

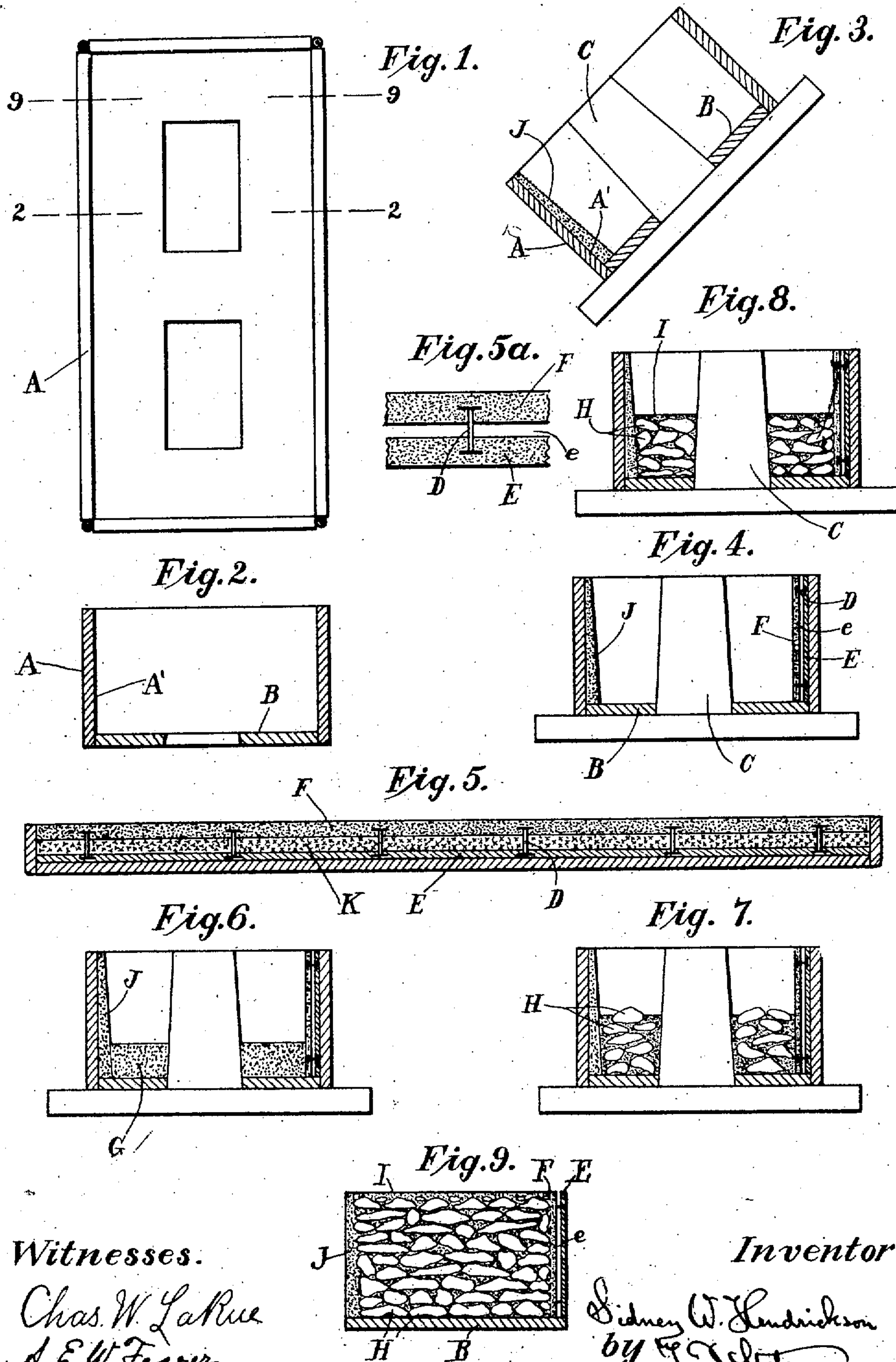
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S. W. HENDRICKSON.

METHOD OF MANUFACTURING CONCRETE BLOCKS FOR BUILDING PURPOSES

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Witnesses.

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METHOD OF MANUFACTURING CONCRETE BLOCKS FOR BUILDING PURPOSES.

No. 850,112.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, SIDNEY W. HENDRICKSON, a citizen of the United States, residing in White Plains, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in the Method of Manufacturing Concrete Blocks for Building Purposes, of which the following is a specification.

I operate mainly with the long-known cement and sand and stone united by the long-known chemical action to constitute a permanent unit. The manufacture should be conducted where these materials can be easily brought by cheap transportation. The work can be performed by unskilled labor at any ordinary temperatures.

