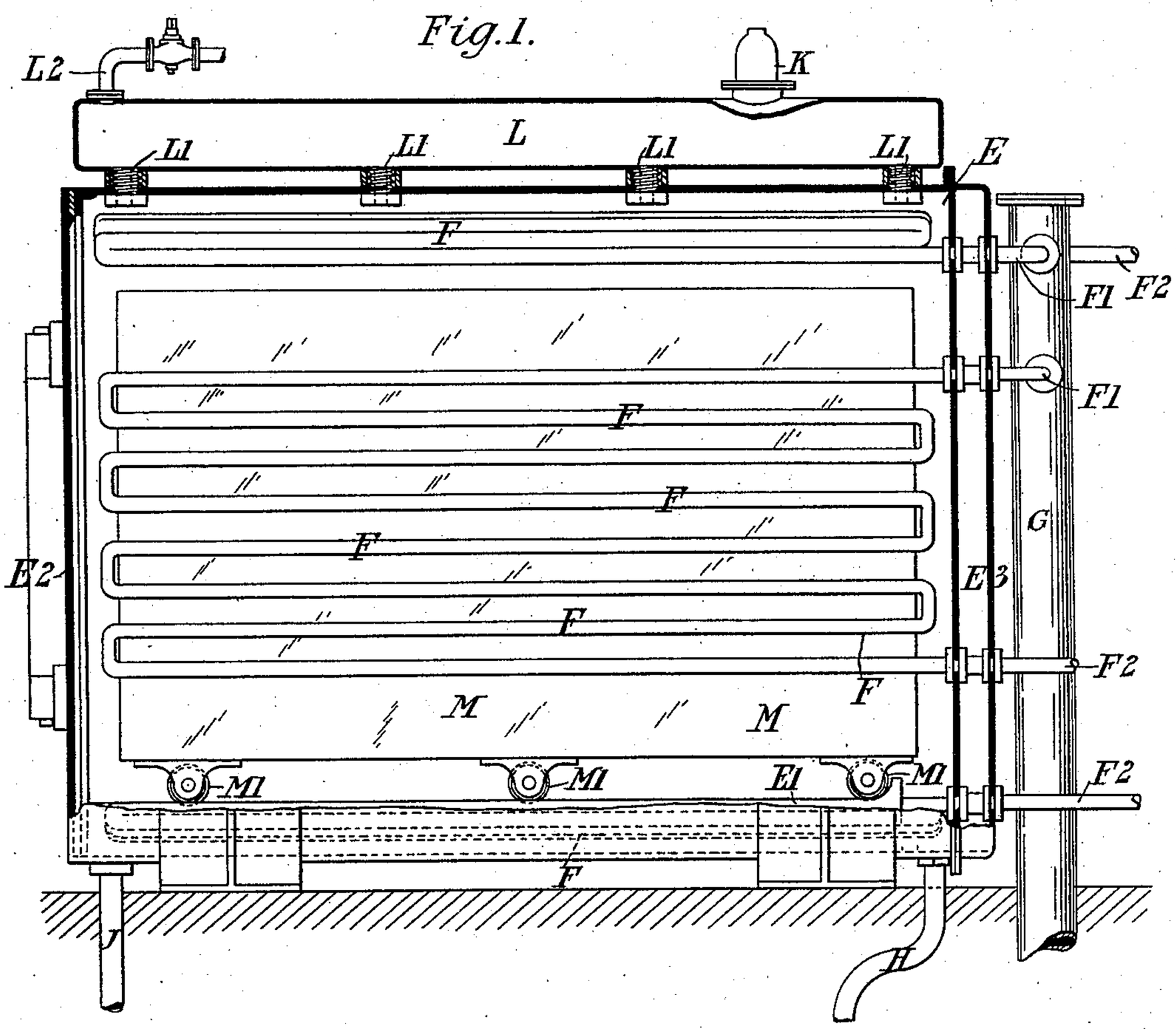
(No Model.) 2 Sheets—Sheet 1.

