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Patented July 31, 1900.

E. KÖPPELMANN.

PROCESS OF WASHING FIBROUS MATERIALS.

(Application filed Nov. 11, 1899.)

(No Model.)

Fig. 1.

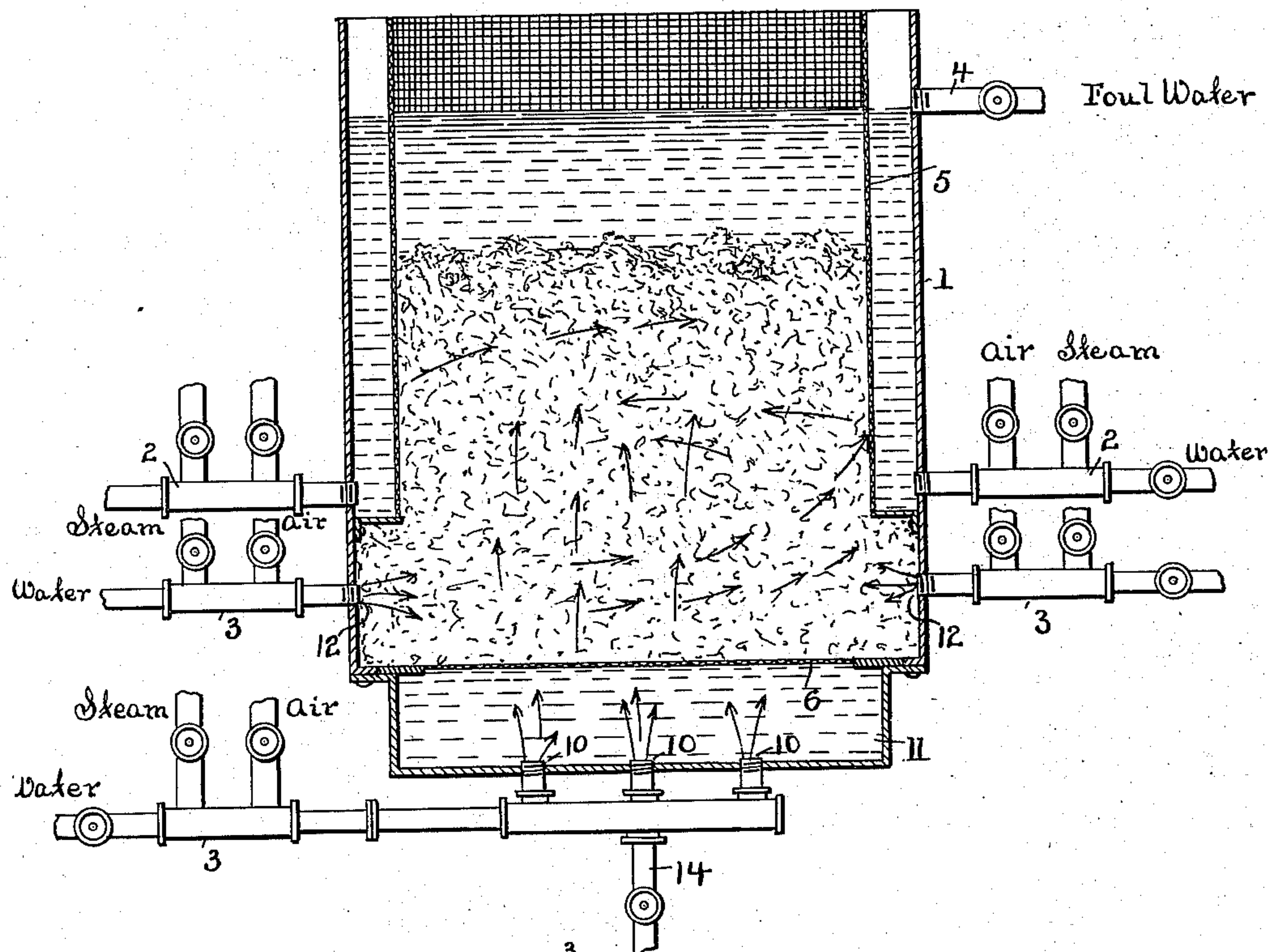
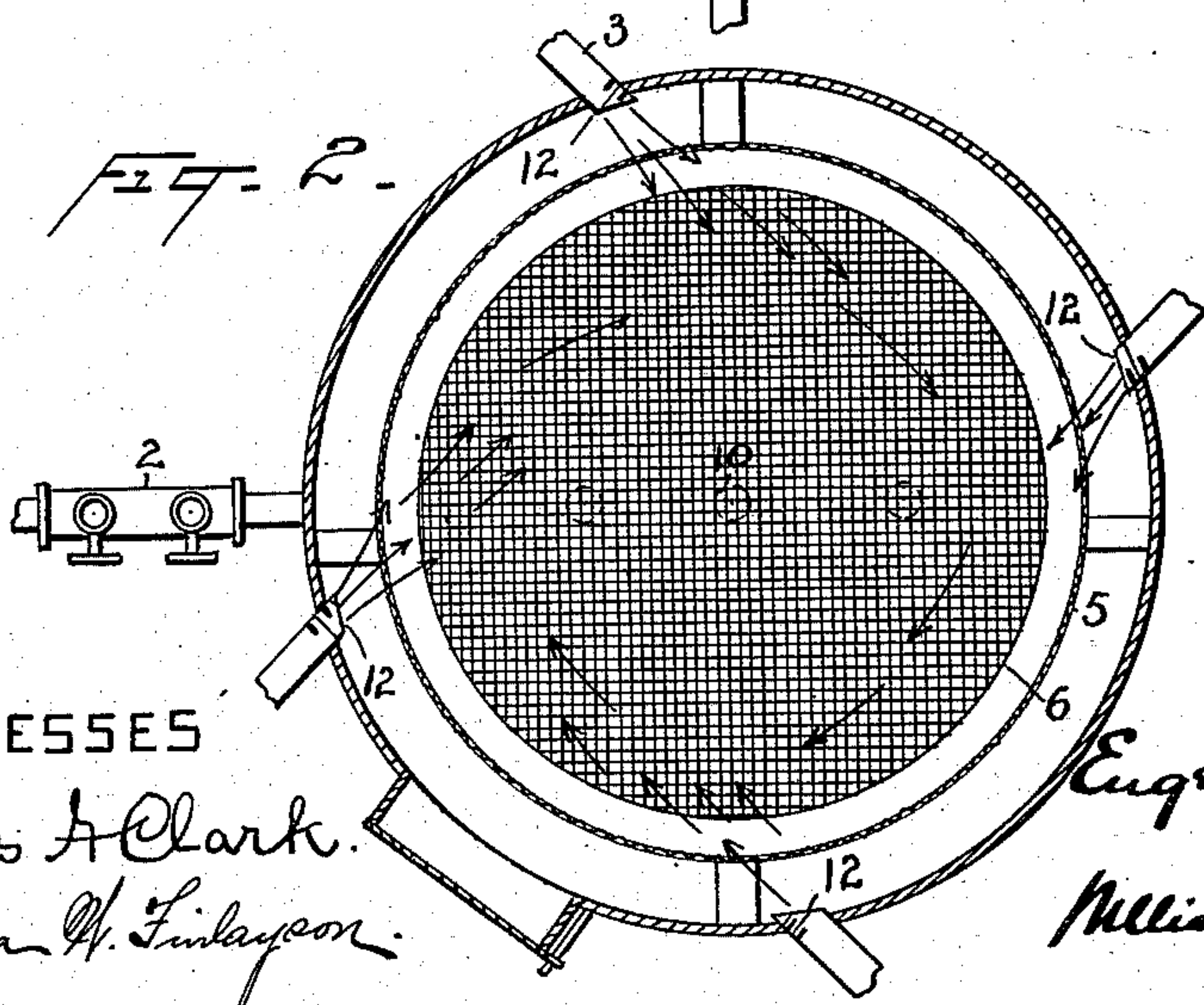


Fig. 2.



WITNESSES

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# UNITED STATES PATENT OFFICE.