My invention avoids some of the serious difficulties in rapidly and economically producing by cheap and reliable means known as the "wet" process blocks having fine surfaces and strong and cheaply-made central portions, with a very efficient arrest of heat, moisture, and sound. I will describe it as applied to the production of two-faced building-blocks of an ordinary convenient size, cored, using the term "concrete" to include all grades of coarseness of sand or gravel. I will use the term "half-dry" to mean a condition of the powder having about one-quarter as much water as it will hold and will use the term "dry" or "dry powder" when necessary to designate the proper mixture of cement with sand before the water has been added to it.

I can by my invention produce a hollow concrete block molded wet, using a mixture of cement and sand and of stone up to several inches in diameter and remove the block from the mold without necessarily waiting any time for the material to set.

I have discovered that it is practicable to so introduce stones, more especially broken and therefore rough and angular stones, into the mold as to not only economize the plastic material, but also to hold it in shape during its early stages, so that so soon as the block is completely rammed and its upper surface struck off the mold may be taken apart and the blocks being successively carried away, each on a proper pallet, and ranged in a proper slow-drying place. The mold may after each operation be immediately adjusted and the production of the succeeding block commenced. I have also discovered that a thin mortar—grout—in percolating through a fac-

ing layer of fine granular material from the interior outward leaves most of its cement on the way and arrives at the outer surface of the block nearly or quite reduced to the condition of water, and also that the tendency to the formation of bubbles and of cavities produced thereby in the surface of concrete cast wet may be avoided by applying an exterior layer with an excess of water and applying dry or relatively dry material on what is to be inner face. Based on these, I have devised a method of manufacture which avoids the usual gray color of the cement and allows us to have any desired fineness and color in one face or in more faces of a block cast wet from mainly gray material. The invention can be operated with but little expense for apparatus. It requires little skill, gives great strength, and provides very perfect surfaces.

I have developed my invention to provide a widely-extended air-space near the inner face, which avoids the transmission both of heat and moisture, and when the several tiers of my blocks are properly applied together in building up a wall therewith, taking care to preserve and match these spaces, allows a free circulation of air in the wall, which contributes greatly to prevent the penetration of moisture to the interior of the building.

By my invention either the front face or the back face, or both, may have the color of brownstone or other color, according to the material used in the fine facing, and the walls built with my blocks will be always dry and be warm in winter and cool in summer.

The following is a description of what I consider good means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a plan view of the parts which constitute the upright sides and ends of the mold and showing a pallet in position. Fig. 2 is a cross-section of the removable flask or casing and of the bottom board or pallet. It is on the line 2 2 in Fig. 1. Fig. 3 is a section corresponding to Fig. 2 after the mold has been inclined and the material for the upright front layer has been molded in place and the cores inserted. Fig. 4 is a section after the mold has been restored to its level position and the previously-molded back plates have been set in the proper upright position in the mold. Fig. 5 is on a larger scale. It is a cross-section illustrating the

manufacture of such rigidly-connected back plates. Fig. 5^a is a corresponding section of a portion of such back plates on a still larger scale. Figs. 6, 7, and 8 are all sections on the line 2-2 on the same scale as Figs. 1, 2, 3, and 4. They show later successive stages of manufacture of the final block. Fig. 6 shows the first and main instalment of the grout introduced. Fig. 7 shows the condition after the large stones have been dropped in. Fig. 8 shows the condition after the half-dry has been applied and rammed. Fig. 9 is a cross-section of the block on the line 9-9 in Fig. 1 after it is completed, supported by the pallet alone.

Similar letters of reference indicate like parts in all the figures where they appear.

A is a mold having its sides and ends flexibly and separably connected in any convenient manner to shape and liberate a molded block. It is supported so as to allow it to be partially revolved or tilted. One side A', which is to mold the outer face of the block, by which I mean the face which is presented to the eye on the exterior of the building, is carefully wrought to produce the required plane surface or any desired pebbling, paneling, or floral or other decoration.

It may not be necessary to give a minute description of the mold. All the parts thereof may be cast-iron, preferably for some work with the inner faces coated with zinc and burnished. Only one mold and one set of cores are required, with a good supply of plane bottom plates, sometimes termed "pallets," (each of the latter with the usual apertures for the cores,) to do a large business.

One of the materials required is stone H of any strong and enduring quality suitable for building and small enough to apply in the mold A after the cores C have been raised into their places so as to occupy their ordinary positions in the interior. Refuse from other stonework is preferable; but ordinary boulders may serve well for a part of the stone skeleton. I give a preference to irregular shapes, for the reason that they give more extended and rougher surfaces for the adhesion of the cement and sand and also for the reason already intimated that I depend upon the property of the natural stones introduced to stand in a manner akin to their standing in a stone wall or pier to aid the slight holding force of the plastic material in keeping all the parts of my artificial-stone block firmly in position relatively to each other when the mold is first removed.

