H. L. GANTT.

PILING MECHANISM FOR FABRICS.

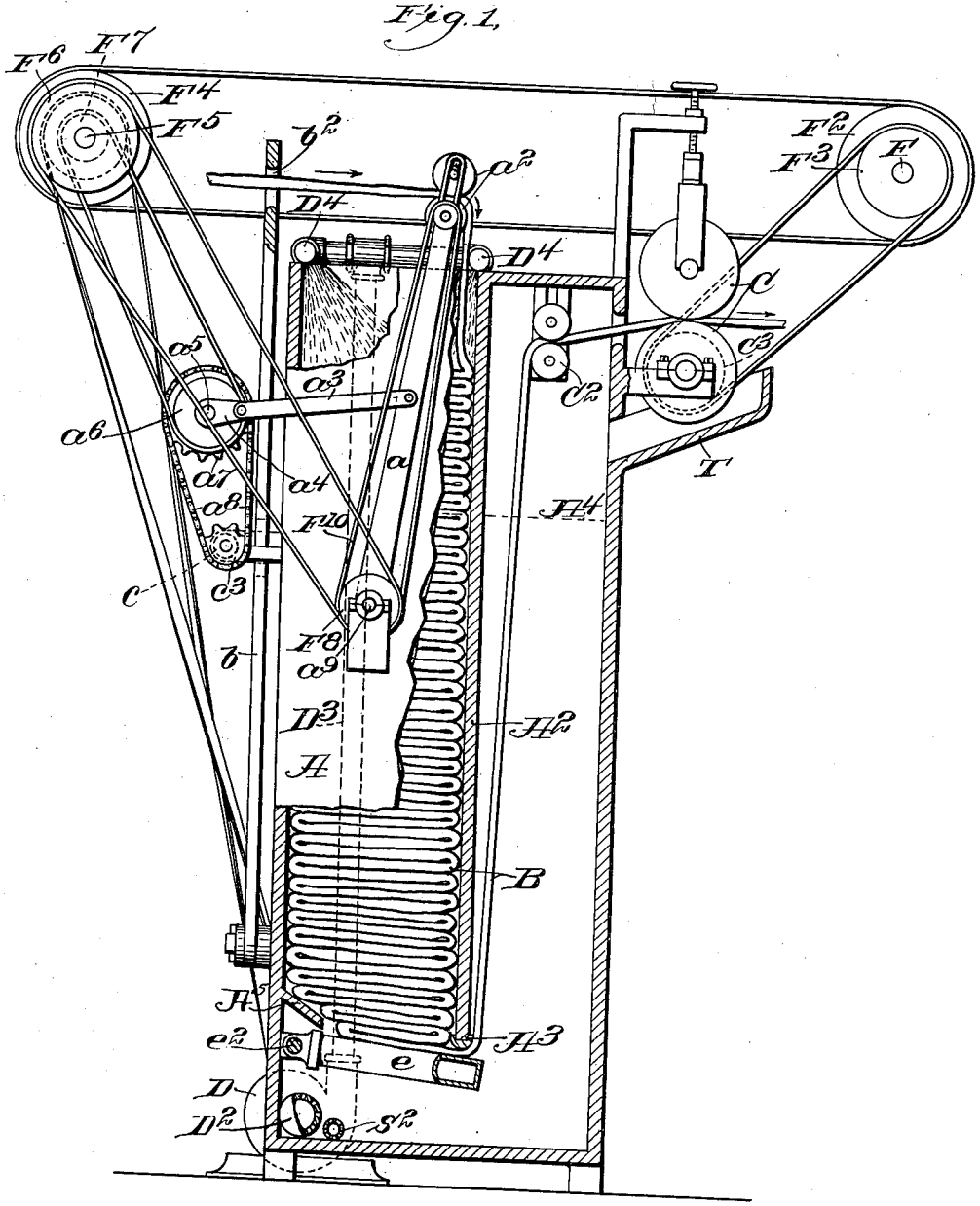
APPLICATION FILED JAN. 13, 1908.

