C. W. FULTON.

APPARATUS FOR TREATING TEXTILE MATERIALS WITH LIQUIDS.

APPLICATION FILED MAY 23, 1912.

**1,083,360.** Patented Jan. 6, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

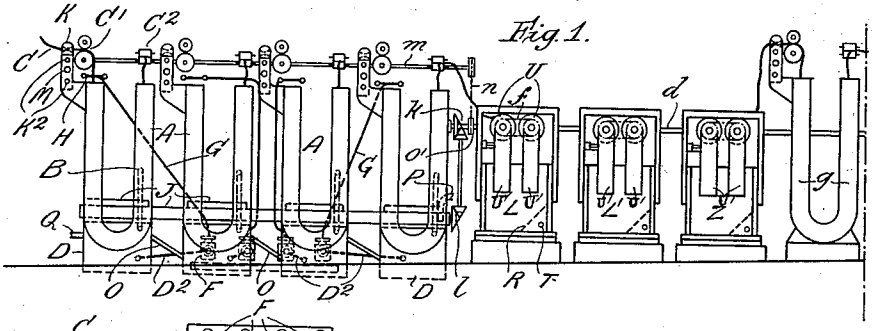


Fig. 2.

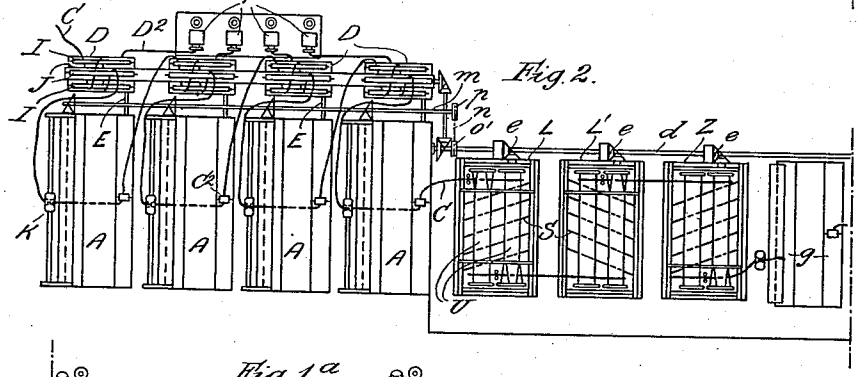


Fig. 1a.

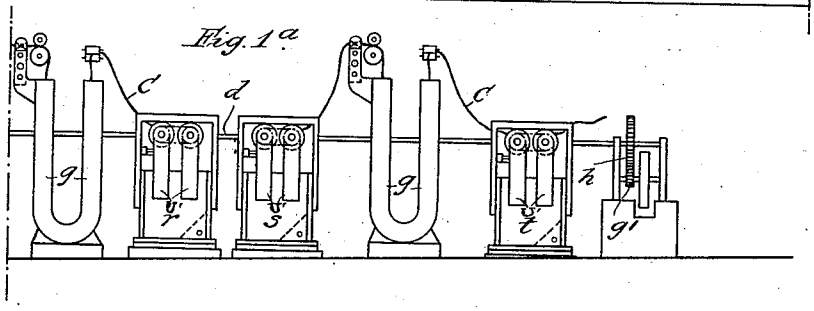
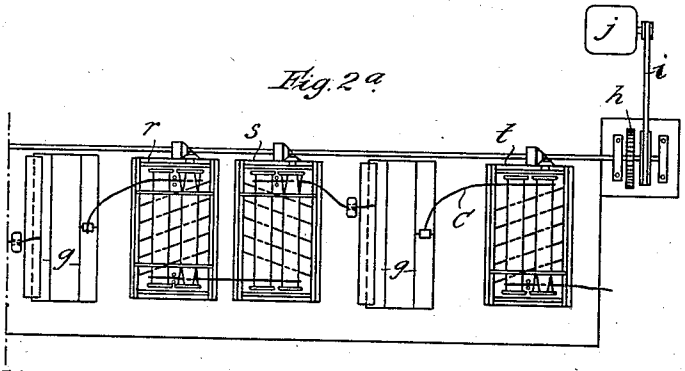


Fig. 2a.



