To all whom it may concern:

Be it known that I, CHARLES HENRY FISH, of Dover, county of Strafford, and State of New Hampshire, have invented an Improvement in Apparatus for Continuous Web-Steaming, 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 an apparatus for steaming fabrics, as is necessary for the development of certain colors used in dyeing or printing, or for the steaming of any article in the web state. In many instances the best results are not obtainable from the steaming process unless the fabric or article to be steamed is subjected to the action of steam under pressure, it being essential in this instance that the fabric should be included in a steam-tight chamber in order that the desired pressure may be obtained. In carrying out the process of steaming under pressure heretofore the said fabrics or webs have been either folded or draped upon racks within a chamber adapted to be closed, so as to be steam-tight and to have steam admitted thereto under pressure, it obviously being essential that after the fabric has been subjected to the action of the steam for a certain length of time the steam must be turned off, the chamber opened, and the material removed and other material which is to be operated upon placed in the chamber, thus involving great labor and waste of time. It is impracticable, moreover, by this method of carrying out the process to steam a very large amount of material at a time, as it is desirable to have it hung or draped upon racks or otherwise arranged so that the various parts will not be in close contact with each other, but loosely open to the action of the steam. The process of steaming fabrics or webs has also been carried out by exposing the fabric or web to steam which is not under pressure—as, for example, by letting large amounts of steam escape into an inclosed space or room where the fabric or web is either hung up or is passed through continuously. This process, however, is wasteful and requires a much longer time than when the fabric is subjected to the action of steam under pressure and even under the most favorable circumstances is not productive of such good results.

The present invention relates to an apparatus in which a continuous steaming operation may be carried on with steam under pressure, a web of the fabric or other material being carried through a steam-tight chamber which contains steam at the desired pressure.

To this end the apparatus which embodies the invention comprises a steam-tight chamber having feeding devices in the walls thereof, whereby the fabric is carried into and out of the chamber, and in order to render the chamber practically steam-tight the feed-openings are suitably packed, while the feeding devices preferably consist of rolls having packing along the sides and ends thereof arranged to resist the internal pressure of the steam.

Figure 1 is a sectional view of an apparatus embodying the invention; Fig. 2, an enlarged sectional detail of the feed-rolls shown in Fig. 1; Figs. 3 and 4, similar sectional views showing modifications in the arrangement of the packing-blades; Fig. 5, a sectional view of a modified form of apparatus and Fig. 6 an enlarged detail and side elevation illustrating the feed-rolls and packing devices shown in Fig. 1.

The apparatus embodying the invention consists, essentially, in a substantially steam-tight chamber $a$, shown as provided with a steam-inlet pipe $a^2$, which may extend along the bottom thereof with perforations, as indicated, for the better distribution of the steam, the said receptacle being provided with feed mechanism whereby a web of fabric or other material may be caused to travel into, through, and out of the chamber, thereby becoming subjected in its travel to the steam confined under pressure in the said chamber in accordance with the process which, as stated, forms a feature of the present invention.

To feed the fabric into and out of the chamber, the feeding devices above mentioned are herein shown as consisting of rollers adapted to be rotated by suitable mechanism, it being practicable, as shown in Fig. 1, to provide a single feed-roll $b$, adapted to be driven, as shown, by means of a belt $b^1$ from a shaft provided with a pulley $b^2$, there being in conjunction with said feed-roll $b$ a pair of presser-rolls $c$, so that the web $W$ may be fed in between said roll $b$ and one of the said rolls $c$, as indicated by the arrows in Fig. 1.

In order that a considerable length of web may be introduced into the chamber at a given time without unduly increasing the
size of the said chamber, the web is preferably caused to travel a zigzag course through the chamber and is herein shown as passed over sheaves or rolls at and feed-rolls at, the said feed-rolls in order to facilitate the feed of the web being shown as connected, by means of the chain or belt at, (indicated in dotted lines, Fig. 1) with the shaft which carries the pulley b.

It is essential in order to maintain the steam under pressure within the chamber a that the said steam should be prevented from escaping therefrom, and to this end the feed-rolls are provided with packing means along the sides and ends thereof, such packing means being herein shown as consisting of blades of metal or other suitable material (indicated by the letter d) having their edges covered with yielding material d", and arranged to have the said edges interposed between the periphery of the rollers c, and a portion of the frame herein shown as a supplemental frame provided with bearings for the rollers and adapted to be secured to the outer wall of the casing a, the said frame surrounding the opening e", through which the web enters and leaves the said casing. The said frame is herein shown as made of two parts, the former consisting of a plate e, having a central opening adapted to register with the opening e", and a flange e", adapted to be secured to the wall of the chamber a by means of bolts e", which also serve to secure the other portion of the frame to the outer wall of the casing, as will be described. Surrounding the opening in the portion e is a projection e", forming a kind of box against which the edges and ends of the rolls c are closely supported, as best shown in Figs. 2, 3, and 4, the packing-blades d being secured to the walls which run parallel with the said rolls, so that their edges d" may be interposed between said rolls and the frame, as shown, to securely pack the same and prevent the steam from escaping. At the ends of the walls e" the said walls are shaped as shown in Fig. 6 to fit the ends of the rolls e", which are shown as tapered at e", and in order to further pack the ends of the rolls to prevent the escape of steam the portion e is provided with a packing-plate e", secured to the end e" of the portion e, and provided with a semi-annular projection e", having a tapered edge adapted to fit between the tapered ends of the rollers b and c, the body of said plate being movable along the part e" as shown in Fig. 6, and secured thereto by means of bolts or cap-screws e", extending through elongated slots e" in the said plate, the said bolts being threaded in the portion e and adapted to secure the plate e" in place after it has been adjusted with relation to the rolls by means of the screws or bolts e", which are shown as threaded in lugs e" upon the portion e" and adapted to bear against the rear edge of the said plate e".