1,074,567.

Patented Sept. 30, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses;

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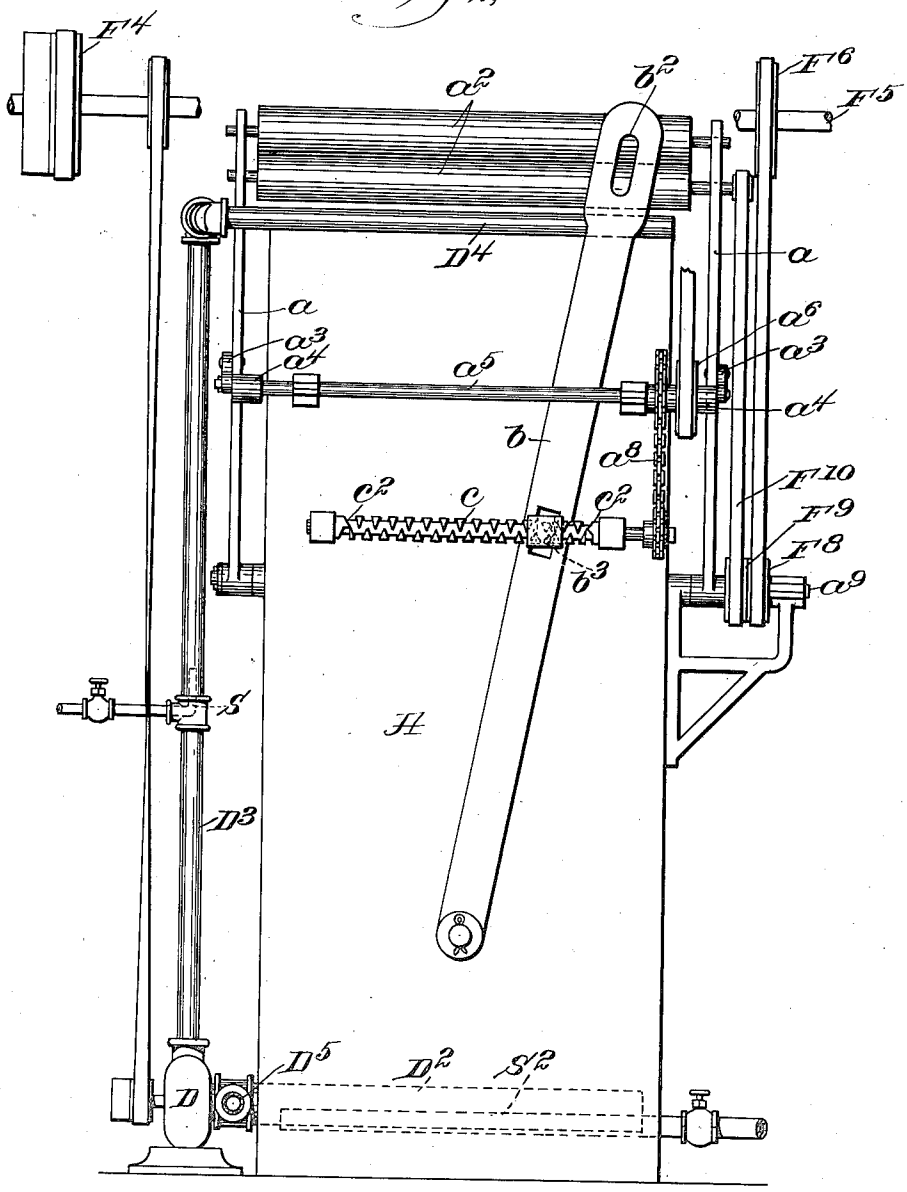
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