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## PROCESS OF WASHING FIBROUS MATERIALS.

SPECIFICATION forming part of Letters Patent No. 654,647, dated July 31, 1900.

Application filed November 11, 1899. Serial No. 736,632. (No specimens.)

*To all whom it may concern:*

Be it known that I, EUGENE KÖPPELMANN, a citizen of the United States of America, and a resident of the city of New York, borough of Bronx, county of New York, State of New York, have invented certain new and useful Improvements in Processes of Washing Fibrous Materials, of which the following is a specification.

My invention relates to the cleaning of fibrous, granular, or other finely-separated material employed in the various arts and manufactures.

I have invented a new process and method of cleaning any material when in a loose state wherever that result may be accomplished by a direct and turbulent agitation of the material and either with or without the additional application of water, hot or cold, steam, or either of them.

Many different kinds of raw material require cleansing before use, and many kinds are used as media for straining, purifying, and other purposes in the different arts and manufactures, particular reference being made to the use of a fibrous pulp in brewing-establishments for filtering liquor. It is the custom in brewing maltous liquors immediately before shipment to strain the liquor as it comes from the storage-casks through filters under pressure in order to clarify it and remove any sediment or other impurities resultant from the brew of the same. This is done by passing the beer or other liquor through filters in which are placed layers of different substance—such as a pulp of fibrous material, either cotton, wood, or any other suitable fiber, or charcoal, sand, sponge, and like material, closely packed—which is designed to catch said impurities and to strain and filter the liquor when it is forced through the same by pressure. The media after frequent use must be washed and thoroughly cleaned, as they become slimy and saturated with the impurities coming from the liquors, after which they can be replaced in the filters for further use. The most effective cleansing of these materials is obtained when they are rapidly agitated in such a way as to keep each particle or fiber separate and moving, and the abrasion or rubbing of each particle or fiber against the others continually will re-

move extraneous substances foreign to the same and leave the fiber in its proper clean condition. The dirt so removed may be carried off by means of water or other suitable medium.

I have limited the illustration of my process to the cleansing of fibrous pulp; but this is done without limitation and with the statement that the process is just as effective with all other media. Purely mechanical means of agitation by means of revolving paddles have been found to injure the fiber and to make the same lumpy and often unfit for use.

The object of my invention is to provide a method of cleansing material of a fibrous, granular, or separated nature by means of a rapid, uniform, and continuous agitation of the material, whereby no injury will be caused and the material after being cleaned will be in a separated and fluffy and good condition.

I have illustrated the mode of practicing my invention by an apparatus especially designed for the application of the same to the cleansing of filter media used by brewers and shown in the accompanying drawings, in which like numerals refer to like parts throughout both figures.

Figure I is a longitudinal section of an apparatus used in my process. Fig. II is a cross-section of the same above the supply-pipes.

1 is a tank provided with systems of piping for the introduction of air, water, hot or cold, and steam, all under pressure, of such an amount determinable upon the nature, condition, and volume of the material to be cleaned. The tank is supplied with two sieves 5 6.

5 is a cylindrical wire sieve extending around the inside of the tank and resting upon an angle-iron secured to the interior of the tank.

6 is a circular flat sieve extending across the bottom of the tank and directly above the chamber 11.

The piping systems 3 3 3 each consist of three pipes feeding into common ports 12 12 in the side of the tank and 10 10 in the bottom for compressed air, steam, and water. By connecting the water-pipe to the heating apparatus hot water may be supplied as well



as cold through the same pipe. One set of these piping systems is introduced into the tank on the side and near its bottom, but directly above the sieve 6. They are connected tangentially, so as to direct the pressure of the supply in substantially that direction, as shown in Fig. II, for the purpose of exercising a pressure upon the internal mass in order to give it a revolutionary motion. Another system is connected directly to the bottom of the tank, with the supply directing its pressure upward. These pipes are all provided with suitable valves for regulating the supply. Pipes are also provided at 4 and 2 for drawing off the foul water and cleansing the sieve. The pipe 14 will draw off all water in the tank, and drain the media before removal after the same are cleansed.