The bearings for the rolls are contained in the other portion of the supplemental frame, which is shown as consisting of a support f, having at each end a flange f", through which pass the bolts e", which have been hereinbefore described with relation to the portion e of the casing, and being provided with a guideway f" at each end for the journal-boxes e" for the rolls c. The said bearing-support f has a central recess adapted to form half of the journal-box for the roll b, the other half of said journal-box consisting of a cap-piece f", secured to the body of the frame by means of bolts f".

The construction and arrangement of the portion f and the bearings for the rolls may be arranged in any suitable way.

The feed-roll b is herein shown as provided with a covering b", of rubber or other yielding material, said covering not quite extending to the end of the roll, which is preferably of metal, as shown at b", and of slightly-smaller diameter than that of the rubber to afford a bearing for the rolls c, which are also of metal and adapted to be adjusted by means of the screws c", which bear against the journal-boxes e", so that they can be brought snugly into contact with the metal portion b", and thus compress the rubber to the desired extent, but no more, so that the proper grip is obtained for feeding the web, while there is no danger of getting so snug a fit that the rubber or material will snug up and cause trouble. The yielding covering, moreover, is useful in maintaining a practically steam-tight contact of the rolls, while any knots or uneven places in the cloth will pass through without injury and without permitting steam to escape.

The packing-blades d may be arranged in various ways, being placed, for example, as shown in Fig. 3, on the inside instead of the outside of the casing e, or it may be desirable in some instances to place them, as shown in Fig. 4, one on the outside and the other on the inside, so that the tendency of the rolls c in rotating is to frictionally carry the packing-blades to a seat or wedge them in between the frame and the roll.

While the construction shown in Fig. 1 is simple and practicable, it may be found in some instances that the web will stretch or shrink in passing through the steam-chamber, in which instance it is desirable to have the rolls through which it is passed out of the chamber travel at a slightly greater or less speed than that of those whereby it is fed into the chamber. To accomplish this, the chamber may be provided with a set of separate feed-rolls at any suitable point in the wall thereof and adapted to be driven at any suitable rate of speed equal to or differing from that of the feed-rolls through which the web enters. As shown in Fig. 5, the chamber a is provided with a pair of rolls b" for
introducing the web and another pair of rolls $c^{10}$ for carrying it out, the said rolls $c^{10}$ being shown as in the opposite wall of the chamber and connected, by means of a belt $c^{12}$, with the rolls $b^{10}$, the pulley on the rolls $c^{10}$ being shown as somewhat smaller than that on the feed-rolls $b^{10}$, so that the rolls for feeding the fabric out travel somewhat faster than those for feeding it in. These rolls may obviously be packed to prevent the escape of steam in substantially the same manner as shown in Fig. 1, the details of construction not being shown in said Fig. 5, as they are not material to the invention, so far as relates to the main features thereof.

To first introduce the web, the chamber $a$, Fig. 1, is shown as provided with a manhole or opening provided with a cover $a'$, it being intended, however, in the normal operation of the device to connect together a large number of pieces of fabric or other material into a continuous web which can be fed from a suitable roll or folded and drawn off, and when the said web is nearly exhausted the machine can be stopped and another web put in its place and connected to the end thereof, or this may be accomplished without stopping the machine by having the attendant pull off what is left on the feed-roll and attach the end of a new web thereto while the machine is taking up the slack thus produced.

It is not intended to limit the invention to the specific construction and arrangement herein shown and described, since modifications may obviously be made without departing from the invention.

I claim—

1. The combination with the chamber provided with an opening in a wall thereof, of the plate $e$ secured to the casing and having an opening corresponding to that in the wall of the casing, the wall $e$, the bearing $f$ also secured to the casing, the rolls, the packing-blades $d$ adapted to engage the rolls, and the packing-plate $e$ adjustably secured to the plate $e$ and movable toward the ends of the rolls, substantially as described.

2. The combination with the chamber adapted to contain steam under pressure, of feed-rolls mounted adjacent to a wall thereof, said feed-rolls being in contact with each other at the ends thereof, a covering of resilient material on one of said rolls extending from a point near one end thereof to a point near the other end, said covering being of slightly-greater external diameter than that of the roll at the ends thereof, and means for packing said rolls to prevent the escape of steam, substantially as described.

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

CHARLES HENRY FISH.

Witnesses:

H. J. LIVERMORE.
JAS. J. MALONEY.