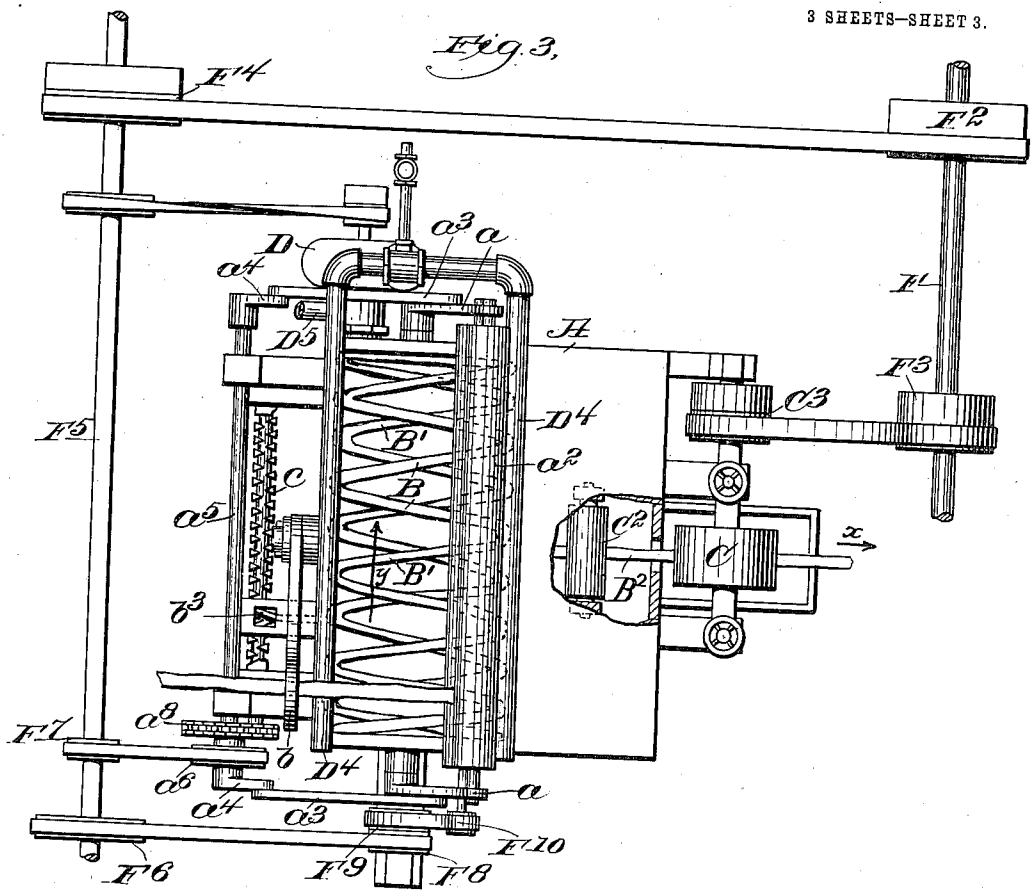
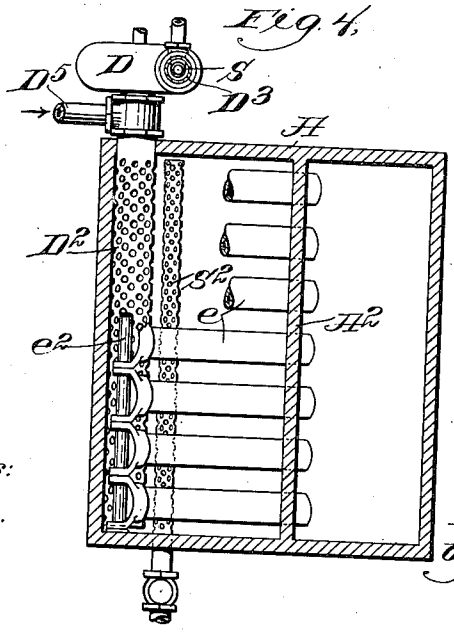


Fig. 4.



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UNITED STATES PATENT OFFICE.

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PILING MECHANISM FOR FABRICS.

1,074,567. Specification of Letters Patent. Patented Sept. 30, 1913.