W. OWEN.

MANUFACTURE OF ARTIFICIAL STONE.

No. 577,060. Patented Feb. 16, 1897.

Fig. 1.



Witnesses:
J. M. Fowler Jr
A. M. Kelly

Inventor
William Owen,
by Church & Church
his Attorneys

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Fig. 2.

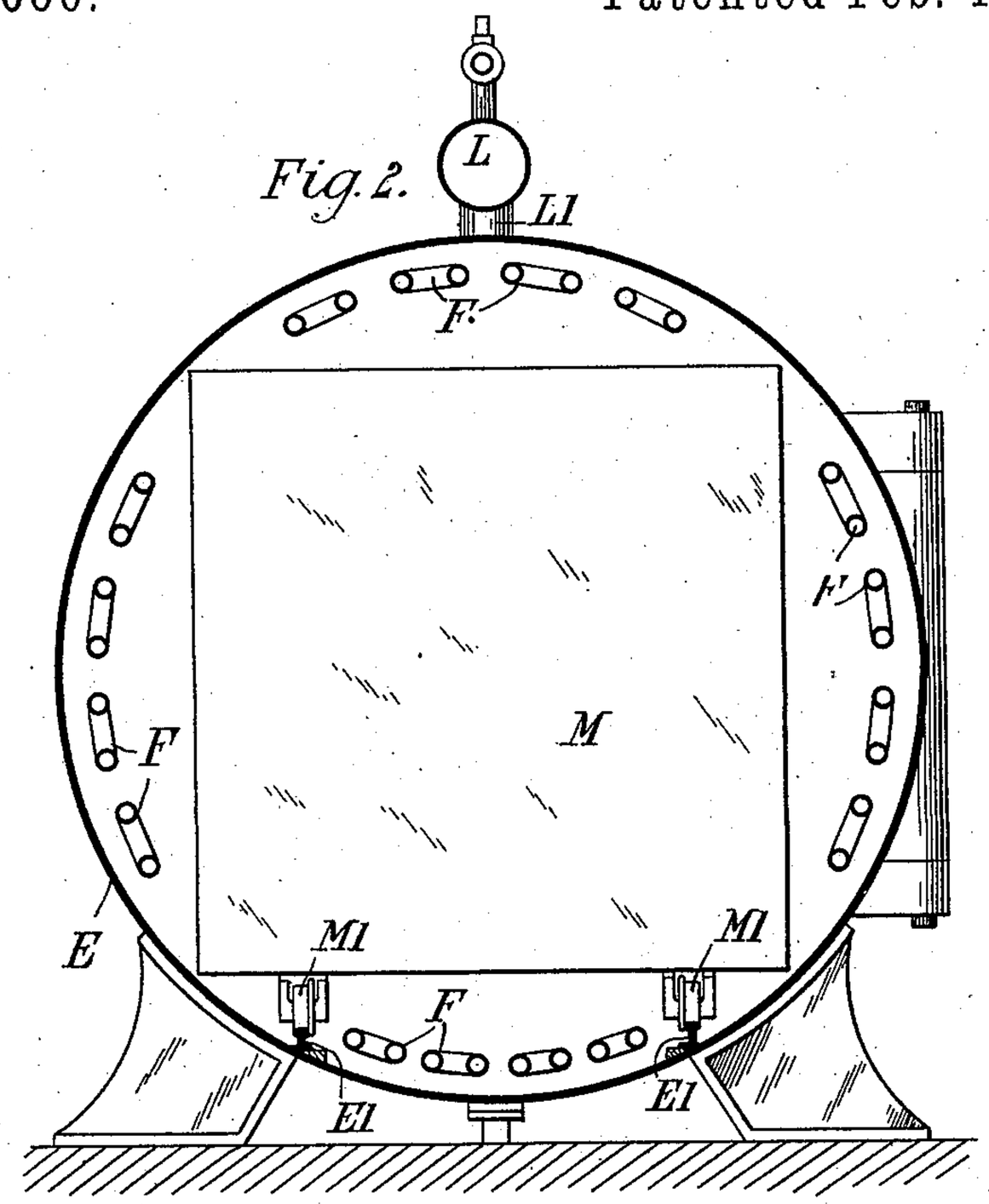
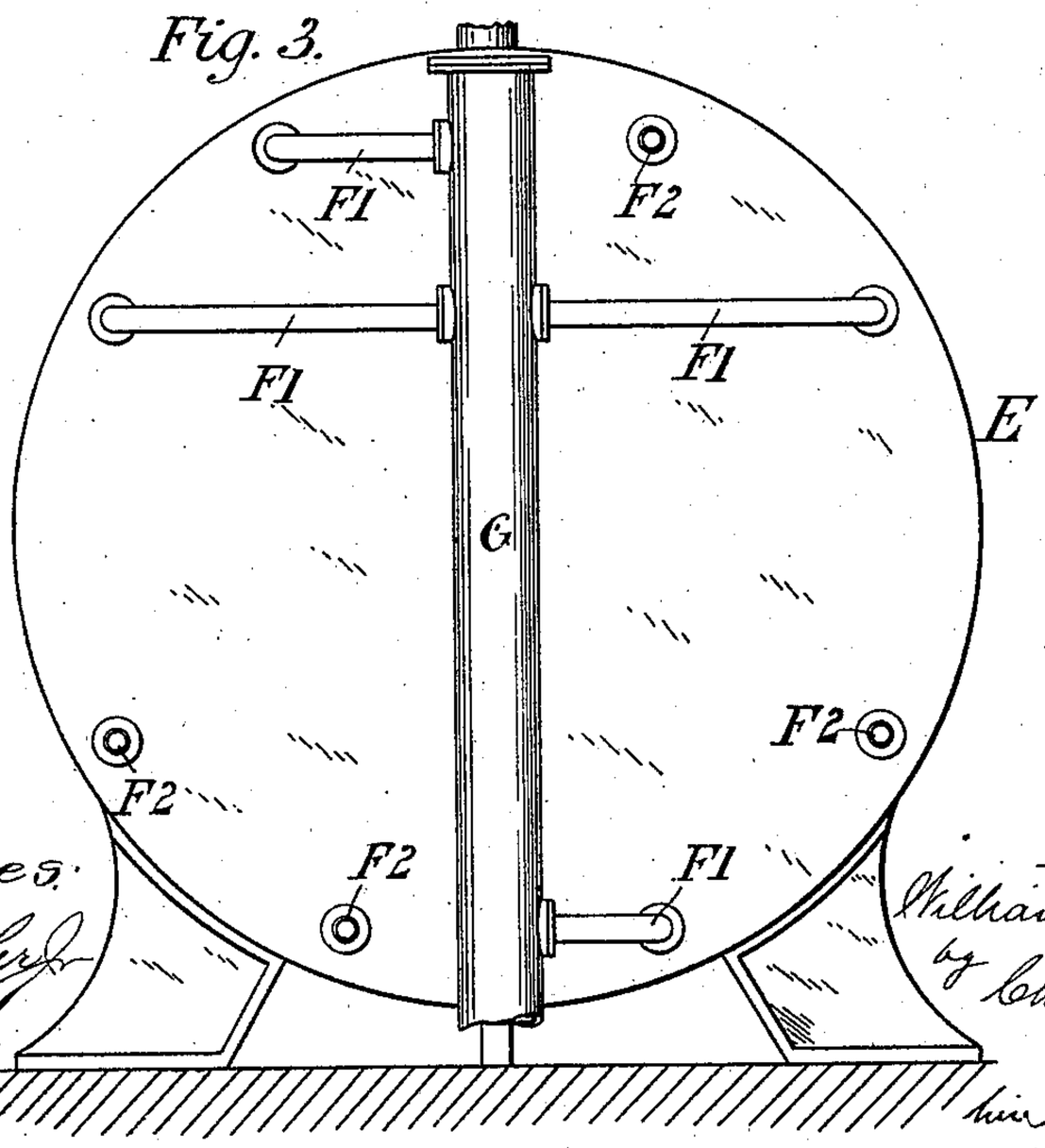


Fig. 3.



