

(No Model.)

3 Sheets—Sheet 1.

T. O. EASTON, A. WATT & J. BUCHANAN, Jr.
BAG FILTER.

No. 502,511.

Patented Aug. 1, 1893.

FIG. 1.

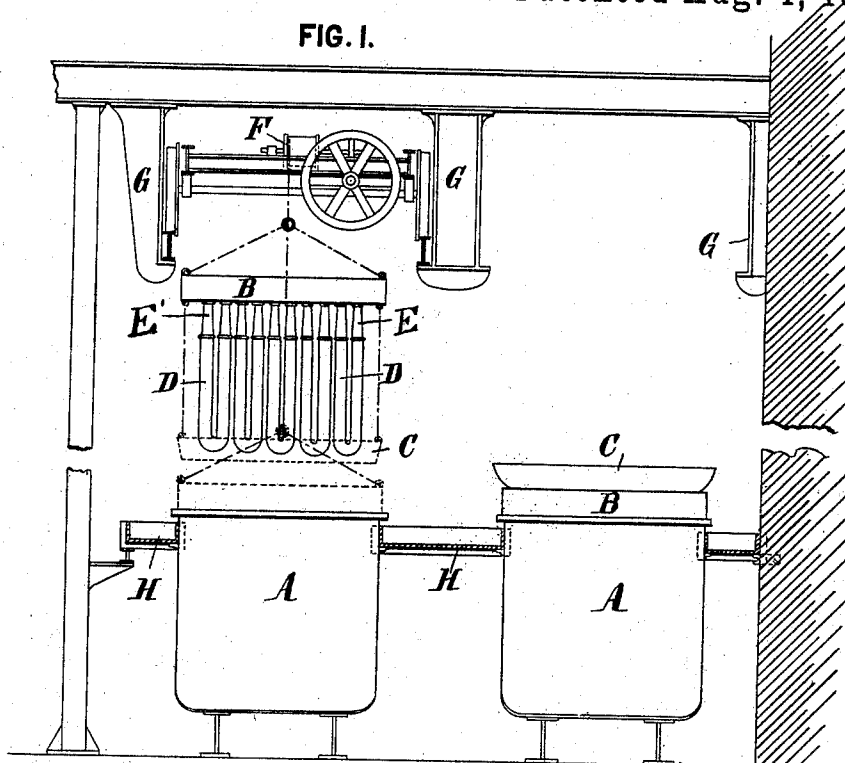
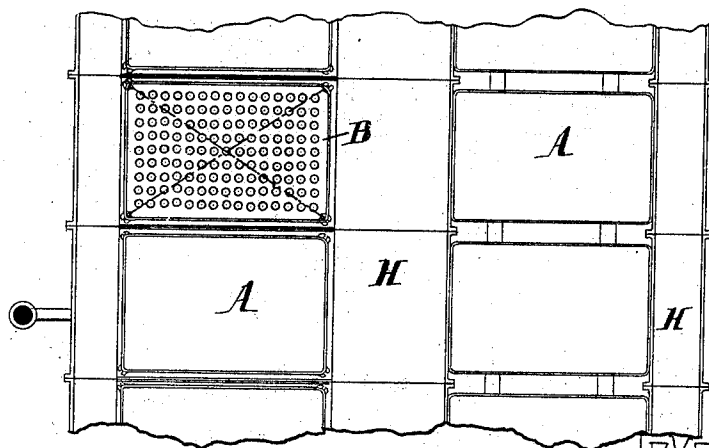


FIG. 2.



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FIG. 3.