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To all whom it may concern:

Be it known that I, HENRY L. GANTT, a citizen of the United States, residing in Pawtucket, in the county of Providence and State of Rhode Island, have invented an Improvement in Piling Mechanism for Fabrics, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to a continuous processing apparatus for fabrics, and is applicable to bleaching or analogous processes in connection with what is known as a keir or vat in which the fabrics are subjected to any process involving the use of a liquid.

The keirs now commonly in use in bleacheries consist of large tanks or vats adapted to contain the liquid used in carrying out the process required, and the fabric is usually piled in these keirs by hand before the solution is put in. The heating of the contents of the keir requires time after the keir has been filled, which time is saved by the use of the apparatus embodying this invention, as will be hereinafter described. In order to produce a circulation of the liquid, the steam may be intermittingly admitted, or a pump or some similar expedient may be employed, and while the liquid may be caused to circulate satisfactorily the process is apt to result in an uneven treatment of the fabric, owing to the irregular packing of the said fabric, and the consequent uneven distribution of the solution throughout the mass owing to the different density of the fabric in different parts due to the lack of uniformity in the pile. Moreover, much time is consumed in piling in the fabric before the boiling process is begun, and in pulling the fabric out after the process has been finished.

The present invention is mainly embodied in the combination with automatic devices for systematically laying or piling the fabric in the keir, of means for maintaining a large amount of fabric in the keir without tangling, continuously supplying and withdrawing the fabric, and uniformly saturating the fabric with the liquid. In accordance with the invention, the fabric is laid or piled in such a way that circulation can be uniformly maintained and all parts of the fabric can be substantially equally exposed to the action of the solution; while the fabric can be continuously withdrawn, layer after layer, from the bottom of the pile, without destroying the continuity of the layers above or tangling the fabric. Furthermore, as the fabric enters the keir, it is subjected at once to the action of the hot liquid, which is delivered in streams on the top of the pile, and the fabric is then saturated and heated, layer after layer, so that the time required to heat a large mass of fabric until the liquid in which it is submerged reaches the boiling point, is entirely saved.

To sum up, the apparatus embodying the invention is provided with means for saturating the fabric with liquid, piling it into a keir of liquid, and withdrawing it therefrom, all of the above steps in the process being carried on simultaneously and continuously. With this system employed, I have discovered that the time required for the proper action of the solution upon the fabric is so greatly reduced that it becomes practicable to withdraw the fabric continuously from the keir, so that the treated fabric can be continually withdrawn, while the untreated fabric is continually piled in. The entire bleaching process consists of two different boilings of the fabric with a number of intermediate processes to which the fabric is subjected between the boilings, it being unnecessary to describe these processes in detail, the fact being mentioned merely to indicate how the entire bleaching process can be facilitated by the use of a continuously operating keir, as distinguished from one which must be packed and discharged by hand, and in which the boiling must be carried on for a comparatively long time owing to the unsystematic packing of the material.

With the objects above set forth in view, the keir is provided with a feeding mechanism for the fabric, which is customarily boiled in the keir in rope form, this feeding mechanism consisting in devices for systematically piling or laying the fabric so that the layers will contain substantially equal

amounts of fabric, while the mass of fabric will not be so compact as to prevent free circulation of the liquid between the top and bottom of the tank. The expression "rope form" is used as implying that the cloth, instead of being laid in flat, is loosely drawn or bunched into a rope-like mass, the purpose being to facilitate the piling in and drawing out of the fabric. In accordance with the invention, the fabric is piled into the vat by means of drawing rolls which rotate to pull the fabric forward, and reciprocate to lay the fabric in zig-zag folds in the keir, combined with a guide member which produces a lateral movement of the fabric from one end of the rolls to the other. The movements of these coöperating members may be so proportioned to each other that the fabric will be piled in such a manner that the strands in successive layers will cross each other, thus forming latticed layers and producing a practically self-sustaining pile and leaving substantially regular spaces throughout the mass for the proper permeation of the liquid.

The liquid in the keir is heated and caused to circulate, the arrangement being such that the hot liquid is directed in a heavy spray against the fabric as it enters the keir, and before it becomes submerged in the liquid therein. The circulation and heating may be provided for in any suitable or usual way, the apparatus being herein shown as provided with a circulating pump and means for injecting live steam into the liquid.