WITNESSES:

M. E. Rathvon

S. J. Henderson

INVENTOR:

Charles William Fulton

By Calvert Calvert Attys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

C. W. FULTON.

APPARATUS FOR TREATING TEXTILE MATERIALS WITH LIQUIDS.

APPLICATION FILED MAY 23, 1912.

**1,083,360.**

Patented Jan. 6, 1914.

2 SHEETS—SHEET 2.

Fig. 3.

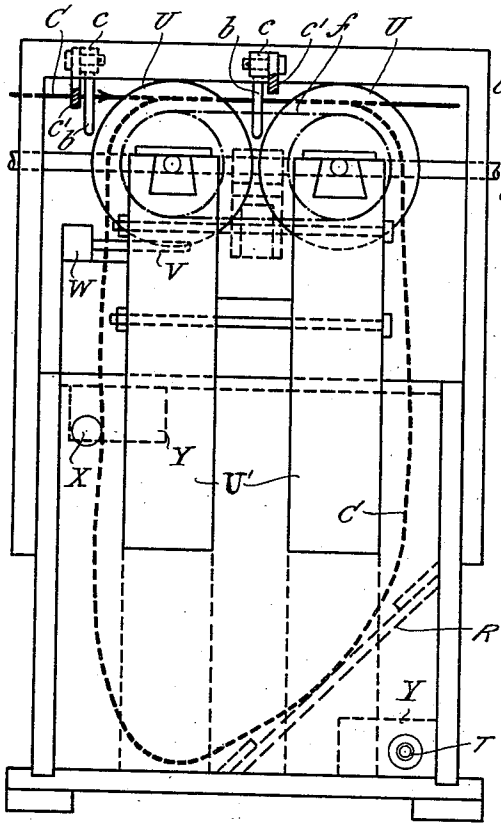



Fig. 4.

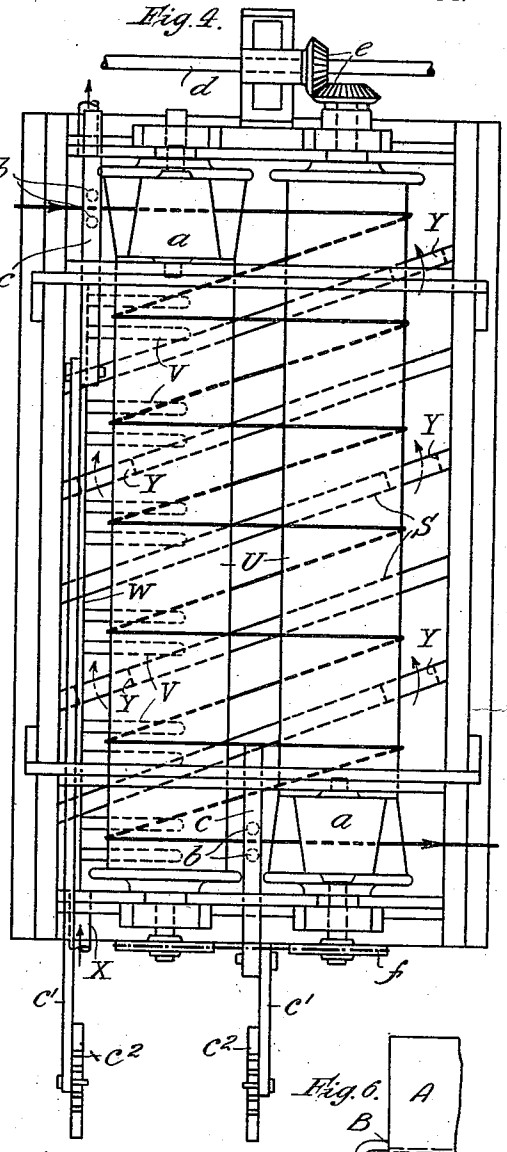



Fig. 7.

