March 26, 1935. A. E. THORLEY 1,995,405

DYEING, WASHING, AND LIKE APPARATUS

Filed April 20, 1934 2 Sheets-Sheet 1

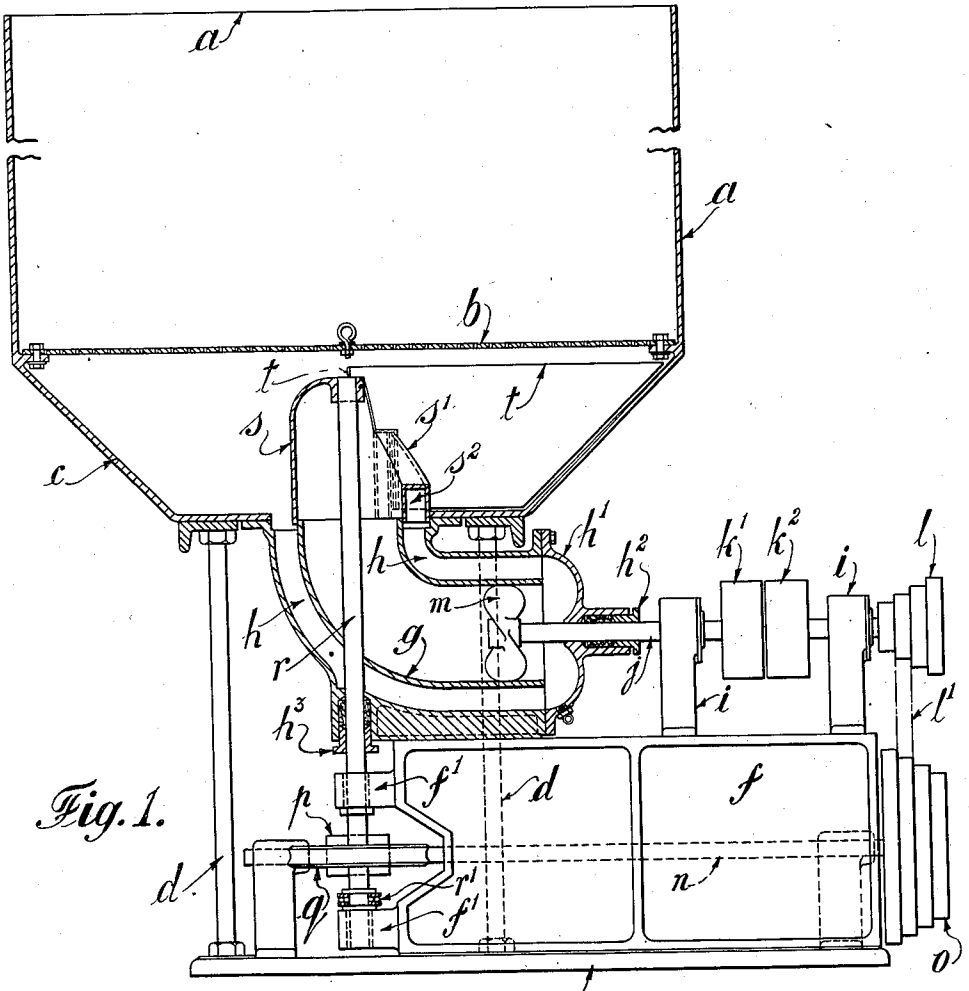

Fig. 1.

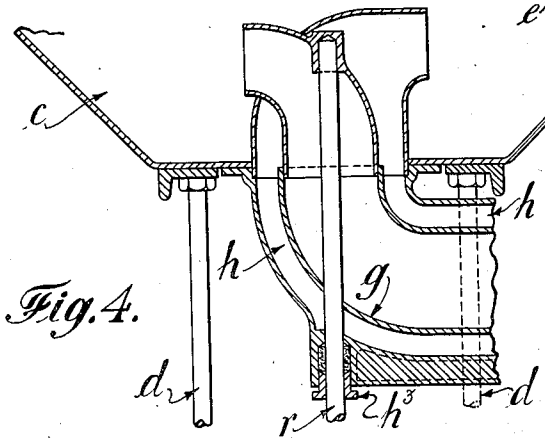

Fig. 4.