The keir is provided with a fabric-containing portion, the bottom of which is above the bottom of the keir, and the fabric contained in said portion is pulled out endwise from the bottom of the pile, layer after layer. Inasmuch as the circulating liquid is liable to displace the strands in the layers at the bottom of the pile and thus to cause them to tangle, the apparatus is shown as provided with means for maintaining the strands in their original relative position in the lower layers of the pile and for preventing the action of the circulating liquid from unduly displacing them.

Figure 1 is a side elevation of an apparatus embodying the invention, with parts broken away and shown in section; Fig. 2 is a rear elevation of the same; Fig. 3 is a top plan view; and Fig. 4 is a horizontal section.

The invention is herein shown in connection with a keir consisting of a vat or tank A provided with a secondary inner wall A^2 which terminates above the bottom of the tank, as indicated at A^3. The space between this secondary wall and one of the outer walls of the tank which constitutes what will be termed the fabric-containing portion, is arranged to contain the rope of fabric B which is to be subjected to any process which forms part of the bleaching operation. The keir is intended to be filled with the proper solution, usually about to the level indicated by the reference letter A^4, and the fabric is piled into the space between the outer wall of the keir and the wall A^2, as indicated, and is partially supported by a ledge A^5 (Fig. 1) forming a slightly contracted opening at the bottom of the fabric-receiving space, the lower end of the line of fabric being drawn up around the lower end A^3 of the supplemental wall, so that it can be carried away by means of suitable rolls C toward which it is guided by rolls C^2. The rolls C serve also to squeeze out a certain portion of the liquid which falls in the trough T and drains back into the keir. In order to keep the liquid in the keir in circulation and to saturate the fabric thoroughly and evenly, the apparatus is shown as provided with a circulating pump D having an inlet pipe D^2 with lateral perforations to receive or suck in the liquid from the bottom of the tank, the outlet passage from said pump consisting of a pipe D^3 which communicates with spraying pipes D^4 arranged along the upper edges of the walls of the keir so as to direct streams of liquid downward upon the fabric as it enters. To heat the liquid, steam is admitted to the circulating pipe through a jet orifice S; and the keir may be further provided with a steam pipe S^2 near the bottom, through which steam is blown into the liquid. The keir may be originally supplied with liquid through an inlet D^5. By this construction, the fabric is immediately saturated with the hot liquid as it enters the keir, and the time necessary to saturate and heat a large mass of fabric, which is consumed when the keir is filled by hand, is thereby saved. The liquid directed in streams upon the top of the pile, as shown in Fig. 1, thoroughly saturates the fabric as it enters the keir, and every layer receives this thorough saturation at the start, so that the treatment is uniform throughout, and not unequal, as is apt to be the case when the fabric is promiscuously piled in before the keir is supplied with liquid. Furthermore, the hot liquid, impinging upon the fabric as it falls, heats the fabric before it becomes submerged, and the time necessary to heat a mass of fabric to the boiling point, as in the old process, is saved.

In order to lay the fabric in the keir in such a way as to expose all parts thereof equally to the action of the liquid, and at the same time to admit of the continuous filling in and removal of the fabric, the keir is provided with a feeding mechanism which consists of members *a* provided with