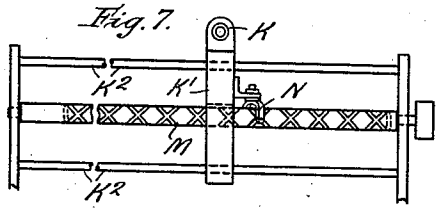



Fig. 5.

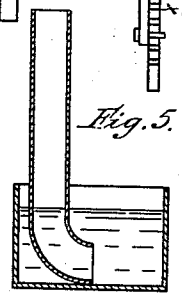
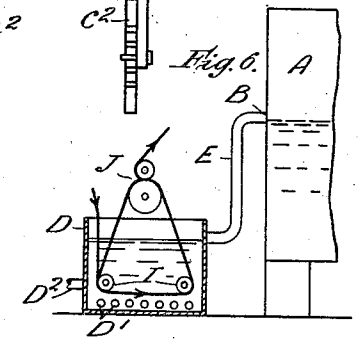


Fig. 6.




WITNESSES:

M. E. Rathvon

S. J. Henderson

INVENTOR:

Charles William Fulton

By Albert G. Davis Atty.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

CHARLES WILLIAM FULTON, OF PAISLEY, SCOTLAND.

## APPARATUS FOR TREATING TEXTILE MATERIALS WITH LIQUIDS.

1,083,360. Specification of Letters Patent. Patented Jan. 6, 1914.

Application filed May 23, 1912. Serial No. 699,161.

*To all whom it may concern:*

Be it known that I, CHARLES WILLIAM FULTON, a subject of the King of the United Kingdom of Great Britain and Ireland, and residing at Paisley, Renfrewshire, Scotland, have invented a certain new and useful Improvement in Apparatus for Treating Textile Materials with Liquids, of which the following is a specification.

This invention relates to a system of apparatus applicable to certain industrial processes in which textile materials are subjected to successive treatments or stages of treatment, frequently of unequal duration, with liquids, generally involving, according to the practice at present in vogue, interruptions between the treatments or stages of treatment, the unequal duration of the various treatments or stages of treatment entailing the necessity for the provision of facilities for storage of the materials being handled and also occasioning difficulties in adjusting the speed of various moving elements of the system in relation to one another.

To instance a particular case: In the bleaching of cotton goods, as widely practised at present, the goods are first boiled in caustic or soda ash in keirs or like apparatus, then washed, then "chemicked" and allowed to stand for several hours in the "chemic" in large piles, on the floor or in tanks, then washed again, then treated with acid and then, usually with an interruption of the process at this stage, finally washed. To confine the illustration to the case of bleaching it may here be noticed that the process as commonly practised up till now, if performed once only, is attended with considerable drawbacks well appreciated by those acquainted with the art. For instance, an unnecessary amount of time is spent in the discharging operation. Again, if the goods be piled up after having passed through the "chemic" machine they may run for say two hours before the pile is complete; and, if three hours elapse before the commencement of the operation of drawing them away, the uppermost piece lies only three hours in the "chemic", while the undermost piece lies seven hours. For this reason, and also because the strength and duration of action of the liquids used in the process are liable to vary, variations are apt to be produced in the bleach which in turn are frequently shown up as inequality in dyeing. It is therefore not unusual to subject the goods twice to the aforesaid operations, so as to eliminate or reduce variations in the bleach; and in the repetition of the process to provide that the goods which lay at the bottom when piled up in the "chemic" for the first time should come to the top of the pile the second time.

The system of apparatus forming the subject of this invention is not only applicable for bleaching, but is also suitable for other purposes, it being understood that the general construction, arrangement and mode of operation may remain substantially the same although the composition of the liquids, etc., and the sequence and arrangement of the elements may be varied according to the nature of the process for which the apparatus is used.

