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APPARATUS FOR TREATING TEXTILE FABRICS.

APPLICATION FILED JULY 20, 1905.

Fig. 7.

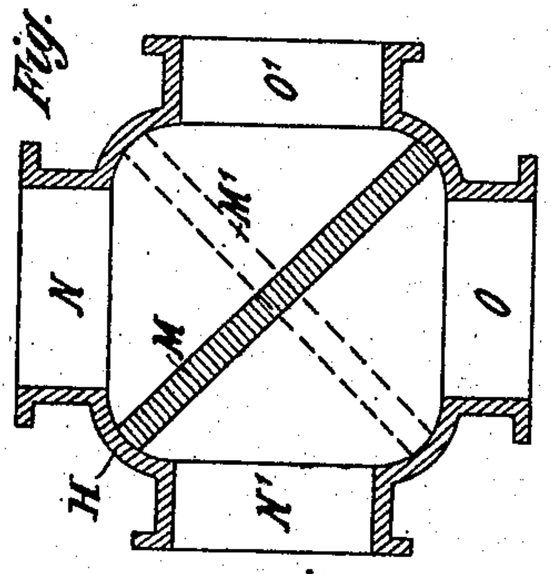

Fig. 6.

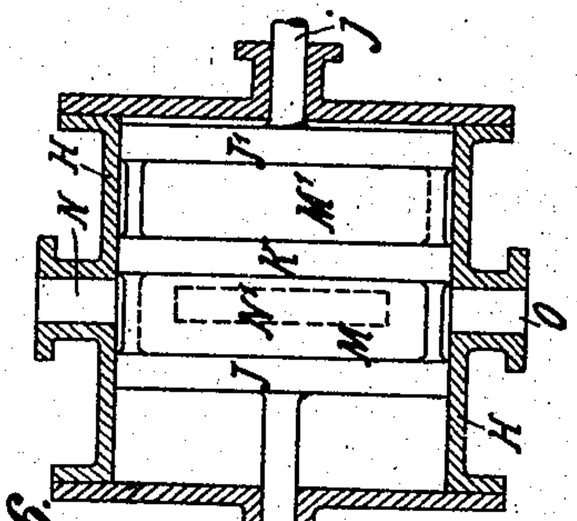

Fig. 5.

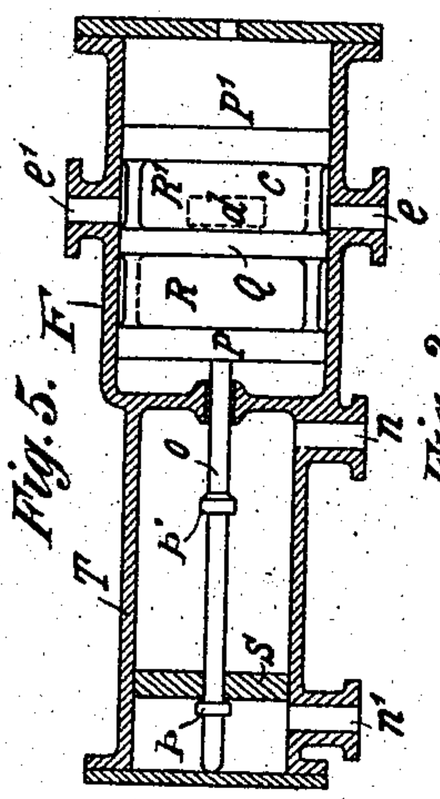

Fig. 3.