a pair of rolls a^2 arranged to receive the rope of fabric between them so as to carry the same along from the source of supply in the direction of the arrows. In order to arrange the fabric in the keir, these rolls are arranged to be reciprocated, the arms a being shown as pivotally supported and connected by means of links a^3 with crank arms a^4 on a shaft a^5 which is arranged to be continuously rotated in any suitable or usual way. This movement of the arms a will lay the rope of fabric back and forth in layers; but it is necessary, in order to fill the keir, that the layers should be extended laterally across the keir, as well as longitudinally. With such a formation, the strands in adjacent layers will be in the form of V-shaped loops, thereby leaving substantially uniform spaces throughout the mass. To this end, the rope of fabric is further acted upon by means of a guide arm b which is provided with a guide eye b^2 and is arranged to reciprocate in a direction transverse to that of the arms a. In order that the movement of these two members may be proportioned to suit the proper laying of the fabric, they are arranged to be operated by common mechanism, so that the right proportion of movement can be attained. In the construction shown, the arm b, which is also pivotally supported, is arranged to be reciprocated by means of a rotating member c which is herein shown as connected with the shaft a^5 by means of a chain and sprocket wheels. This rotating member or shaft c is provided with right and left hand screw threads, there being two lines of threads crossing each other. The arm b is acted upon by a swiveled forked member b^3 adapted to enter these screw threads and to be caused thereby to travel longitudinally along the shaft and thereby move the said arm. At each end of the shaft c, a cam c^2 is located which is arranged to tip the swiveled fork and throw it from one thread into the other, so that each time the arm b reaches the end of the shaft its movement will be reversed. The combined movement of the arms a and b results in the piling of the fabric in layers, so that the fabric is evenly and uniformly disposed in the keir, whereby practically the entire surface is equally exposed to the action of the liquid.

The means above described for moving the rolls a^2, and the arms b, are such that the proportioning of the transverse movement of the fabric which forms a feature of the invention may be easily attained, the proportion being such that those of the strands of fabric in which the layers run in the same direction will be parallel and superimposed, the fabric thus being piled in accordance with the configuration shown in plan view of Fig. 3, that is to say, in substantially uniform piles with vertical spaces extending from the top to the bottom of the tank to insure a rapid and free circulation of the liquid. It is obvious, however, that other means for accomplishing this result may be employed, without departing from the invention.

In the construction shown, the mechanism is all driven from the main shaft F provided with two pulleys F^2 and F^3 connected respectively by belts with a pulley F^4 on a countershaft F^5 and a pulley C^3 on one of the rolls C which draw the fabric from the keir. The countershaft F^5 is provided with two pulleys F^6 and F^7, the latter being connected by means of a belt with a pulley a^6 on the shaft a^5. This shaft, in turn, is provided with a sprocket wheel a^7 which is connected by means of a chain a^8 with a sprocket wheel c^3 on the end of the shaft c, so that the proportionate drive of the rolls a^2 and the guide arm b can be easily varied by merely changing the sprockets. The rolls themselves are driven from the pulley F^6 which rotates a pulley F^8 located at the lower end of the arms a, this pulley driving a shaft a^9, which, in turn, is connected by means of a pulley F^9 and a belt F^{10} with the lower roll. The result of this systematic piling of the fabric is that the boiling process can be satisfactorily finished in a very short time, so that the fabric once started through the keir can be continuously piled in at the top and drawn out from the bottom without the necessity of stopping the process while the keir is being loaded and unloaded.

In order that the keir may contain a large amount of material at one time, and at the same time admit of the withdrawal endwise of the fabric from the bottom of the pile, the device is provided with supporting means for the pile arranged to maintain the formation thereof and to keep the bottom of the pile above the bottom of the keir. It is also desirable that the supporting means should be of such a nature as not to interfere with the circulation of the liquid throughout the fabric containing portion; and moreover that they should tend to maintain the original arrangement of the fabric and prevent the displacement thereof through the action of the circulating liquid.

In the construction shown, the support consists of a ledge A^5, and a series of arms or fingers extending from said ledge across the bottom of the fabric containing portion, and so arranged with relation to the piling mechanism that the rope of fabric lies generally lengthwise of the arms, and the members of each loop thus travel along instead of across the said arm, as they are pulled out endwise. While, therefore, the support extends substantially across the entire bottom

of the pile, it does not materially interfere with the withdrawal of the lowermost layer. The purpose of the support is largely to act on the closed ends of the loops at opposite sides of the pile, and while the ledge and the arms together constitute what I believe to be the best practical embodiment of the invention, it is obvious that either element might in some cases be dispensed with. The arms may furthermore be arranged to yield individually, it being practicable to construct them, as shown, of hollow metallic bodies or other buoyant devices e pivotally connected at one end, as at e^2, and having a tendency to press upward yieldingly against the bottom of the pile. The support thus afforded for the pile of fabric may be described as locally yielding, the purpose being to arrange the support so that that part which is in the path of the line of fabric being withdrawn can yield while the remander of the support keeps its normal position.

