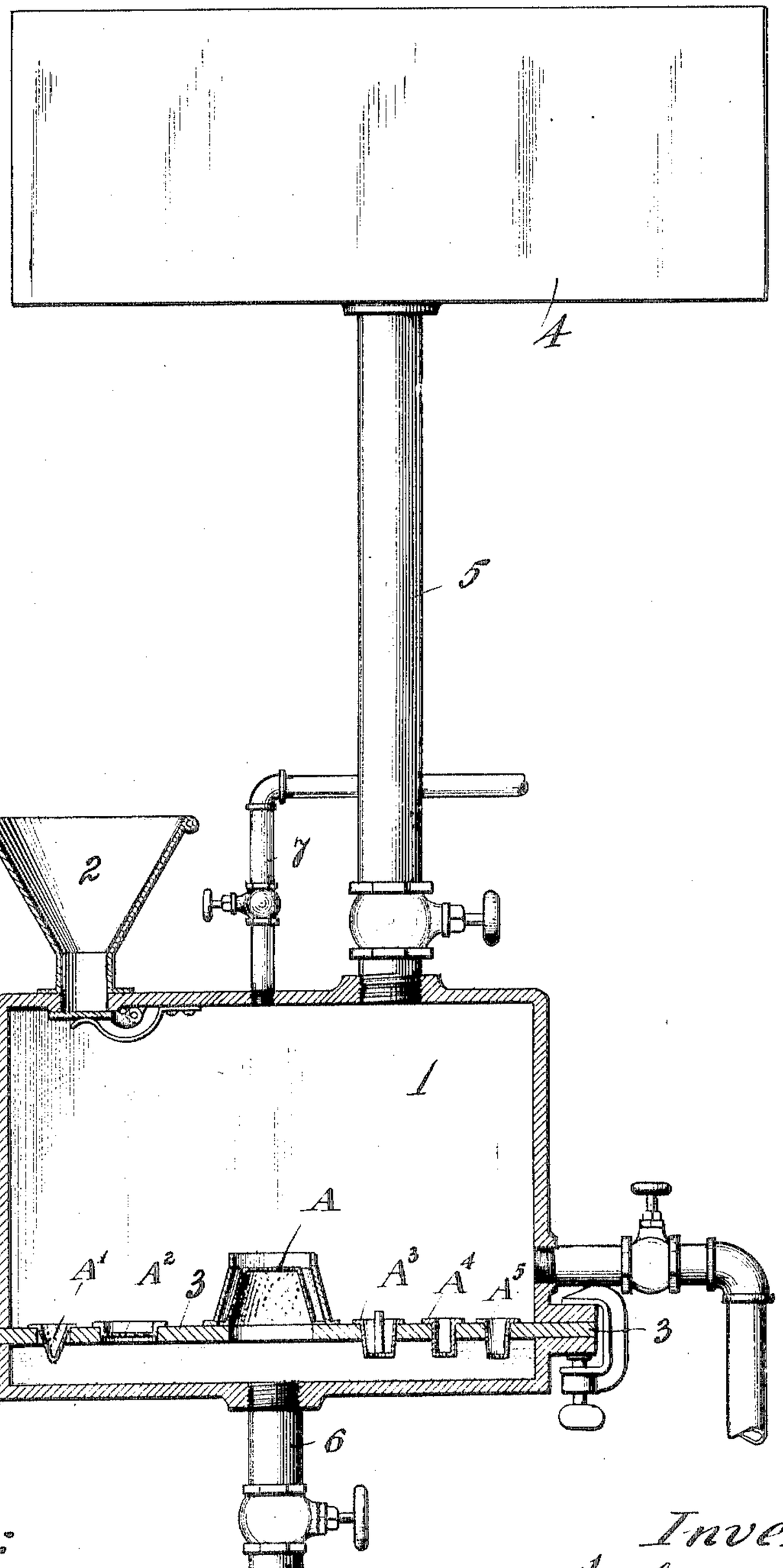
No. 804,432. PATENTED NOV. 14, 1905.

J. H. RIVERS.

PROCESS OF COMPACTING LIQUID BORNE FIBROUS PULP.

APPLICATION FILED NOV. 14, 1904.



