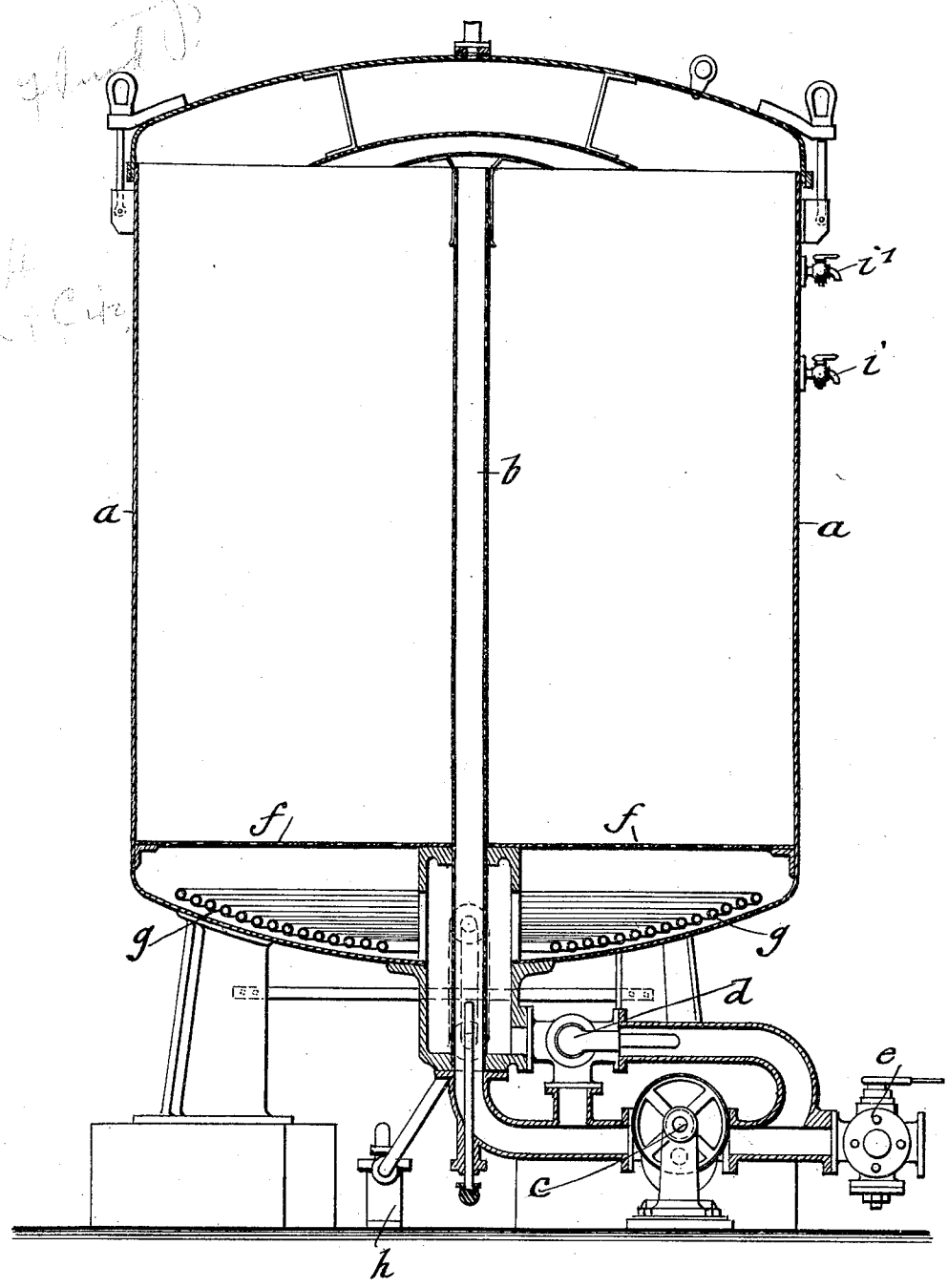
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FIP8309 OR 927,457
CATION OF TEXTILES & FIBERS,

F. FUHRMANN.

PROCESS OF BLEACHING.

APPLICATION FILED JULY 10, 1907.

927,457. Patented July 6, 1909.



Witnesses:
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Inventor
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8. BLEACHING & DYEING; FLUID TREATMENT & CHEMICAL MODIFICATION OF TEXTILES & FIBERS,
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UNITED STATES PATENT OFFICE.

FRANZ FUHRMANN, OF BERLIN, GERMANY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO L. FRED NEIRATH, OF BERLIN, GERMANY.

PROCESS OF BLEACHING.

No. 927,457. Specification of Letters Patent. Patented July 6, 1909.

Application filed July 10, 1907. Serial No. 383,051.

To all whom it may concern;

Be it known that I, FRANZ FUHRMANN, a subject of the German Emperor, and resident of Berlin, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Bleaching, of which the following is a full, clear, and exact specification.

