel rollers 16, which extend transversely of the said frame and are arranged a suitable distance apart longitudinally of the frame. A cam-wheel 17, which has a cam-forming peripheral surface arranged to operate between the rollers 16, is operatively mounted on a shaft 18, which is arranged horizontally and transversely of and below the path of the frame Q and supported in any approved manner from the shaft A. The shaft 18 is operatively provided with a driving-wheel 20, to which power is applied in any approved manner. An endless chain 24 leads over a sprocket-wheel 23, operatively mounted on one of the shafts T, and also operatively engages a sprocket-wheel 25, operatively mounted on the shaft 18.

The parts are so arranged and timed that during the reciprocation of the frame Q each chamber Q' of the frame Q comes in full registry with the passage-way B when the other chamber Q' of the said frame is in position over a pallet; that one of the chambers Q' is brought into position over the pallet P or the other chamber Q' is brought into position over the pallet p, according as the frame Q is in the one or the other of its positions; that the portion of the cementitious column C, lifted into either chamber Q' of the frame Q, so as to fill the said chamber, is severed horizontally from the remainder of the said column during the next stroke of the said frame; that the different chambers Q' are filled alternately; that sections are removed successively from the upper end of the cementitious column C, but in opposite directions alternately; that the frame Q delivers or feeds cementitious sections alternately onto the pallet of the different tables, respectively, and

that each pallet-bearing table when the pallet thereon is to receive the next cementitious section moves into its upper position ready to receive the said cementitious section, which may, if desired, be subdivided into bricks or predetermined products.

Each chamber of the frame Q is quadrangular in plan and is shown large enough in dimensions horizontally and deep enough vertically to hold a cementitious block or section C², divisible into ten ordinary bricks. The said chamber is therefore four inches deep vertically, about twenty inches long, and eight inches wide and arranged with its length widthwise of the path of the frame Q, and of course the passage-way B of the shaft A, next below the said path measures, therefore, about twenty inches transversely of the said path and eight inches longitudinally of the said path. Each chamber Q' when in position registering fully and exactly with the passage-way B forms an upward extension of the said passage-way and permits the cementitious column C, formed in and by the shaft A, to be lifted into and thereby fill the said chamber. The parts are so arranged and timed, furthermore, that fresh, moist, and unset cementitious material is added to the lower end of the column C by the plunger G, and the said column is lifted by and during the addition of the said material to the column into a chamber Q' when the said chamber is brought into full registry with the passage-way B against the under side of a head 14, with which the shaft A is provided, which head extends transversely of and over or bridges the path of the frame Q and extends between and is rigid with the walls or guides 12. The head 14 (see Figs. 4 and 5) is large enough in dimensions horizontally to render it capable of completely covering a chamber Q' when the said chamber is brought into full registry with the passage-way B and forms an abutment for the upper end of the elevated cementitious column and operates to trowel the top of the cementitious sections severed and removed successively by the frame Q from the said column during the reciprocation of the said frame.

The pallets P and p are large enough in dimensions to receive a cementitious section C², severed from the column C, and to completely cover the said section from below. A pallet suitable for receiving a cementitious section C² twenty inches long and eight inches wide would therefore be at least twenty inches long and eight inches wide and arranged transversely of and next below the path of the frame Q. Each cementitious section C² conveyed by the frame Q onto a pallet will upon being received by the said pallet descend by gravity with the pallet during the next descent of the table bearing the said pallet; but, if desired or required, pressure by a plunger (not shown) or

otherwise may be exerted on top of the said cementitious section to assist gravity in loosening the said section relative to the frame Q.

I would here remark that the cementitious slurry employed with sand in the proportion heretofore specified in making the desired cementitious mass contains more liquid or moisture than necessary for incasing all of the particles of the sand of the original mass; that the solid particles of the cementitious column C are more closely compacted as the said column ascends within the shaft A; that obviously any quantity of cementitious slurry remaining free in the mass and not already employed in permanently incasing particles of sand with cement will during the ascent of the column be spread or distributed and coat any surfaces newly formed upon particles of sand during the compacting of the solid particles of the mass within the shaft A and any cementitious moisture not finding employment in coating surfaces of sand particles will be squeezed downwardly and descend by gravity and escape at the lower end of the cementitious column, where the said moisture or thin cementitious slurry is added to fresh, moist, and unset cementitious material next added to the lower end of the said column. I would remark also that the upper portion of the cementitious column is equally moist transversely; that the cementitious material added to the lower end of the column becomes drier as it ascends and becomes uniform in every respect transversely of the column; that the said material upon reaching the upper end of the column is, while still unset, but not too moist, in the most desirable condition for conversion into bricks or other desired cementitious products; that the said upper portion of the column is readily broken or severed from the remainder of the column; that the sections successively severed and removed from the upper end of the column are readily capable of subdivision while the material composing them has still to set and harden, and that the pallets laden with the cementitious blocks, bricks, or products are conveyed to and left in any convenient place until the products thereon have completely set and hardened. I would remark, furthermore, that to prevent the tables R from tipping between the guides 13 the shaft A is provided with pins x, which project into vertically-arranged grooves y, formed in the said tables. It will be observed also that the shaft 18 extends through the path of the arms 15, and consequently the said arms are slotted longitudinally, as at 19, to accommodate the location of the said shaft, which by its extension through the said arms desirably steadies the latter.

The apparatus hereinbefore described and employed in carrying out the process which constitutes the subject-matter of this appli-

cation forms the subject-matter of a contemporaneous application filed simultaneously with this application.

What I claim is—

5 An improvement in the art of making cementitious products or artificial stone, consisting in forming a moist and unset upright cementitious column having predetermined dimensions transversely at its upper extremity, adding fresh moist and unset cementitious material to the column at its lower extremity, lifting the column into a space corresponding in dimensions transversely with the transverse dimensions of the upper extremity

of the column and against a downwardly-facing surface, and then severing and separating the section of the column lifted into the said space from the remainder of the column, and sliding the said section along the aforesaid surface and thereby troweling the said section on top. 15 20

In testimony whereof I sign the foregoing specification in the presence of two witnesses.

WILLIAM E. JAKES.

Witnesses:

C. H. DORER,
G. M. HAYES.