Attest:
Edward L. Dillon
Edwin L. Gemp[illegible]

Inventor:
Julian H. Rivers
by J. S. Ripley
Att'y.

UNITED STATES PATENT OFFICE.

JULIAN H. RIVERS, OF ST. LOUIS, MISSOURI, ASSIGNOR TO HYDRO-PRESS MANUFACTURING COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

PROCESS OF COMPACTING LIQUID-BORNE FIBROUS PULP.

No. 804,432. Specification of Letters Patent. Patented Nov. 14, 1905.

Application filed November 14, 1904. Serial No. 232,772.

To all whom it may concern:

Be it known that I, JULIAN H. RIVERS, a citizen of the United States, residing at St. Louis, Missouri, have invented a new and useful Process of Compacting Liquid-Borne Fibrous Pulp or other Materials, of which the following is a specification.

This invention relates to the process of compacting liquid-borne fibrous pulp or other materials, and has for its object to produce a process by which such material can be compacted to form objects of various sizes and shapes evenly bonded or felted and evenly compacted throughout and avoid the difficulties which attend the process when mechanical pressure is used.

In compacting pulp or other finely-divided fibrous material certain differences are noted between it and the plastic materials. In the preliminary stages of manufacture this material is easiest handled when thoroughly diffused in liquid, (as water,) so that each cubic inch of liquid shall contain approximately two grains of the material, in which condition it may be handled and pumped as water; but as the material should be condensed to eighty to one hundred grains per cubic inch to be sufficiently compact for use the liquid containing the diffused material is about fifty times the bulk of the finished article. If the liquid be drained from the diffused material by usual means, the remaining mass will contain ten to fifteen grains per cubic inch, and in this condition the bulk thereof is seven to ten times that of the finished article. Therefore a great reduction in volume is required, and when performed by mechanical pressure the material contracts chiefly along the lines of pressure and does not move or "flow" to fill the formers with the freedom of truly plastic material.

In compressing pulp by mechanical pressure I have found that the compressing-surfaces cause a matting or felting of that portion of the pulp which comes into contact with those surfaces, but that this felting or matting extends only a little way into the mass, so that any object formed of pulp compacted in this way has a matted or hard exterior and a relatively softer interior and is of uneven density and that such objects also have planes or lines of easy cleavage or separation which become more marked as the pressure increases.

For the purpose of avoiding these difficulties and producing objects evenly compacted and evenly felted throughout I have produced a process of casting to finished size, shape, and density direct from the pulp-water which utilizes a force closely allied to that of rushing water, the action and effect of which can be controlled by well-known means and devices. It is known that pulp can be compacted to three hundred and forty-eight grains per cubic inch, and hence at the usual density required for ordinary articles, to wit—eighty to one hundred and twenty-five grains per cubic inch—there is ample egress for water or other liquid. I therefore utilize the pressure generated by the water or other liquid as it escapes under controlled pressure through perforated formers which, however, check the pulp or other material though allowing the liquid to pass, thereby compacting the material into masses of equal or uniform density and evenly felted throughout. The packing results from the checking of the speed of flow. The density of packing depends upon the speed of flow. The speed of flow depends upon the head or pressure. Fine cement or other suitable substances may be mixed with the fibrous material and liquid to harden or solidify the finished product as required for various uses, such as to form abrasive blocks or tiles, &c.

The drawing shows an apparatus which can be used in compacting material by my process.

In following my process the material to be compacted is fed into a container 1 through any suitable valve-controlled supply-inlet, such as 2. The container 1 is provided with a series of removable sides or bottoms 3, and each of these removable parts carries a series of formers A A′ A^2 A^3 A^4 A^5, having perforated or reticulated outer walls, through which the liquid passes under pressure, thereby compacting the material to the desired density within the former. All the formers on each side or bottom are of one type or class; but for purpose of illustrating some of the different types or classes of articles which can be produced I have shown formers for shaping the material into conical, truncated, cylindrical, and flat objects.

Preferably the material is thoroughly diffused in clear liquid before being fed into the container. Liquid under pressure is admit-

ted from a suitable supply source, such as 4, through a valve-controlled conduit 5, and this pressure forces the liquid out through the perforated or reticulated formers A, &c., the pulp or other diffused material being stopped in the formers, while the liquid passes on through an outlet 6. The moving liquid carrying the diffused material against stationary formers compacts said material to the required density, which is determined by the speed of flow of the liquid, and the speed of flow and pressure can be regulated by well-understood devices, such as pumps or compressors.