In spite of the many attempts that have been made to bleach vegetable fibers, such as cotton, ramie, linen, jute, or the like, with oxygen compounds free from chlorin like alkali peroxids or hydrogen peroxid, no success has been attained in working on a large scale and hitherto the oxychlorin compounds, particularly hypochlorites, and the electrolytically-prepared solution of sodium hypochlorite have been used almost exclusively. Although the said chlorin-free oxygen compounds have considerable advantage for bleaching purposes the quantities required for obtaining a pure white bleach by the known processes is so great that the cost becomes too high. The disadvantage attending the use of hydrogen peroxid and the alkali peroxids is chiefly that when they are used alone their active oxygen is given up too quickly. In the case of alkali peroxid which is a strongly alkaline oxidizing agent, the powerful caustic action which it exerts militates against success, since great care has to be taken in treating vegetable fibers with this agent. The attempt has been made to overcome these objections by adding to the bleaching liquors containing the hydrogen peroxid or the alkali peroxid certain substances which have the property of retarding the liberation of oxygen and thus of prolonging the bleaching action while at the same time moderating the oxidizing action, for instance, calcined magnesia, soap, water-glass, zinc oxid and a like substance have been added. In this manner a certain result has been achieved, but one which is by no means satisfactory.

According to the present invention the defects of hydrogen peroxid and alkali peroxid are completely avoided and the bleaching action of these materials is considerably enhanced by adding to the alkaline bleaching liquor a suitable proportion of boric acid or alkali borate followed by a magnesium salt. In this manner there is produced in an extremely finely divided state magnesium perborate which is characterized by a remarkably powerful bleaching action. Magnesium perborate thus formed yields its active oxygen on being boiled much more gradually and uniformly than is the case with the known bleaching mixtures containing active oxygen. For example, cotton or ramie which has been subjected to a suitable preliminary treatment may be bleached pure white in about 3 to 4 hours when treated in this manner with a quantity of perborate corresponding with about 0.05 per cent. of active oxygen calculated on the weight of the goods.

Instead of adding to the alkaline liquor hydrogen peroxid or alkali peroxid and boric acid or alkali borate followed by a magnesium salt, the liquor may also be prepared by adding a solid alkali perborate and a magnesium salt, or by adding previously prepared magnesium perborate. There is no difference in the bleaching effect whichever method is followed.

The presence of soap, Turkey-red oil, castor oil soap, olive-oil soap, tallow soap, or like substances, if necessary with the addition of alkali, such as caustic soda, sodium carbonate, caustic potash, potassium carbonate or the like, has a decided improvement on the bleaching action. These materials have on boiling the effect of dissolving the albuminous matter, fat and resin from the vegetable fibers and thus leave the latter free for the oxidation of the natural coloring matter.

In bleaching cotton and ramie fiber it is best to boil the yarn, fabric or the like, previously subjected in the usual manner to the preliminary bowking for some hours in the presence of caustic soda and soap, with a bleach liquor obtained as described above, the liquor being thoroughly circulated and the pressure being preferably slightly above normal; the boiling may be continued until a sample of liquor no longer yields a reaction indicative of active oxygen. In the case of linen and jute, the operation is similar except that more mildly acting carbonating alkalies, like sodium carbonate, are substituted for the caustic alkalies, while boiling is conducted at ordinary pressure. For linen the process may take the place of the hitherto usual ozone bleaching or open-air bleach. The process is free from the trouble endan-

gered by the separation of metal soaps in the form of pulverulent or sticky precipitates which dirty the fiber and give rise to spots, which precipitations are liable to occur in the known processes when soap or Turkey-red oil is added to the liquor containing hydrogen peroxid or alkali peroxid together with calcined magnesia, zinc oxid, aluminum salts or the like and such liquor is boiled. The bleaching liquor containing magnesium perborate remains quite clear and transparent when heated. Only on cooling the liquor after use is a fine precipitate of magnesium perborate thrown out. This fact, and the circumstance that magnesium perborate even at the boiling temperature does not attack metals which resist dilute boiling soda-lye, render the use of bleaching liquor containing magnesium perborate particularly applicable where metallic apparatus such as iron boilers and circulating pumps are used; and there is here an important technical advance, because in using the oxygen bleaching liquors hitherto known in metallic apparatus certain troubles, such as rusting of the apparatus, loosening of the joints and dirtying of the goods by formation of spots could not be avoided.

The process can be carried out in an apparatus such as shown in the accompanying drawing in longitudinal section.

In the drawing, *a* is an iron boiler, which is lined at the inside with sheet-nickel as far as the material to be bleached comes in contact with the same.

b is a tube, which is provided with a number of perforations through which the bleaching liquor is introduced by means of a pump *c* into the boiler.

d and *e* are three-way cocks, *f* a perforated bottom, *g* tubes which are heated by steam or the like, *h* a condensation-vessel, and *i* and *i'* are test-cocks.

The articles to be bleached are placed in the boiler on the perforated bottom *f*, after which the bleaching liquor is forced into the boiler by means of the pump *c*. The bleaching liquor passes in downward direction through the bottom *f* and is returned through the same to the pump *c*, by which it is forced again in the boiler so that a regular circulation of the bleaching liquor takes place.