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DYEING, WASHING, AND LIKE APPARATUS

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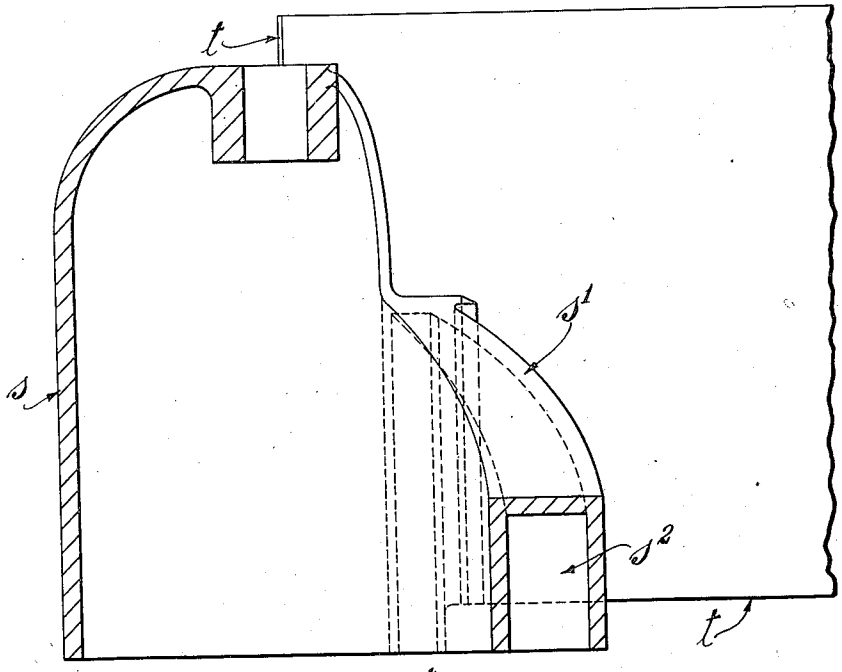

Fig.2.

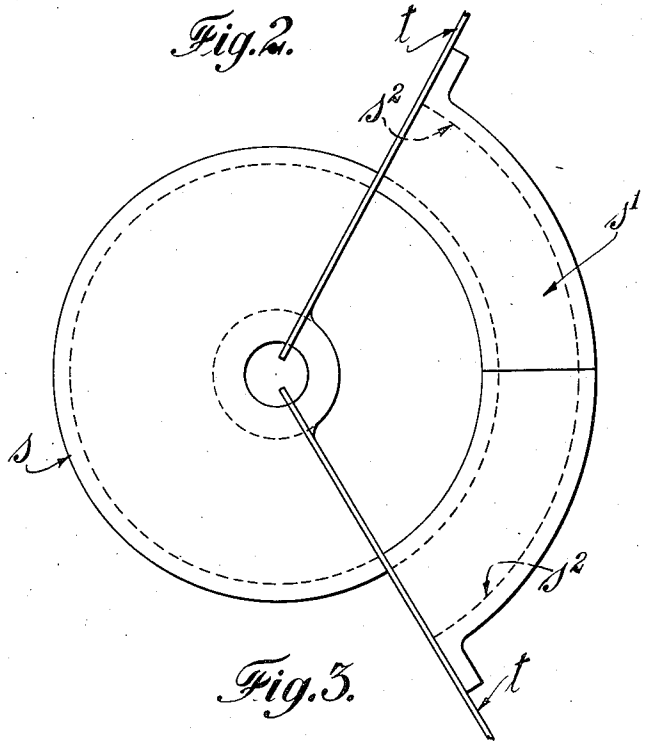

Fig.3.

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UNITED STATES PATENT OFFICE

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DYEING, WASHING, AND LIKE APPARATUS

Arnold Edward Thorley, Denton, Manchester, England

Application April 20, 1934, Serial No. 721,416
In Great Britain April 26, 1933

4 Claims. (Cl. 8—19)

This invention refers to dyeing, washing and like apparatus for textile goods, including felt hat bodies, but relates chiefly to dyeing apparatus of the type in which the dye liquor is caused to circulate through the goods first in one direction and then in another direction, and in which the dye liquor enters and leaves the dyeing chamber at constantly varying points.