Witnesses:
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A. M. Kelly

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UNITED STATES PATENT OFFICE.

WILLIAM OWEN, OF LONDON, ENGLAND.

MANUFACTURE OF ARTIFICIAL STONE.

SPECIFICATION forming part of Letters Patent No. 577,060, dated February 16, 1897.

Application filed June 15, 1896. Serial No. 595,551. (No model.) Patented in England October 16, 1894, No. 19,647.

To all whom it may concern:

Be it known that I, WILLIAM OWEN, a subject of the Queen of England, residing at Brixton, London, England, have invented a certain new and useful Improved Manufacture of Artificial Stone, Marble, and the Like, (for which I have obtained Letters Patent of Great Britain, No. 19,647, dated October 16, 1894,) of which the following is a specification.

One method heretofore practiced for the manufacture of artificial stone is to mix dry sand and unslaked lime or other suitable materials in a mold-box, which is then placed in a cylinder, and after being tightly closed the cylinder is filled with water, and steam is then let into the water for the double purpose of imparting pressure and heat thereto, the pressure counteracting that generated within the box during the formation of the stone. By this method large quantities of air and gases brought into the cylinder by the steam and also already contained in the water itself are forced into the mold-box and form innumerable air-cracks in the mass therein contained, with the result that it is impossible to produce a perfectly sound stone; also, it is impossible to attain a high degree of temperature, for as the pressure required in the cylinder is only fifty to sixty pounds per square inch it is obviously impossible to get to a higher degree of temperature than that of slightly-superheated steam itself at this pressure, say 281° to 292° Fahrenheit, which has proved not to be enough to produce a highly-finished and reliable stone. Another objection to this method is that the stone at the end of the process is soft and friable and for several weeks is totally unfit for using in masonry. I get over all these difficulties by the process hereinafter described, whereby I produce a stone (in half the time required by the above-mentioned method) which is sound, hard, homogeneous, free from all cracks, flaws, and other imperfections and can be used in masonry immediately after it is taken out of the cylinders and mold-box.

I require for my process a mold-box of any suitable construction to receive the ingredients of which the stone is to be composed and a cylinder or chamber, preferably of the kind illustrated in the accompanying drawings of the same, in which—

Figure 1 is a longitudinal central section of the cylinder; Fig. 2, a transverse section, and Fig. 3 an end elevation of the same.

Inside the shell of the cylinder E are fixed a series of coils F close to the wall. In the example illustrated there are four such series.

F′ are inlet connections whereby steam is admitted to the upper end of each coil, and F^2 are outlet connections whereby the exhaust is taken from the lower end of each coil.

G is the main steam-supply pipe.

H is a pipe by which water is delivered to the interior of the cylinder E, and J is a pipe for the exit of water therefrom.

K is a relief-valve set to lift at any desired pressure and prevent too much stress being put upon the apparatus or applied to its contents.

The usual or other convenient cocks, valves, pressure-gages, and thermometers, although all of them are not shown in the drawings, are provided to enable the influx, efflux, and pressure and temperature of fluid in the apparatus to be observed and regulated as desired.

L is a drum with its interior in connection, by way of the tubular screws L′, with the highest part of the interior of the cylinder. The tubular screws are screwed through the walls of both cylinder and drum or passed through the former and screwed into the latter, so that the drum is maintained in place by them.

L^2 is an outlet at the upper part of the drum L, for a purpose hereinafter described.

M is a mold-box (indicated diagrammatically) on wheels M′ and adapted to run in and out of the cylinder on rails E′.

E^2 E^3 are the cylinder-covers. E^3 is steam-jacketed, and the other, E^2, is hinged to the cylinder-shell, so that it can be readily opened and shut when the mold-box M passes out of or into the cylinder.

The barrel of the cylinder E may be wholly or partially steam-jacketed or surrounded by external steam-coils instead of or in addition to the internal coils aforesaid.