For the sake of brevity I will describe the apparatus simply as a bleaching apparatus and indicate the advantages to be derived from its application to bleaching. The advantages in question are attributable in large part to the circumstance that duplication of any of the steps of the process may be avoided, and that an opportunity is offered of performing all of the steps of the process concurrently, *i. e.*, the process is rendered continuous, and, as far as possible, automatic. The most important of these advantages are as follows:—(1) Reduction in labor costs. (2) Uniformity of strength and duration of action of the chemicals and consequent uniformity of the bleach. (3) Saving of chemicals. (4) Ability to run heavy and light goods indiscriminately through the same process. (5) Absence of strain on the goods.

I will now proceed to describe the function of the apparatus as applied to the bleaching of cotton piece goods say.

The goods are first cleaned or discharged in one or more receptacles hereinafter described, then run at a high speed in rope form through one or more hot-washing machines, one or more cold-washing machines, and a "chemic" machine; then are delivered to one or more storage receptacles capable of holding a large quantity of fabric, the capacity of the said storage receptacle or receptacles being such that the fabric received therein is delivered therefrom only after the expiry of a period necessary for completion of the chemicking operation; the goods are then preferably led through one or more

washing machines, an acid machine or machines, another storage receptacle or receptacles, and a further washing machine or machines, and may then be led into barrows or the like or to a beater opener.

The various machines through which the goods are led are operated in unison, means being provided whereby the speed of the goods leaving or entering the machines may be regulated as required.

I will assume that the number of machines constituting the system is limited as hereinafter appears, though of course it will be understood that a smaller or larger number of machines may be used.

In the accompanying drawings Figures 1 and 1ª are an elevation and Figs. 2 and 2ª are a plan showing diagrammatically a general arrangement of apparatus embodying the invention; Fig. 3 is an elevation and Fig. 4 is a plan of one of the washing machines hereinafter referred to; Fig. 5 shows a modification; Figs. 6 and 7 show details.

Referring to the drawings, the apparatus comprises one or more receptacles A each consisting preferably of a vertical U-shaped trough one limb of which is provided with a lateral outlet B, communicating with a tank D, hereinafter more fully described (see Fig. 6). The goods C pass through each receptacle A, by way of guide rolls C′, being assisted in their passage by the liquid which tends to float them around the curved bottom of the receptacle or each receptacle toward the outlet thereof, the receptacle or receptacles being of such capacity that the time occupied in the passage of the goods through the same is sufficient for the goods to be thoroughly acted on by the liquid.

Adjacent the receptacle or each receptacle A is a tank D, shown particularly in Fig. 6, containing liquid and communicating with the outlet B of one limb of the receptacle by means of a pipe connection E, a pump F or the like connected to the tank D by a pipe $D^2$ being provided to force the liquid from the tank D into the other limb of the receptacle by means of a pipe connection G which is shown attached to a device H for spraying the liquid on to the goods entering the receptacle; the tank or each tank D may be provided with heating coils $D^1$. Alternatively, as shown in Fig. 5, the receptacle or each receptacle may comprise an incomplete U-shaped member the lower end of which is immersed in a tank containing liquid.

By preference, arranged within the tank or each tank is or are one or more guide rolls I and above each tank are fitted coöperating pressure rolls J, so that the goods may be led through the liquid in the tank, around the guide roll or rolls I, between the pressure rolls J, back around the guide roll or rolls I, again between the pressure rolls J and thence through a reciprocatory guide member K located over the receiving end of the receptacle into and through the receptacle, whence they may be led by way of guide rolls $C^2$ to a second tank and through a second receptacle, or, as shown, through a series of such tanks and receptacles consecutively, or thence to the first washing machine L. As shown particularly in Fig. 7, the said guide member K moves with a block $K^1$ which is reciprocated on guide bars $K^2$, for instance by means of a rotatable spindle M having right and left hand screw-threads engaged alternately by a finger N on the block $K^1$, so that the block is first caused by operation of one thread to travel to one end of the spindle M, whereupon the finger N is thrown into engagement with the other thread and the block moved to the other end of the spindle, and so on—all in a manner well known.

The tanks D, (if more than one receptacle and tank be provided) are preferably in communication with one another, by means of pipe connections O, the liquid being caused to flow from one tank to another in the direction counter to that of the passage of the goods. As shown, the liquid is introduced through a pipe P communicating with the tank D nearest the outlet end of the series and discharged through a pipe Q leading from the tank nearest the inlet end of the series.