Another material required is cement, preferably some of the grades of Portland cement.

Another material is sand, either natural or produced by crushing. There should be two grades of this, one being common sand for the interior or body of the block and the other, J, having the color required to show in the front of the building. In a large business

there may be further subdivisions; but I consider the plant fairly complete for good and profitable operation with fresh water, cheap labor of any kind willing to put in earnest work, and these several sets of materials, natural stone of handy sizes mainly broken, cement, and two kinds of sand.

A portion of the material is to serve in two continuous sheets strongly held a little distance apart near the inner face or back of the block. The double plates thus formed must be prepared in advance and become partially set, so as to have the strength required for gentle handling before the manufacture of the remainder of the block.

In preparing I procure a sufficient quantity of small tie-pieces of low steel or other metal D enlarged at each end, which I will designate as "headed rivets." I provide a mold of the required size and a sufficient stock of removable plane bottoms—pallets. Placing this shallow preliminary mold in a level position, I pour in and evenly spread a wet mixture of sand of any desired color and cement for the double plate, making a uniform layer E of a half-inch or more in depth. Next I sift a little dry cement on the upper surface, which has the effect to remove all air-bubbles from that portion of the concrete, and by hand or otherwise then insert the double-headed rivets or tie-pieces D, leaving the upper ends projecting. Next I sift a layer of sawdust and sand on the concrete, forming a layer K a half-inch, more or less, in depth, and lastly I apply gently upon the wet sawdust and sand enough additional sand and cement to make a third layer of about equal thickness or a little less, and after the material for both the layers E and F properly held apart by the wet sawdust and sand K has been moderately compressed the body of this preliminary mold is lifted away to be used with other bottoms or pallets. After being allowed to lie twenty-four to forty-eight hours, resting on the bottom of the mold in a horizontal position, the duplex plate may be detached therefrom, and either with or without being allowed to stand on edge for a time is ready to be used.

Now to make the main block I use a quantity of facing-sand and mix the proper amount of cement therewith to produce good concrete J. The proportion may be two parts of finely-crushed stone or facing-sand to one of cement. I mix in another bin conveniently accessible a good stock of thin semifluid mortar, sometimes termed "slop" or "grout," using therein sand containing a liberal proportion of small stones. I take care in this to use strong material without regard to color.

I tilt the mold A with its front face A' downward at a considerable angle, (see Fig. 3,) and sift in a thin layer of half-dry powder, using the term "half-dry" to distinguish it

from fully-wetted material. It should be previously dampened to about the extent necessary to cohere when compressed by hand. If it is not convenient to sift it, the labor, always rather severe, may be varied by simply shoveling. However introduced, I use the hands with some suitable implement to pack it fairly and tightly into all the intricacies of the front face of the mold. The front layer J thus formed will be a little thicker at the edge which is to be at the bottom than at the top. It must, though technically dry, have when properly compressed sufficient strength to stand when the mold is turned, bringing the pallet B level and the front face A of the mold, and consequently the front layer J of the block, upright. The latter now stands in the position which it is to hold in the building. At this stage I line the other portions of the mold with paper to avoid adhesion. Next I introduce in an upright position at the rear the nearly-corresponding double plate E F, united by the ties D and partially set, as above described, and we are ready to commence the treatment which will build up the interior of the body and also supply the moisture under the right conditions for hardening and perfecting the front without hanging the color.

Ramming is an important agency in compacting the main body, and efficient rammers weighing in my experimental work about eight pounds are liberally used. I first shovel into the space around and between the cores enough thin grout G to fill the mold A something like quarter full and follow this with stones H, the latter dropped in and depressed, so as to avoid arches or unfilled spaces. Next I shovel in a more stiffly mixed powder, half-dry, made with the cheap sand I, and ram upon and into the mass, using little care except to ram fairly hard upon and between the stones, which shifts them more or less in various directions; but I take care not to force any stone through the upright front layer, so as to appear on the outer surface. The operation of applying grout and stones and ramming is repeated. This is an interesting stage of the manufacture. The face side has been built up quite to the top with the face J of fine and carefully-placed material of the desired color, and the back side also standing to the full height, with the thin air-space *e* strongly braced by its filling of clean sand and sawdust and also by the double-headed ties or rivets between the spaced parts E and F. The remaining space in the mold—the large space not occupied by the cores between the front layer and the double back plate—has also been filled nearly to the top with the relatively large stones II and the grout. Some small natural stones are now applied and sunk into the slight remaining space at the top, a little

grout alone is added to complete the filling, the upper surface is struck off level, and the molding process is complete.

