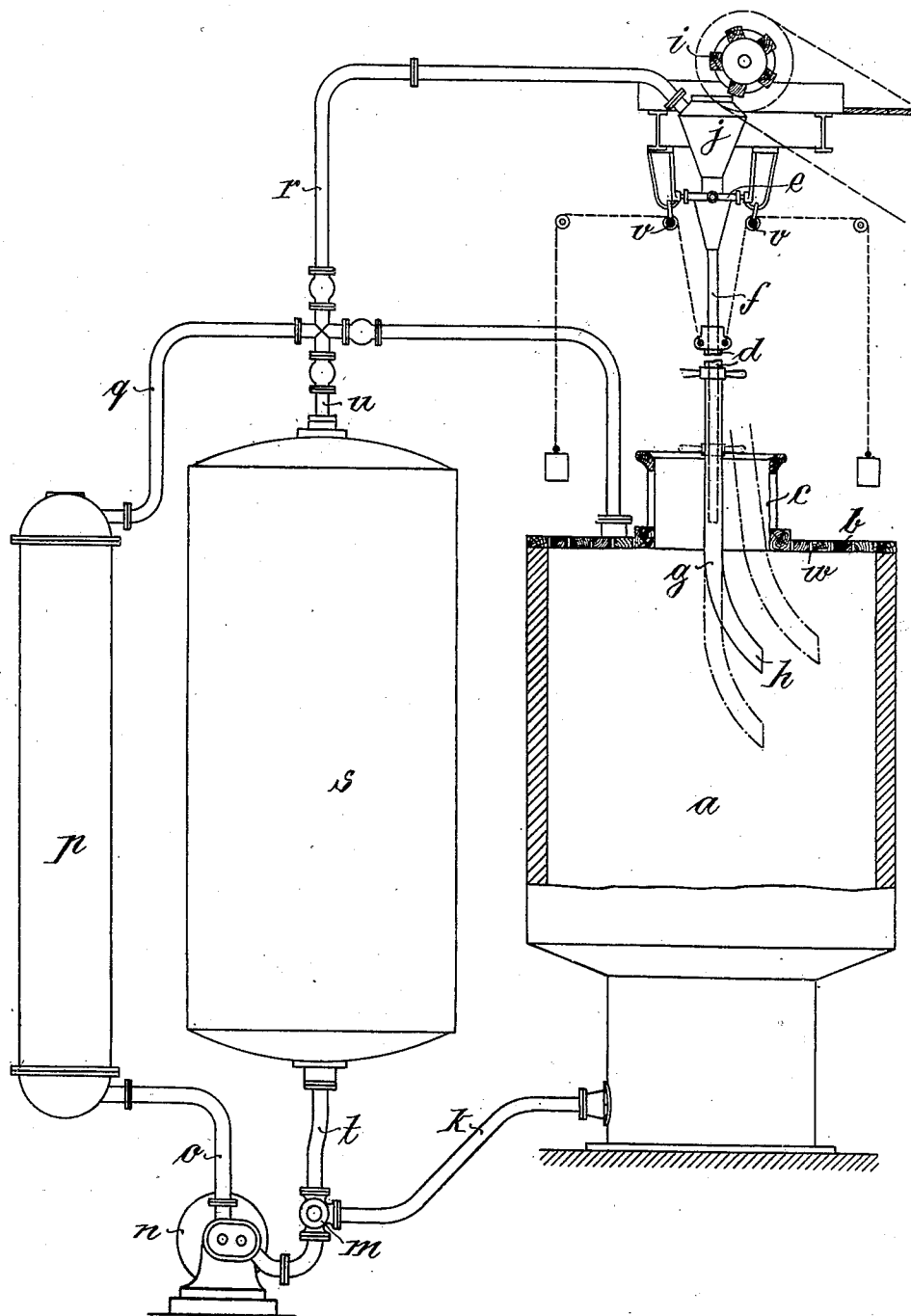


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 APPARATUS FOR TREATING FIBROUS MATERIAL WITH LIQUIDS.
 APPLICATION FILED MAY 13, 1907.

923,310.

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Witnesses:
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UNITED STATES PATENT OFFICE.

HEINRICH THIES, OF COESFELD, AND WALTHER MATHESIUS, OF BERLIN, GERMANY.

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Specification of Letters Patent.

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Application filed May 13, 1907. Serial No. 373,297.

To all whom it may concern:

Be it known that we, HEINRICH THIES, a subject of the King of Prussia, and resident of Coesfeld, in the Province of Westphalia, Germany, and WALTHER MATHESIUS, a subject of the King of Prussia, and resident of 46 Lietzneburgerstrasse, Berlin, Germany, have invented a new Apparatus for Treating Fibrous Material with Liquids, of which the following is a specification.

The invention relates to the laying in of yarns and fabrics in tanks or vats for the purpose of treating the same with liquids, for instance in acidulating, bucking and coloring yarns or fabrics. In such apparatus it is desirable to obtain as far as possible uniform compression of the layers of material in the vat and also to obtain a thorough and even saturation of the material. It is already known to treat fabrics in the spread out form in which case the fabric was led up and down over pulleys and rollers through the liquid, but such apparatus requires considerable ground space and consequently also necessitates a large quantity of the treating liquid. It has also been proposed to lay the fabric or other material in layers on the bottom of a tank but the apparatus employed was not suited to produce the necessary uniformity of compression in the layers of material in the vat nor a thorough and even soaking of the same with the treating liquid.

The object of the present invention is to construct an apparatus which combines these two features which we have found are essential to success namely, even laying down of the material and thorough and even soaking of the same with the solution.