The object of the present invention is an improved construction of such type of apparatus and an improved method of circulating the dye (or wash) liquor, whereby more thorough, even and rapid dyeing (or washing) can be effected.

According to the invention, a stationary vat is employed having a perforated floor part. Below said floor part is an enclosed chamber forming part of or additional to the vat, and within such chamber are liquor circulating devices whereby the liquor in said chamber and vat is caused to flow upwards and through the perforated floor at one side of the vat, then horizontally through the vat to the other side, and then downwards through the perforated floor back into the said chamber, the circulating devices being preferably capable of rotary or angular movement so that the dye liquor shall flow in constantly changing directions with respect to the floor of the vat, the liquor flowing in a directly opposite direction after a half rotation of the said devices.

In addition to the said circulating devices, there may be one or more pumps below the said perforated floor, which will operate periodically to produce sharp upward impulses on the liquor, in addition to the said normal flow, thereby adding to the efficiency of the apparatus.

In the accompanying drawings:—

Fig. 1 illustrates a sectional elevation of one example of the improved apparatus.

Fig. 2 illustrates an enlarged sectional elevation, and

Fig. 3 a like plan of a part of the liquor circulating devices appearing in Fig. 1, but as shown separate from the vat.

Fig. 4 is a sectional elevation of a modification hereinafter described.

In the example shown in Figs. 1–3, the improved apparatus comprises the stationary, open-topped vat or container *a* provided with a perforated floor part *b*, the perforations preferably extending over the whole area of the floor part. Below the floor part *b*, the vat is contracted in diameter to form a frusto-conical chamber *c*, the whole vat being mounted on pillars or standards *d* rising from a base *e*. Connected to the lower horizontal face of the part *c* of the vat, and also connected to a frame *f* on the base *e* are concentric elbow pipes *g*, *h*, the larger pipe *h* being closed at one end by a plate h^1 provided with a central gland h^2, and the smaller pipe having its end short of such plate so as to leave a free passage from one pipe to the other.

Carried in bearings *i* mounted on the frame *f* is a horizontal shaft *j* carrying fast and loose pulleys k^1, k^2 for the drive (not shown), and carrying stepped pulleys *l*, such shaft also extending through the gland h^2 into the pipes *g*, *h* and carrying at its inner end a propeller *m* which lies within and closely fits the inner pipe *g*, or which could be arranged in the pipe *h*.

A further horizontal shaft *n* mounted alongside the frame *f* carries stepped pulleys *o* complemental to the pulleys *l*, and driven therefrom by a belt l^1 and also carries a worm *p* which meshes with a worm wheel *q* on a vertical shaft *r*. Such vertical shaft *r* is mounted in bearings f^1 at the end of the frame *f*, a thrust bearing r^1 being provided to take the weight, and the shaft extends upwards through a gland h^3 on the elbow pipe *h*, into the frusto-conical chamber *c*. At the upper end of the shaft *r* there is fitted a cowl or spout member *s* having a housing formation to fit over and enclose the end of the inner elbow pipe *g*, and a further housing formation to fit over a part of the annular space between the pipes *g* and *h*. The member *s* has a notch or spout s^1 substantially of V shape in elevation, below which notch or spout is formed a box-like housing s^2 which lies over the said annular space. The member *s* also has fins or vanes *t* extending to the wall of the chamber *c*.

In operation the materials or articles to be dyed or washed are placed in the vat *a*, above the perforated floor *b*, and the machine is filled with the dyeing or washing liquor up to the desired level, the liquor filling the pipes *g* and *h*, the conical chamber *c* and so much of the vat *a* as is necessary to cover the materials or articles.

The driving belt (not shown) is then moved to the fast pulley k^1 whereupon the propeller *m* is rotated and causes a flow of liquid up the central pipe *g*, the liquor being forced through the V notch or spout s^1, and through the perforated floor *b*, and after flowing through the goods being treated, returning via the floor *b* into the outer elbow pipe *h* and back to the propeller, and so on. At the same time, the shaft *r* and the cowl or housing *s* are rotated so that the positions of the points at which the liquor passes upwards

and downwards through the floor *b* constantly vary, the effect on the goods being that they are repeatedly subject to a reverse flow, the direction of discharge after half a revolution of the spouts being directly opposite to the direction of discharge prior to such half revolution.