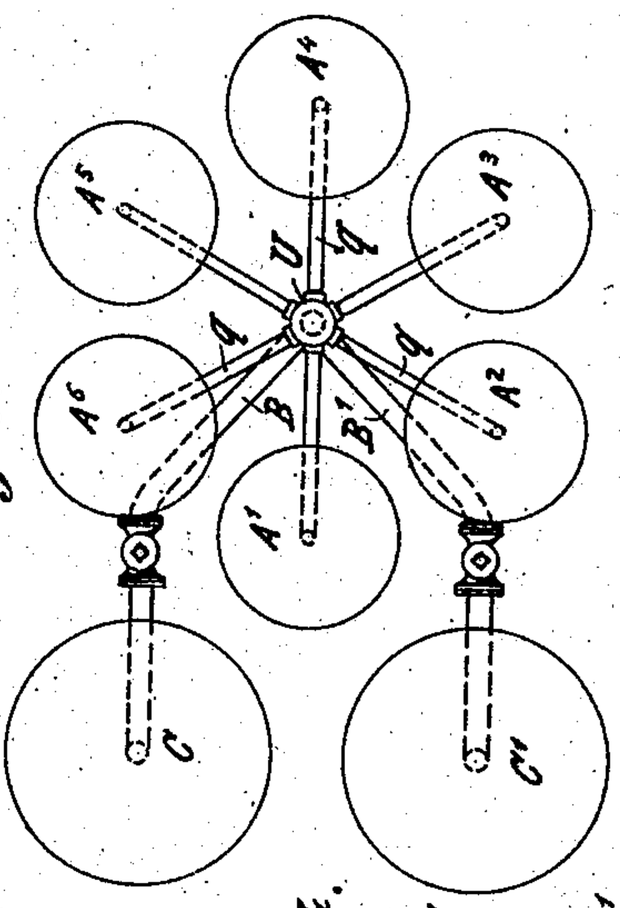

Fig. 4.

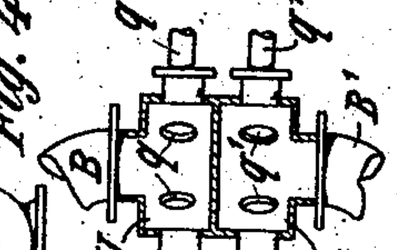

Fig. 2.

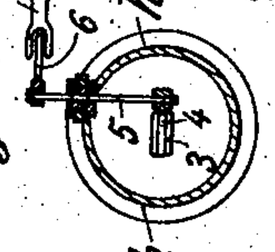

Fig. 1.

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APPARATUS FOR TREATING TEXTILE FABRICS.

No. 815,306. Specification of Letters Patent. Patented March 13, 1906.

Application filed July 20, 1905. Serial No. 270,572.

To all whom it may concern:

Be it known that I, OTTO OBERMAIER, manufacturer, a subject of the King of Bavaria, residing at Lambrecht, Palatinate, Germany, have invented a certain new and useful Apparatus for Treating Textile Fabrics, of which the following is a specification.

This invention has reference to an apparatus for treating textile fabrics, as in dyeing, extraction of grease, bleaching, washing, and for similar operations, by means of circulating liquids. In the known apparatus of this kind the circulation of the liquids is usually effected by submitting them to pressure and by connecting a receptacle containing the liquids with the keir containing the materials to be treated. In such case the pressure is transmitted to the material to be treated, so that the said material is compressed, and it then becomes difficult to have the liquids permeate the material. Then when working in this manner the compression produced in the material was irregular, and consequently the treatment of the material with the liquids was also very irregular, particularly in the case of dyeing, in which the coloring was not uniform.

The apparatus forming the subject of this invention produces not only a pressure, but also a powerful vacuum, in such a manner that during the passage of the liquid through the receptacle for effecting the treatment the vacuum acts by pulling on one side, while on the other side the pressure acts by pushing upon the liquids. The vacuum produces the effect of causing the material to be expanded—*i. e.*, the individual fibers tend to move away from each other, so that the material is loosened and it becomes possible for the liquid to permeate the material readily and uniformly. The pressure employed is not strong enough for overcoming this favorable action of the vacuum, but it is sufficient for imparting to the liquid a sufficient flow between the discharge from the receptacle for effecting the treatment of its entrance into the receptacle. By the aid of the apparatus about to be described it is possible whenever necessary to introduce a pressure of a column of air or of gas of one-half, one, or two atmospheres into the liquor-tank, which is connected to the receptacle for containing the material or fabric instead of working with the atmospheric pressure exclusively, which is sufficient in most cases.

In the accompanying drawings, the subject-matter of the invention is illustrated in a construction shown by way of example.