Example I: 500 kilos of cotton yarn which has been freed in the usual manner by boiling with alkalies of the greater part of the pectin compounds are charged into a high pressure boiler provided with a thoroughly efficient circulating device. The boiler now receives the bleaching liquor prescribed below, and this liquor is heated to boiling by means of indirect steam. The boiler is now closed and the temperature raised until a pressure of about half an atmosphere above normal is attained. Boiling is continued at this over pressure and with good circulation of the liquor for from 3 to 4 hours. After cooling and blowing off the steam and liquor the goods are thoroughly washed with water in the boiler. A suitable bleaching liquor for this example is made as follows: 20 kilos of caustic soda and 10 kilos of soap or 5 kilos of Turkey-red oil of 50 per cent. strength or a corresponding proportion of castor oil soap are dissolved in 4000 liters of water, and to this bath are added: (1) 16.5 kilos of hydrogen peroxid of 3 per cent. strength or 1.25 kilos of sodium peroxid and 2.1 kilos of boric acid, and 5 kilos of concentrated magnesium chlorid solution, or (2) 2.5 to 3 kilos of sodium perborate, 5 to 6 kilos of concentrated magnesium chlorid solution, or (3) 2.5 to 3 kilos of magnesium perborate. The goods are now removed from the boiler, washed and treated with dilute sulfuric acid of 0.5 to 1 per cent. of strength. They are then thoroughly washed and dried. In most cases a full bleach is obtained by this operation. Only in the case of cotton that is difficult to bleach or yarns of like nature the treatment must be repeated in order to obtain a full bleach. Yarn that has been wound in the form of cops, for instance, and loose cotton, can be treated in the same manner.

Example II: In order to bleach heavy cotton fabrics or cotton weavings, about 1000 kilos of material, after suitable preliminary treatment (greatest possible removal of the size and of the pectin substances by alternating use of acid and boiling with diluted alkalies) are impregnated with the following liquor, in such a manner that the bleaching material is as uniformly as possible distributed through the material. In about 2000 liters of water there are dissolved or suspended, as the case may be: (1) 33 kilos of hydrogen peroxid of 3 per cent. strength, 5 kilos of caustic soda, 4.2 kilos of boric acid, 10 kilos of concentrated magnesium chlorid solution, or (2) 2.5 kilos of sodium peroxid, 4.2 kilos of boric acid, 10 kilos of concentrated magnesium chlorid solution, or (3) 5 to 6 kilos of sodium perborate, 10 to 12 kilos of concentrated magnesium chlorid solution, or (4) 5 to 6 kilos of magnesium perborate. The material is then immediately brought into a pressure-boiler having a perforated inner tube and a circulation-device and covered by perforated plates and iron rails. The boiler is then filled with about 1,000 liters of hot bleach liquor which contains about 15 to 20 kilos of caustic soda and 20 kilos of soap or 10 kilos of Turkey-red oil or an equivalent quantity of castor oil soap. The circulation device is set in action and the cover hermetically closed. By heating indirectly with high pressure steam the pressure in the boiler is raised to about ½ to 1 atm. above normal and the boiling and circulation are continued for 4 to 5 hours. After cooling and blowing off the steam and bleach liquor, the goods are well washed in

8. BLEACHING & DYEING; FLUID TREATMENT & CHEMICAL MODIFICATION OF TEXTILES & FIBERS,
111

the boiler, removed, washed, passed through sulfuric acid of about 1 per cent. strength and again thoroughly washed.

In the case of linen, jute and like fibers, it is better not to work at an excess of pressure and to use carbonated alkali instead of caustic alkali.

The foregoing bleaching process has the following advantages as compared with the previously known processes for bleaching by means of active oxygen:

1. A considerable saving of the bleaching agent is obtained.

2. In consequence of the possibility of using metallic apparatus with circulating bleach liquor, fibers in the loose form, or spun and wound up as cops or in yarns can be completely bleached.

3. In many cases, for example in the case of light and soft fabrics, it is possible to bleach them directly in the raw condition without previous treatment or cleansing, as owing to the presence of alkalies in the bleach liquor and owing to the boiling under pressure, the separation of the pectin matter and the bleaching is accomplished at the same time.

4. A nearly clear bleaching liquor is used which yields no precipitate that can filter through the goods during the circulation of the liquor and thus give rise to the formation of spots.

Having thus described my invention I claim as new and desire to secure by Letters Patent:

1. The bleaching process herein described consisting in heating the goods to be bleached with a liquor containing magnesium perborate in presence of alkali salts of fatty acids.

2. The bleaching process herein described consisting in heating the goods to be bleached under pressure with a liquor containing magnesium perborate in presence of alkali salts of fatty acids.

3. The bleaching process herein described consisting in heating the goods to be bleached under pressure with a liquor containing freshly-precipitated magnesium perborate in presence of alkali salts of fatty acids.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

FRANZ FUHRMANN.

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.