The preferred process in which the aforesaid cylinder and mold-box or equivalents are employed is as follows: The mold-box M, having been filled with the lime and other

components of the artificial stone, is run into the cylinder E, which is then closed and filled with water at a temperature of 212° Fahrenheit, and an accumulator or pump is kept working until a hydraulic pressure of about sixty pounds per square inch is shown on the cylinder pressure-gage. The supply of water is then stopped. The water under pressure is used to counteract the pressure generated within the mold. Steam is then let into the heating-coils F to raise the temperature of the contents of the cylinder gradually to between 400° and 450° Fahrenheit or even higher. This raising of the temperature should be commenced within one hour after filling the cylinder with water, as described. The raising of the temperature must be gradual. Otherwise the moisture within the mold-box will have a tendency to escape and be kept out by reason of the temperature outside the box being suddenly made higher than the temperature within it. It is desirable that the maximum temperature should be reached within five hours from the time of filling the cylinder with water and is to be kept up for, say, thirty hours to effect the "setting" of the stone, after which the steam is partially shut off and the water drained out of the cylinder. The cylinder is then converted into a rapid-drying chamber, the steam-supply to the coils being maintained, but regulated to give a temperature of, say, 200° Fahrenheit in the cylinder in order to expel all moisture from the stone. After, say, ten hours of this drying operation the steam to the coils F is entirely shut off, the cylinder is opened, and the mold-box taken out and opened. The stone will then be found to be hard, practically dry, and ready for immediate use in masonry.

It is found that the absorption of water from the cylinder E by the contents of the mold-box during the slaking process, which takes place in the latter during the first hour, has very little effect in diminishing the volume of the water in the cylinder, for the reason that simultaneously with the absorption due to slaking there occurs an expansion of the water by heat derived from the coils F. This expansion and absorption approximately compensate each other, but if any decrease of the volume and pressure of liquid in the cylinder E should occur it will be very slight, and a few strokes of the supply-pump will restore the original conditions of working. This is the only pumping which need be done after once the process is begun, whereas hitherto it has been necessary to maintain a continuous circulation of the liquid contents of the cylinder for the whole duration of the process. Any gases formed or given off during the process ascend through the tubular screws F′ into the drum, whence they can be allowed to issue by way of the outlet L^2.

It is an important feature of this process that the air-cracks hitherto produced in the artificial stone are avoided by using in the cylinder E distilled water free of air and by not permitting the steam used as the heating medium to have any access to the cylinder except under confinement in the coils F. Thus no air can get to the contents of the mold-box M.

By this particular method I have found it possible to get sufficient moisture at a high degree of temperature to enable me to use not only various sands and grits, but to use chips of marble ground into a powder and with the requisite proportion of hydraulic lime produce an artificial marble capable of being polished and of precisely the same texture, closeness, specific gravity, and appearance as the natural marble. It is impossible to do this without a high degree of temperature.

I claim—

1. The herein-described improvement in the art of manufacturing artificial stone under pressure, consisting in confining the ingredients in a suitable mold, applying water-pressure to the outside of the mold, and then heating the mold by a heating medium having no direct access to the mold or water; substantially as described.

2. The herein-described improvement in the art of manufacturing artificial stone under pressure, consisting in confining the ingredients in a suitable mold, applying water under pressure to the outside of the mold, shutting off the water-supply and subsequently raising the temperature of the water and mold by means of a heating medium having no direct access to the water or mold; substantially as described.

3. The herein-described improvement in the art of manufacturing artificial stone under pressure, consisting in confining the ingredients in a suitable mold, inclosing the mold in a casing, applying water under pressure to the outside of the mold, shutting off the supply of water, raising the temperature of the mold and water by steam having no direct access to the mold or water, drawing off the water from the casing and finally maintaining a reduced temperature within the casing, sufficient to dry the stone; substantially as described.

In witness whereof I have hereto set my hand in the presence of the two subscribing witnesses.

WILLIAM OWEN.

Witnesses:
HARRY B. BRIGHT,
FRANK W. JARVIS.