Figure 1 is a diagrammatic view, partly in elevation and partly in section, of the entire apparatus. Fig. 2 is a horizontal section on line M M of Fig. 1. Fig. 3 shows in plan view the arrangement of a complete apparatus for industrial purpose on a small scale. Fig. 4 is a sectional side view of a multiple distributer for an apparatus with several keirs for dyeing purposes or for other operations. Fig. 5 is a longitudinal section through a valve for the purpose of automatically reversing the direction of movement of the gases or of the air which are forced into one of the supply-tanks and are aspirated from the other. Figs. 6 and 7 are respectively longitudinal and transverse sections of an intermediate valve which effects a distribution of the gases in any direction desired in order to produce a longitudinal movement of the valve, Fig. 5, at the desired moment.

The apparatus will be described hereinafter only as applied to the dyeing of textile fibers.

The materials to be dyed are placed in one or more perfectly closed receptacles A, known as "keirs," and are retained in these keirs between two perforated diaphragms a a'. In the present case there are provided a series of keirs A′ A² A³ A⁴ A⁵ A⁶, Fig. 3, which are arranged in a circle around a distributer U. (See Fig. 4.) This distributer is provided with two series of pipes q q', arranged at the corners of a regular hexagon. Into the upper part of the distributer U enters the pipe B, which leads off from the supply-tank C, while the pipe B′, which leads off from the supply tank C′, enters the bottom of the distributer.

In Fig. 1, where but one keir A is shown, the pipes B and B′ enter directly underneath the same into a pot V, which serves as a distributer, while in the case of the apparatus with several keirs, as in Figs. 3 and 4, the pipes q and q' enter the distributer U. The keirs A′ to A⁶ are also provided in the middle of their bottoms with pots V of the construction shown in Fig. 1. Such pot V is provided with a short pipe fitting r, which is so arranged and constructed as to be easily connected with the pipes q, Figs. 3 and 4, or with the pipe B, Fig. 1. The pot V extends into the interior of the keir A, where it is provided with a number of openings s. The perforated false bottom a of the keir A is situated

above the pot V. A vertical stand-pipe *t* passes through the said pot V and is rigidly connected to the same, and at its lower part it is connected by means of a flange to one of the pipes *q'*, Figs. 3 and 4, or with the pipe B', Fig. 1. This pipe *t* extends above the upper perforated diaphragm *a'*, and at its upper end it may be provided with horizontal distributing-pipes (not shown on the drawings) for the purpose of distributing the liquid uniformly.

In the supply-tanks C and C' there is produced on top of the dyeing liquor either a pressure of the air or of the gas employed, or a partial vacuum. A fourth tank D, Fig. 1, serves as a gas or air receptacle. The air or gas enters this under pressure through the pipe *b* from an air-pump—as, for instance, from the rotating pump E. The suction-pipe of this pump E is connected to the pipe *c*. If desired, the suction-pipe is connected to a condenser, so as to be able to work with hot liquids. This condenser is not shown on the drawings. The air-pump E forces air or gas through the pipe *b* into the receptacle D. There the air or the gas, respectively, ascends and passes through the pipe *d* into the reversing-valve F, Fig. 1 and Fig. 5. According to the position of a piston in the reversing-valve F the compressed air is conducted into the pipe *e* or into the pipe *e'*, the former of which is connected to the supply-tank C', while the latter is connected to the supply-tank C. From the tanks C or C' the dyeing liquor passes into the keir A, either through the pipe B, which conducts the liquor below the false bottom *a*, or through the pipe B', which conducts the liquor above the upper diaphragm *a'*. During the time when one of the two pipes *e e'*—for instance, the pipe *e*—conducts the compressed gas away the other pipe—for instance, the pipe *e'*—serves for aspiration, and it is connected by way of the reversing-valve F and the pipe *c* with the pump, which produces the aspirating action.

In the rather-frequently occurring case where the atmospheric pressure on one side is sufficient for effecting by itself alone the circulation of the liquids aspirated on the other side the tank D is to be provided with air-cocks, permitting connection of the tank to the atmosphere. In this case the pump is relied upon only for producing the aspirating action instead of for aspirating and forcing, and the entire machine operates only by means of the vacuum. This will of course only be the case where air is used as an operating-gas. If one is compelled to work with other gases of limited source and which are expensive, it becomes necessary not to allow them to escape to the outside atmosphere, but instead of that they have to be sucked off on one side and to be compressed on the other side.