The first washing machine L is formed as a box-like structure or tank with a sloping false back R and is divided into compartments by a series of vertical partitions S which are preferably inclined or diagonally arranged within said tank as shown in Fig. 4. A steam pipe T may be fitted behind the sloping back R and arranged to direct a jet or jets of steam against the goods lying on the sloping back R to assist in causing them to slide down such sloping back without becoming entangled, while serving to heat the liquid.

Fitted overhead the washing machine L and journaled in brackets $U^1$ are two drums or reels U over which the fabric passes and whence it falls into the first compartment of the washing machine dropping down the sloping back R and being brought up the opposite side, passing between guiding fingers V on a bar W and straight over at right angles to the axes of the drums, and thence into the second compartment, and so on until it comes to the opposite end of the washing machine and is led to the next machine.

It will be understood that the path of the materials through the washing machine is more or less zig-zag, the inclined partitions S serving to guide the fabric along the machine in stages. The pure washing water is led at X into the last compartment and flows into one compartment after an-

other by way of an opening Y in each of the partitions S until it reaches the first compartment; the washing being thus effected on the counter-current principle. From the first washing machine L the goods are led to a second washing machine $L^1$ of similar construction but in which the partitions S are inclined in the opposite direction. From the second washing machine $L^1$ the goods are led to the "chemicking" machine Z which is constructed similarly to the first washing machine. At the delivery from, and, if desired, at the entrance to, each machine the drum or reel U is cone-shaped, coöperating with a nipping roller *a*, the fabric passing between a pair of fingers *b* on a bar *c*, shown particularly in Fig. 4, which is capable of being adjusted as by means of an extension $c^1$ provided with a detachable pin adapted to engage a notched fixture $c^2$, so as to vary the speed of entrance or exit of the goods from the machine in question.

The machines L, $L^1$ and Z may be driven by a horizontal shaft *d* and bevel gearing *e*, one drum U of each pair being geared to the other by means of a chain *f*. As shown, the shaft *d* is operable by means of spur gearing $g^1$, *h* and a belt *i* from a motor *j* and is adapted to operate the lower pressure roll J by means of bevel gearing *k*, *l*, the shaft *m* for driving the lower guide rolls $C^1$ being also operable from said shaft *d* by means of a chain *n* and wheels $o^1$, *p*.

To insure that the goods shall be subjected for sufficient time to the action of the "chemic," I may provide one or more liquid-containing storage receptacles *g* which may be of the construction shown in Figs. 1, $1^a$ or shown in Fig. 5. As shown, for example, the goods pass from the chemicking machine Z, by way of reciprocatory guiding members and guide rolls arranged in substantially the same manner as described with reference to the receptacles A, through two U-shaped receptacles *g*, thence through a machine *r* where the goods are washed with water, through a machine *s* where they are subjected to the action of acid, through a third storage receptacle *g* and then through a washing machine *t*, said machines *r*, *s* and *t* being constructed similarly to the machines L, $L^1$ and Z.

Having now described my invention what I claim and desire to secure by Letters Patent of the United States is:—

1. In apparatus for treating textile materials with liquids, a washing machine formed as a box-like structure, diagonally arranged partitions dividing said structure into compartments, and devices for leading the materials through the compartments in a zig-zag path.

2. In apparatus for treating textile materials with liquids, a washing machine formed as a box-like structure having a sloping false back, diagonally arranged partitions dividing said structure into compartments, devices for leading the materials through the compartments in a zig-zag path, and a steam pipe located behind said false back.

3. In an apparatus for treating textile materials with liquids, a washing machine formed as a box-like structure, diagonally arranged vertical partitions dividing said structure into compartments, and devices for causing the materials to travel through the compartments in a zig-zag path.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES WILLIAM FULTON.

Witnesses:

WALLACE CRANSTON FAIRWEATHER,

JOHN MCCLEARY.

**Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."**