The distribution of the water is important. The excess of water in the grout disappears as the work proceeds, partly by being absorbed by the half-dry powder and partly by its penetrating the previously-applied upright layers at the front and rear. The plates E and F, spaced a little apart to form two parallel back layers, having been previously wetted and partially set do not absorb much water; but the front layer J is highly absorbent. The greater thickness of the lower part of this front face as compared with the upper should be as nearly as practicable just sufficient to balance the greater pressure and the longer time, which favors the penetrating of the water through this front layer at the bottom. The grout filters through to the face, and when the mold is opened the completely-molded but as yet tender block of artificial stone stands properly on its supporting-pallet with all its faces exposed, being able to stand alone on the pallet by the aid of the stones H, roughly piled and rammed so as to rest on each other and form a mass standing like a wall, column, or skeleton in its interior. Now the soaked paper is peeled off, and the block is placed carefully on a car and hauled away to the drying house or shed, and immediately or soon after it has assumed its place in the tiers therein the front face has become gently and uniformly wet all over and sets without cement discoloration. I thus produce a handsome concrete block by a wet process made of natural stone and cement.

The thin material, as paper, forms an important function in preventing adhesion. It is useful in two ways—first, by preventing the contact of the soft unset material with the inner face of the mold, and, second, by facilitating the entrance of air into the joint when the mold is opened, and thus reducing the risk of distorting the soft mass.

I can vary the manipulation by pouring the mold about one-third full of the wet mixture, pressing it by forcing an iron plate of nearly the same size as the mold, having grooves across the upper surface, into the concrete mixture, removing the surplus water which collects in the grooves of the plate, and repeating this treatment till the mold is filled.

The sawdust and sand between the parts E and F become loose with drying and can be removed by gravity by placing the blocks so that the extended air-spaces E will be held upright, aiding its discharge by blowing or agitation, or both, if necessary in any case.

My theory of the action is that in the act of filtering through the front layer J the grout leaves its denser portions in the interior. There must have been enough cement with-

out much water in the composition of the upright front layer to set with the water which it receives. I attach importance to the fact that the face is hard and weatherproof, and yet its exterior is not made appreciably gray by the access of the grout, and the face is more firmly bound to the body of the block, because the strained cement adheres across the entire interior.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. Obviously short lengths of wire, which may be variously crooked and barbed, can be introduced as a substitute for a portion of the stones H.

The filling and ramming of the interior may be effected at one operation; but my experiments indicate that it is preferable in most cases and with ordinary materials to effect the filling at two or three operations, as described. I have found two to give very satisfactory results.

I do not in this patent claim the product. Such is made the subject of a separate application for patent, Serial No. 312,941.

I claim as my invention—

1. The method described of producing artificial building-blocks comprising the turning of a mold partially down upon its side, introducing cement and fine material of the desired color and forming thereof a front layer in the temporarily-depressed side by the dry process, afterward righting the mold and applying strong and cheap material thereto for the body in a too wet condition, and allowing the water to penetrate therefrom through the front layer, all substantially as herein specified.

2. The method described of producing artificial building-blocks comprising the turning of a mold partially down upon its side, introducing cement and fine material of the desired color and forming thereof a front layer in the temporarily-depressed side by the dry process, afterward righting the mold and forcibly applying strong and cheap material thereto including a pier-like skeleton of natural stone, applying grout at an early stage and compacting and allowing the excess of moisture in the body to penetrate the dry face and set the latter without affecting its color, all substantially as herein specified.

3. The method described of producing artificial building-blocks comprising the construction of a front layer of cement and fine material of the desired color introduced dry in a temporarily-depressed side of a mold, turning the mold upright and placing a previously-formed face on the opposite side forcibly applying strong and cheap material between such faces, including a nearly-solid skeleton of natural stone, applying grout at an early stage and compacting and allowing the excess of moisture in the body to penetrate the dry face and set the latter without affecting its color, all substantially as herein specified.

4. The method described of producing artificial building-blocks comprising the construction of a front layer of cement and fine material of the desired color introduced dry in a temporarily-depressed side of a mold, turning the mold upright and placing a previously-formed face in the opposite side, forcibly applying strong and cheap material between such faces, including a nearly-solid skeleton of natural stone, introducing thin yielding material as paper to temporarily line the other faces of the mold, applying grout and compacting, and allowing the excess of moisture in the body to penetrate the dry face and set the latter without affecting its color, all substantially as herein specified.

5. The method described of forming an air-space in a concrete block consisting in separately molding a layer of concrete in a horizontal position, inserting short metallic spacing-pieces therein, applying a layer of light loose material as sawdust to a height less than that of the tops of the metallic pieces, applying another layer of concrete to unite with the upper ends of such pieces, allowing the concrete in both layers to set, using the ventilated plate thus formed to constitute a part of a subsequently-molded concrete block, and finally removing the sawdust, all substantially as herein specified.

Signed at New York, N. Y., this 18th day of January, 1907.

SIDNEY W. HENDRICKSON.

Witnesses:

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