Only the amount of material required to fill the formers when compacted is placed in the container for each operation, and then the pressure is admitted which drives the liquid out through the perforated or reticulated formers. The formers are arranged in very close proximity, so that all the material will be carried therein. The rushing liquid will in a well-understood manner deposit the material within the stationary formers, and this pressure from within the container evenly and uniformly compacts the material, the fibers of the material falling one at a time against the surface, so that each fiber is subjected to pressure before other fibers fall. The pressure, therefore, is applied individually to the component particles instead of to the outside of a mass, as in a mechanical press. The rushing liquid as it escapes through the formers carries the frayed portions of the particles into the exits in the portions first deposited in the formers, thereby felting, matting, and bonding the article evenly and uniformly throughout. The clear liquid admitted under pressure is allowed to flow after deposit of all the material in the formers until the material has reached the required or predetermined degree of compactness or density and also operates to keep the material agitated, so that the entire amount will be deposited fiber by fiber within the formers, as required for thorough matting or felting and uniform density of the finished article.

After the material has been compacted into the formers the pressure through the conduit 5 is reduced or cut off entirely, and the side or bottom carrying the filled formers is removed. If desired, the articles within the formers may be dried or subjected to heat before being removed from the container by admitting dry or hot air or steam into the container by means of an inlet or conduit pipe 7. This treatment, however, may be found inessential in some instances, or the articles may be so treated after removal from the container or even after removal from the formers. Other sides or bottoms may be successively attached in position, so that the apparatus can be kept in almost uninterrupted operation.

I claim—

1. The process of compacting pulp or the like diffused in liquid, which consists in draining the liquid through formers arranged to receive and retain the pulp or the like in mass, and forcing a stream or flow of clear water through the formers and the mass until the required density is attained.

2. The process of compacting pulp or the like which consists in diffusing the pulp or the like in liquid, draining the liquid through perforated formers arranged to hold the pulp or the like in mass, and forcing clear water through the mass after the liquid carrying the same has been drained through the formers, substantially as specified.

3. The process of compacting liquid-diffused pulp into stationary formers, which consists in draining through the formers that amount of liquid which will evenly fill the formers with pulp, and then forcing clear liquid through the formers and the contents until the contents are compacted to the required density.

4. The process of compacting pulp into prearranged formers, which consists in diffusing the pulp in liquid, driving a predetermined amount of diffused pulp against the formers, and forcing clear liquid through the pulp after the liquid in which it had been diffused has passed through the formers.

5. The process of compacting pulp into shaped articles, which consists in feeding a predetermined amount of liquid-diffused pulp into a container having formers, agitating the liquid while in the container, driving the liquid through, and the pulp into, the formers, and finally driving clear liquid through the pulp after it has been deposited in the formers.

6. The process of compacting liquid-borne fibrous or other material, which consists in causing the liquid to pass, under pressure, through perforated formers and to deposit the fibrous or other material within the formers and forcing a quantity of clear liquid under pressure to follow the material-bearing liquid through the formers.

7. The process of compacting liquid-borne fibrous or other material which consists in causing the liquid, bearing the exact amount of material required to fill predisposed perforated formers, to pass through such perforated formers and to deposit the fibrous or other material within said formers, and forcing a quantity of clear liquid under pressure to follow the material-bearing liquid through said formers.

8. The process of compacting fibrous material which consists in depositing said material within formers arranged to hold the material, and forcing clear water or similar liquid under pressure through said material and formers until the required density is attained.

9. The process of compacting fibrous material which consists in arranging a predetermined amount of said material in a perforated former and forcing clear water through the fibrous material so arranged, under pressure greater than that used in the primary arrangement of said material.

10. The process of compacting liquid-diffused pulp or the like which consists in depositing in or near perforated formers that amount of pulp or the like which will evenly fill the formers at a predetermined density, and forcing clear water or similar fluid through said pulp or the like until said pulp or the like is compacted within said formers at the density predetermined.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JULIAN H. RIVERS.

Witnesses:
J. D. RIPPEY,
MERCER ARNOLD.