By reason of the special shape of the cowl or spout member *s*, the opposed streams of liquor are isolated from each other, that is to say, the box-like housing s^2 below the V notch s^1 serves to separate the outgoing stream from the suction in the outer elbow pipe *h*. At the same time there is a relatively large area of the elbow *h* open to the liquor, which prevents undue obstruction to the circulation.

The cowl *s* and fins *t* may extend up to the floor *b* or may stop short of the same as shown.

In another example of the invention, and as illustrated in Fig. 4, each pipe *g*, *h*, at its upper end carries a curved elbow-like spout, the spout of the inner pipe extending in a direction opposite to and passing through the wall of the spout of the outer pipe. The two spouts are more or less integral, and are adapted to rotate as one upon the top end of the shaft *r* over the pipes *g*, *h*. Extending laterally from the combined spouts are the plates or fins not shown in Fig. 4, but identical in shape with those shown in Figs. 1–3, which extend across the chamber below the dye vat, and at their edges lie near to and follow the contour of the inner face of chamber *c*.

In any of the examples, the direction of rotation of the screw propeller may be made reversible at intervals so as to propel the liquor first in one direction and then in the opposite direction.

In some cases a heating coil may be inserted in the inner elbow pipe to heat the liquor.

When the impulse pumps are used below the perforated floor (or cage) they will usually each consist of an open ended cylinder, with the open-end uppermost, and a piston or plunger operated to move down slowly and move upwards quickly. In one example, the piston is spring actuated, the spring being slowly compressed and then quickly released.

In place of a screw propeller, a rotary or reciprocating pump may be provided.

The improved apparatus is chiefly for use in dyeing felt or fur hat bodies, but it may also be used in the washing or other liquid treatment of other articles or goods. It may for instance be used in laundering.

What I claim is:—

1. A machine for the dyeing, washing and like treatment of textile goods, including felt hat bodies, comprising a stationary tank or container for the goods and the treating liquor, a perforated floor part in such tank to support the goods, concentric flow and return pipes connected to the bottom of the chamber below such floor part, a double-spout member over the mouths of the said pipes to connect the respective pipes with different parts of the area of the perforated floor part, means producing relative rotation between the floor part and the spout member, and means to circulate liquor through the said pipes and chamber.

2. A machine for the dyeing, washing and like treatment of textile goods, including felt hat bodies, comprising a stationary vat divided horizontally by a perforated floor part, concentric elbow pipes connected to the bottom of the vat, the elbow pipe orifices connecting with each other at the outer end, a propeller in the inner elbow pipe to promote and maintain circulation of the liquor, a rotary double-spout member mounted over the elbows where they connect to the vat and connecting the respective elbows with different parts of the area of the perforated floor, and means to rotate the propeller and also the spout member.

3. A machine as claimed in claim 2, wherein the double-spout member comprises a housing closed at its upper end and fitting over the mouth of the inner elbow pipe and also having a V notch in one side, and a further housing below such notch to overlie a portion of the mouth of the outer elbow pipe, the two housings being integral, and two vanes or fins extending from the housings to the extremities of the part of the vat below the perforated floor to divide such part into volumes communicating respectively with the two elbow pipes.

4. A machine for the dyeing, washing and like treatment of textile goods, including felt hat bodies, comprising a vat or container with upper cylindrical part and lower frusto-conical part and a perforated floor dividing them, a frame supporting the vat, concentric elbow pipes having vertical arms communicating with the lower part of the vat and horizontal arms supported by the frame, a cover plate on the outer pipe giving communication between the inner and outer pipes at the end of the horizontal arms, a horizontal shaft supported in bearings on the frame and extending through the cover plate into the inner elbow, a propeller on the said shaft also within the inner elbow, a vertical shaft supported in bearings on the frame and extending into and beyond the vertical arm of the inner elbow, a cover for the inner elbow fixed on said vertical shaft having an opening in one side, having below such opening an arcuate channel or housing communicating with the outer elbow and also having radial fins or blades at each side of the opening and extending to the walls of that part of the vat, and means for simultaneously rotating the two shafts.

ARNOLD E. THORLEY.