In the two supply-tanks C and C', in which an alternating sucking and forcing action is produced, two floats G and G' are provided, which are freely movable along the rods *g* and *g'*. Each rod is secured at its lower end to a broad disk 1, upon which the float when descending will rest, the float by its weight forcing the rod *g* to descend also. In order to prevent tipping and displacement of the float, it is necessary to provide an accurate vertical guide or a guide with four pillars 2, which are secured to the walls of the tank and which limit the upward and downward movements of the float. By this arrangement every possibility of the float getting stuck is excluded. The rods *g* and *g'* operate an intermediate valve H, which acts upon the reversing-valve F in the following manner: The cover of each of the two supply-tanks C and C' is provided with an opening *i*, through which the rod *g* or *g'* passes, so as to be freely movable. Above each cover a small hermetically-closed hood *h* is arranged, into which the rod *g* or *g'* passes. The upper ends of the rods in the interior of the hood are connected to links 3, which operate crank-arms 4, fixed on horizontal shafts 5. Each shaft passes to the outside of the hood through an air-tight stuffing-box. (See Fig. 2.) At the outside there is also fixed to the shaft 5 the crank-arm 6, which is jointed to link 7, and which latter imparts a horizontal movement to the rod *j*, which in its turn causes the horizontal displacement of the pistons of valve H. When the rod *g* descends, the rod *j'* is moved to the right exactly for a predetermined distance, which depends upon the adjustment of the levers and on the angles which they form with each other.

The dome or hood *h* is provided for the purpose of retaining the gases which escape at *i*. The gases remain in the hood and will be under the same pressure as that prevailing in the corresponding receptacle.

The intermediate valve H is represented in Fig. 1, and details of the same are shown in Figs. 6 and 7. The round valve-casing surrounds the valve proper, which consists of three parallel and connected pistons J K J', between which rigidly-attached and reversely-inclined walls M and M', Fig. 7, are arranged. These two inclined walls are arranged between and connect the parallel pistons in such a manner that according to the position of the valve-pistons J K J' with relation to the four openings N O N' O' they will allow the gases to pass off through N O' and to flow back through O N', as shown in Fig. 7 of the drawings, or the gases pass through N N' and flow back through O O' when the entire valve J K J' has been moved to the left-hand side. The piston-valve J K J' is provided at either side with a valve-rod *j* and *j'*, respectively, and to these rods is connected the system of levers and the rods *g g'*, with the floats G and G'.

The gas which is to be distributed may be of any suitable kind—compressed air, for instance—at slight pressure or steam of two kilograms pressure. The operating-gas enters into the intermediate valve H through the pipe *k*, provided with a valve *l*. As will be apparent from Figs. 1, 7, and 5, the opening O′ of the intermediate valve H is connected by the pipe *m* to the opening *n* of the reversing-valve F. The other opening *n′* of the reversing-valve F is connected by the pipe *m′* with the opening N′ of the intermediate valve H, and the fourth opening O of the intermediate valve H leads to the discharge-pipe. The compressed gas, air, or steam of three kilograms pressure or the like which is admitted through the pipe *k* enters the intermediate valve H at N, passes through O′, the pipe *m*, and the opening *n*, and then operates in the manner hereinafter described. The escaping gas flows through the opening *n′* of the reversing-valve, and it then passes through *m′* into N′ and escapes at O. When the piston-valve J K J′ is moved to the left, the inclined wall M′ of the valve H determines the direction of movement of the gases, the circulation then going on in the opposite direction to that hereinbefore described. The reversing-valve F shows four openings upon its surface, which are designated *e e′ c d* in Fig. 5 (the two latter openings being indicated by the same rectangle) and which corresponds to the four pipes *e e′ c d*, Fig. 1.

In the reversing-valve F is arranged a system of three parallel pistons P Q P′, the three of which inclose the reversely-inclined walls R and R′, which are arranged with relation to each other in exactly the same manner as the walls M and M′ (illustrated in Fig. 7) and which direct the flow of the gases in the same manner, so that the gases flow either to one or the other side. The pistons P Q P′ are provided with a rod *o*, with two adjusting-collars *p p′*, between which a piston S is freely slidable within the cylinder T, Fig. 5. When the several parts of the apparatus, Fig 5, are in the position shown in the drawings, the gas flowing through the intermediate valve H is admitted at *n′*, and it first forces the piston S toward *p′* along the rod *o*. Then the piston S carries the rod *o* along in its course, and the reversing-piston valve P Q P′ is displaced, whereby the direction of flow of the gas is changed, as above described.