The pulp or mass to be cleaned is put into the tank and thoroughly soaked in cold water and at the same time air under a pressure of about ten pounds is introduced through all the ports. The entrance of the air and water through the bottom of the tank has a pressure directly upward and keeps it well separated and the entire mass in a turbulent and ebullient condition. The introduction of the water and air from the side ports, they being tangentially arranged, causes the mass to revolve and whirl in addition to its motion from the upward pressure of the lower ports. The result is that the mass is thoroughly and rapidly agitated, the water and air reaching every fiber and keeping the same well separated. The pressure of air, steam, and water must be used in sufficient quantity to keep the mass of material, whatever that may consist of, in a violent state of turbidity and agitation. The dirty or foul water is continually flowing off. After the mass is well soaked and such impurities as may be removed by cold water disappear the cold water is turned off and either hot water or steam is introduced in addition to the air to more thoroughly cleanse the mass from impurities by means of a higher temperature. This hot water or steam, together with air under pressure, is allowed to circulate in the same manner until the mass is in a proper condition, after which the pulp or media is taken out.

It will be noticed that the principal cleansing factor in this system is the air, and experiment has shown that the fiber will absorb a considerable amount of oxygen from the air thus introduced, the effect of which is to freshen the same and give it considerable life, which it otherwise would not have. To get the best effects from the air, the same should be as clean and pure as possible. The use of air in connection with cold water, hot water, or steam is an advantage of considerable importance. Many materials while being cleansed may be injured by the application of too much heat, and if water or steam alone were used to get an ebullient effect upon the mass of material it would be necessary to raise the temperature of the water to boiling-point

in order to do so. The introduction of air under pressure causes such an ebullient effect at any temperature which may be necessary, and no injurious effects to material can result. This treatment gives the fiber a certain amount of elasticity, which prevents the same from packing too closely when placed in the filters, and in this way makes better straining media. Where granular or finely-divided material is to be cleaned, the effect of the introduction of the air under pressure is found in the thorough cleaning of each individual grain and particle, as the mass is kept continually in a divided or separated state while being washed.

I am aware that prior to my invention filters have been invented and used with apparatus connected therewith for applying air and water to cleanse and purify the bed of the filter while in use in such filter, and I do not claim any application of my process to any filter or filter-bed while the same is in use. The fundamental feature of my process is the rapid and violent ebullition and agitation of the entire mass by means of a tangential and perpendicular application of force operating on the said mass coming from the introduction of air, water, and steam with sufficient pressure to accomplish the desired result. The tangential pressure causes the material to revolve and work toward the center of the vessel and the perpendicular pressure continually lifts the material from the bottom and drives it toward the sides of the vessel, while the opposing pressures, together with the ebullition caused by the passage of the air through the water and mass cause the fibers and particles of the media to keep separate and travel in all directions within the vessel with great speed, resulting in the thorough cleansing and treatment of the material.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The method of treating finely-divided material while contained in a suitable vessel, which consists of a tangential application of air and water to said material, under sufficient pressure to cause the material to be violently and rapidly agitated.

2. The method of treating finely-divided material while contained in a suitable vessel, which consists of a tangential and perpendicular application to said material of water and air under such pressure as will cause the same to be violently and rapidly agitated.

3. The method of treating finely-divided material, while contained in a suitable vessel, which consists of a direct tangential and perpendicular application to said material of air and steam under such pressure as will cause said material to become violently and rapidly agitated.

4. The method of treating finely-divided material, which consists of a tangential and perpendicular application to said material, of air, water and steam under such pressure as



will cause said material to become violently and rapidly agitated.

5 The method of cleaning finely-divided material, which consists of a continual application of air and water at a proper temperature, to said material under such pressure and in such a manner as will cause the material to be rapidly and violently agitated and disturbed, and the continual removal of dirty

water until said material is properly cleaned, is substantially as and for the purposes described.

Signed by me at the city of New York, N. Y.,  
this 1st day of November, 1899.

EUGENE KÖPPELMANN.

Witnesses:

GEORGE M. S. SCHULZ,  
AUGUST C. DAUM.