The present invention consists in an apparatus for treating yarns and fabrics *i. e.* fibrous material by the laying-in process in which the material is laid in an even layer uniformly over the surface and in a form, in which it can be readily and evenly soaked through and through by the liquid which is preferably introduced together with the material. This liquid is constantly or intermittently sucked off from the bottom of the vat during treatment whereby it is caused to soak or permeate through all the layers of the laid-in material. When fabrics are so treated, they are not stretched breadthwise over rollers but are fed into the vat in rolled up or rope form and thereby the danger of

breakage of the warp threads is avoided as more fully explained hereafter. The uniformity of compression in the layers according to the present invention is obtained by giving the material a constant length of free drop from the outlet of the feeding channel to the vat.

Referring now to the accompanying drawing which diagrammatically illustrates the apparatus according to the present invention. The vat is provided at its upper end with a platform *b* and an opening *c*. Through this opening there projects a delivery pipe *d* which is pivoted by a universal joint *e*. The delivery pipe *d* consists of an inner part *f* and an outer part *g* telescoping over said inner part. The outer part *g* is provided with a curved portion *h* at its lower end so that the lower end is at an obtuse angle to the upper part. The material to be treated is led over a drum *i* into a hopper *j* by which it is fed into the delivery tube *d*.

From the lower end of the vat there leads a pipe *k* to a three-way valve *m* and a pump *n*. From the pump *n* an outlet pipe *o* leads to a preheater *p* and from the preheater *p* there lead pipes *q* and *r* to the hopper *j*. A containing receptacle *s* for the chemicals with which the fabric is to be treated is also provided and pipes *t* and *u* lead from said receptacle to the pump and to the vat respectively. The pipes *r*, *u* and *q* are provided with valves, indicated in the drawings as ordinary ball or globe valves, by which the various manipulations are controlled. By means of this apparatus the treating liquid is led into the hopper *j* simultaneously with the fabric or material to be treated and these pass down the delivery pipe *d* together and are laid in layers within the vat by transmitting a pendulum motion to the delivery pipe *d*.

In order to facilitate the spreading of the material in a uniform manner over the whole area of any shape of vat the delivery pipe *f* is provided with a pulley and weight arrangement *v* which enables the operator to swing the pipe from its normal perpendicular position with ease into any angular position required.

In order to distribute the materials uniformly over the area of the vat all the operator has to do is to walk along the floor *w* provided with slots *w* for inspection, meanwhile keeping the lower end of the delivery pipe constantly in a pendulum motion, so that the

materials shooting out from the end *h* of the pipe will cover the area of the vat in a perfectly even and uniform manner.

The sliding down of the rope of material within the pipe is promoted by introducing some kind of impregnating liquid into the hopper *j* simultaneously with the rolled up material and the best result is obtained if said liquid tangentially strikes upon the material. This simultaneous passing of material and liquid through the pipe and their final dropping into the vat below assures a very thorough and uniform penetration of the liquid into the fine pores of the material which effect is intensified by the fact that the liquids due to their higher density and smaller friction with the walls of the tube have a higher velocity as falling bodies and thus always have a certain lead over the skein.

By introducing the treating liquids at the top of the vat and sucking them away from the lower end of the vat during treatment through the evenly laid layers of material, an even and thorough treatment of the material is obtained in a manner which was impossible in previous types of apparatus of this kind. The suction action of the lye which is drawn off at the bottom of the vat has the effect of causing the lye to pass through all the pores of the fabric, which on account of its regular and even layers is thereby uniformly treated. Further as the fabric is introduced in rope form and not in the stretched out breadth form, breakage is avoided at the folds.

By setting the lower part of the guiding tube or channel at an angle to the remainder, the layers fall on the bottom of the vat almost horizontally and not in a vertical position which effects a better and more even laying-in of the material.

The working of the apparatus may be described as follows:—The material is placed in the vat in such a manner as to avoid compressing the same in the direction of the warp thread. The fabric on account of being delivered to the vat while moving in the direction of the warp thread must naturally be placed in the vat in layers, of which the folding line or the line where the material doubles up is at right angles to the run of the warp thread. The piling of one layer on top of the other takes place under a certain pressure which remains constant through the process of laying-in owing to the fact that the dis-

tance through which the material has to drop freely from the end of the tube remains constant. In this way the force pulling on the material in the tube is of course also constant and the material is laid in in layers at constant speed. Further, as the layers are presented in rope form and not in breadth form no sharp angles at the turning of the layers in the vat occur. In this way the greatly feared breaks occurring in the direction of the warp thread during the bucking, or acidulating treatments are entirely avoided. An arrangement of the kind described can be employed for the bleaching process of the skein in the scouring vat, an achievement which hitherto has been impossible. In fact, the apparatus described can be used to advantage for all similar treatments such as coloring, acidulating and so on. Instead of using a pipe having closed walls along its length for the conduction of the liquid and skein an open channel might be employed in some cases, but provision must be made that the other receptacles used are of a suitable shape. We prefer however to use a pipe to insure the best results.

We claim:—

1. An apparatus for treating fibrous material in rope form with liquids in a vat comprising means for conducting the material to the vat and means for preserving a constant length of free drop for the material within the vat on to the layers piled therein.

2. An apparatus for treating fibrous material in a vat comprising a universally jointed delivery tube, a telescopic delivery part on said tube arranged to adjust the distance between the bottom of the vat and the delivery point for the purpose set forth.

3. In an apparatus for treating fabrics with liquid in a vat comprising a universally jointed delivery tube pivoted at its upper end, means for conducting the fabric in rope form to said delivery tube, means for conducting the treating liquid to said delivery tube, a delivery part set at an angle to said delivery tube and means for sucking off the treating liquid from the bottom of the vat during treatment.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

HEINRICH THIES.
WALTHER MATHESIUS.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.