By applying the description hereinbefore specified to the entire system (represented in Fig. 1 by way of example) the mode of operation is as follows: If the compressed air in the supply-tank C′ forces the liquid down, the float G′ will also descend. Now at a certain point float G′ pulls down rod *g′*, and the movement of the rod *g′* is transmitted, through the links and levers 3 4 6 7, to the shaft *j* and the parts J K J′ of the intermediate valve H, Figs. 6 and 7. The middle piston K will then be sufficiently moved for uncovering the openings on the side which were previously closed up. The operating-gas will now commence passing to the rear of the piston S of the cylinder T of reversing-valve F, Fig. 5, and it drives the said piston forward. During this time the supply-tank C′ continues to be emptied, and the float G′ will have attained its lowest position, and the openings N N′ O O′ are freely exposed between piston K and piston J′. In this position the piston S acts with its entire force upon the piston-valve P Q P′ and pushes the same suddenly forward, whereby the direction of movement of the aspirating and forcing action and the direction of movement of the dyeing liquor are also immediately and quickly changed. The aspiration is effected in C′, and the action of the pressure commences in C. The movement of the liquid in the keir A is changed in accordance therewith. If it is desired to change the direction of movement again when the float has arrived at its lowest point, the action exerted upon the intermediate valve H produces the effect of compressing the operating-gases in the conduit. The piston S is thereby displaced as far as the adjusting-collar *p*, and the pressure exerted upon loose piston S will force the piston-valve P Q P′ again to the left, as shown in Fig. 5.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An apparatus for the treatment of textile materials, which consists of one or more keirs and two liquid-supply tanks, each provided with a float and adapted to contain a gaseous medium under different pressure, in combination with a gas-tank, a pump connected thereto for energizing the flow and means for reversing and controlling the flow.

2. In an apparatus for treating textile materials, a keir with two perforated diaphragms, two liquid-supply tanks, a pot underneath the keir and connected to one of the supply-tanks and opening into the bottom of keir below the lower diaphragm and a standpipe rising through the pot to the upper part of the keir and opening into the same above the upper diaphragm and also connected to the other liquid-supply tank.

3. An apparatus for treating textile material, comprising one or more keirs, two liquid-supply tanks containing floats and adapted to contain a gaseous medium under different pressure, a reversing-valve for regulating the flow of the gas, a pump for energizing the flow and an intermediate valve connected to and operated by the floats of the supply-tanks substantially as shown and described.

4. An apparatus for treating textile materials, comprising one or more keirs, two liquid-supply tanks having floats with a rod

from each float extending up through an opening in the top of the tank, a hermetically-closed dome extending over the tops of the tanks, a horizontal rock-shaft extending through the dome and having one crank-arm connected to the rod of the float within the dome and an external crank-arm and a valve operated by the same.

5. In an apparatus for treating textile materials, one or more keirs, a pump, two liquid-supply tanks having floats, an intermediate valve operated by the floats and a reversing-valve with loosely-sliding piston and stop projections, said reversing-valve being operated through the intermediate valve and serving to permit a complete movement of the floats, as described.

6. In an apparatus for the treatment of textile materials, one or more keirs, two supply-tanks with floats, a pump, slide-valves operated by the floats for reversing the flow of liquids and gas, said slide-valves being constructed in the form of three parallel pistons spaced apart but rigidly connected together by two reversely-inclined partition-walls, and having an inclosing case with four-way openings for inlets and outlets.

7. An apparatus for the treatment of textile material consisting of a series of keirs, two liquid-supply tanks, a pump with connecting pipes and valves, a single pot in common to and connecting a plurality of keirs and consisting of two chambers, one chamber being connected to one supply-tank and the other to the other supply-tank, and an individual pot arranged in the bottom of each keir and having an outlet into the bottom of its keir and a stand-pipe opening into the top, said individual pot and stand-pipe being respectively connected to the two chambers of the common or multiple pot.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

OTTO OBERMAIER.

Witnesses:

MICHAEL ZIMMERMANN,

FRIEDRICH SCHAEDLER.