Claims—

1. A piling mechanism for fabrics consisting of drawing rolls movable in a direction transverse to their axes to draw the fabric from a source of supply and arrange the same in folds, combined with a keir having a portion to receive the folded fabric, said portion being open at the bottom and terminating above the bottom of the keir; means for sustaining the fabric above and free from the bottom of the keir; and devices for drawing the folded fabric endwise from the bottom of the pile thus sustained.

2. A keir provided with an inner retaining wall for the fabric terminating above the bottom of the keir; a yielding bottom member to support the fabric; means for withdrawing the fabric through the space between said retaining wall and said bottom member; reciprocating members transversely movable with relation to each other located over the top of the keir for piling the fabric in the keir; and means for producing circulation of the liquid in the keir.

3. A keir provided with a fabric containing portion having an inner retaining wall terminating above the bottom of the keir, reciprocating members transversely movable with relation to each other located above the keir for piling fabric into the fabric containing portion, means located under the pile of fabric for supporting the pile and maintaining the original configuration of the lower layers thereof, means for withdrawing the fabric endwise from the bottom of the pile layer after layer, and means for producing the circulation of the liquid in the keir.

4. A keir having a fabric containing portion, provided at its bottom with a series of parallel members to support the pile of fabric, combined with piling mechanism adapted to lay the fabric in loops, the strands of which extend generally lengthwise of said parallel members.

5. A keir provided with a fabric containing portion having an inner retaining wall terminating above the bottom of the keir; reciprocating members transversely movable with relation to each other located above the keir for piling fabric into the fabric-containing portion; means located under the pile of fabric for supporting the pile and maintaining the original configuration of the lower layers thereof; means for withdrawing the fabric endwise from the bottom of the pile layer by layer; and means for saturating the fabric with flowing liquid before it is submerged in the liquid in the keir.

6. The herein described means for subjecting fabric to a continuous process carried on in a receptacle, which consists in the combination with the receptacle; of means for filling the receptacle with a pile of fabric regularly arranged in horizontal layers, each layer consisting of loops extending back and forth through the receptacle; means for drawing the lower end of the fabric thus piled out of the receptacle in a horizontal direction and in a direction generally lengthwise of the loops; and means for delivering liquid into said receptacle in downwardly directed streams impinging on the top of the pile of fabric.

7. The combination with means for piling a rope or strand of fabric in layers in a receptacle containing liquid, and means for withdrawing the bottom layer; of means for retaining the strands of the bottom layer in their original relative position in order that they may be withdrawn without tangling; and means for continuously ejecting liquid on the top of the pile as it is formed.

8. The combination with a keir having a fabric containing portion, provided with a fabric support at its bottom; of transversely movable reciprocating members to fill said fabric containing portion with a regularly arranged pile of fabric; means for withdrawing the fabric from the bottom of said pile; and means for continuously ejecting liquid on the fabric as it enters the keir.

9. The herein described apparatus for continuous processing, which consists in the combination with a receptacle for liquid, provided with a fabric containing portion, of means for filling said fabric containing portion with a vertical pile of rope-form fabric in regularly arranged layers; means for supporting said pile of fabric in its vertical formation; means for withdrawing said fabric from the bottom of the pile; means for heating the liquid; and means for spraying hot liquid on the top of the pile.

10. A keir provided with reciprocating draw rolls to draw fabric from a source of

supply and deliver the same into the keir; a device for continuously spraying the fabric with liquid as it enters the keir; means for supporting the pile of fabric above the bottom of the keir; and means for withdrawing the fabric from the bottom of the pile.

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

HENRY L. GANTT.

Witnesses:
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