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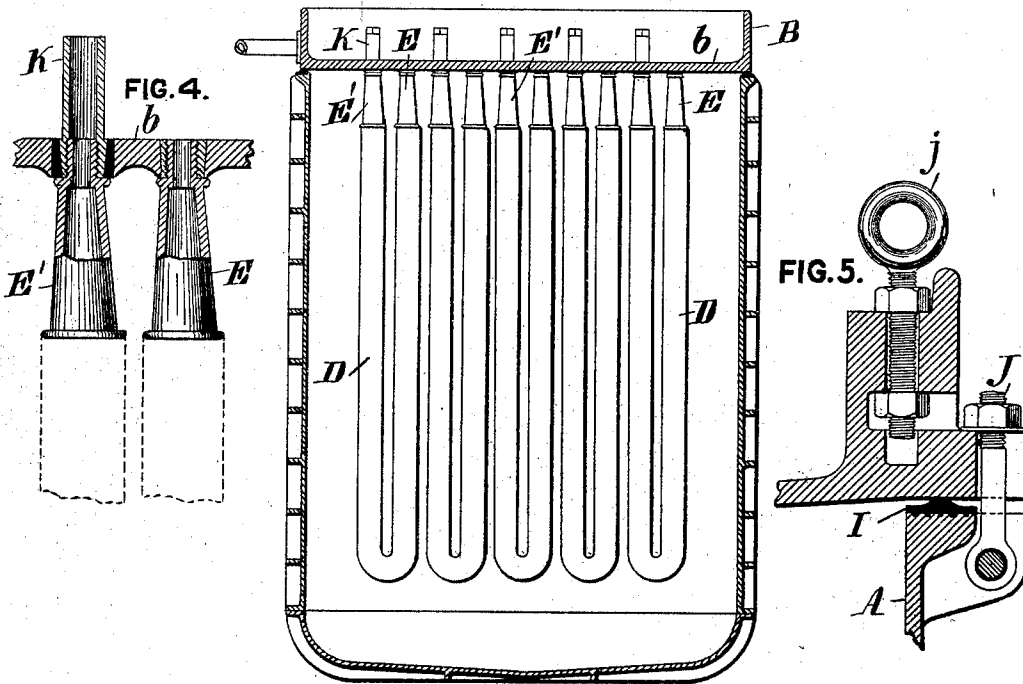
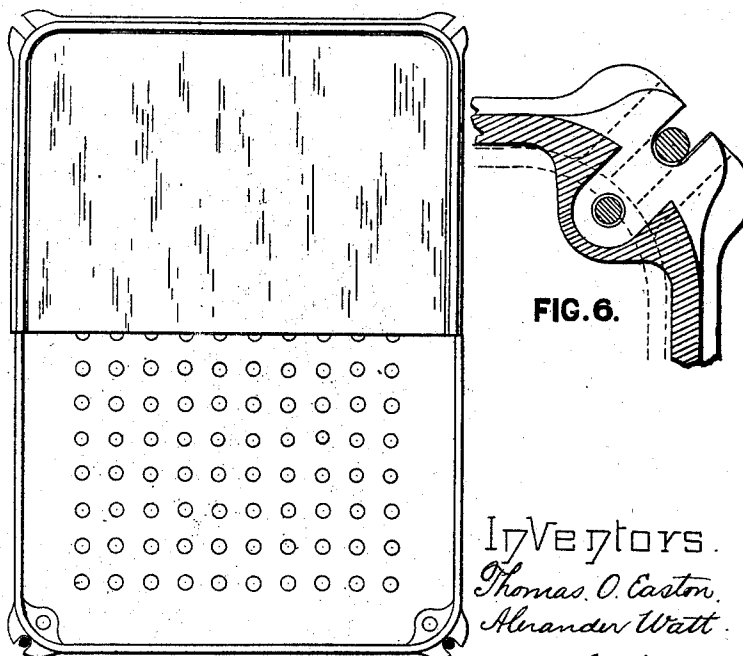


FIG. 7.



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BAG FILTER.

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FIG. 8.

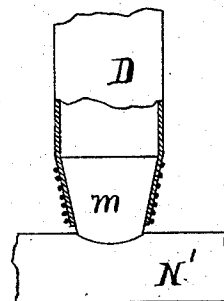
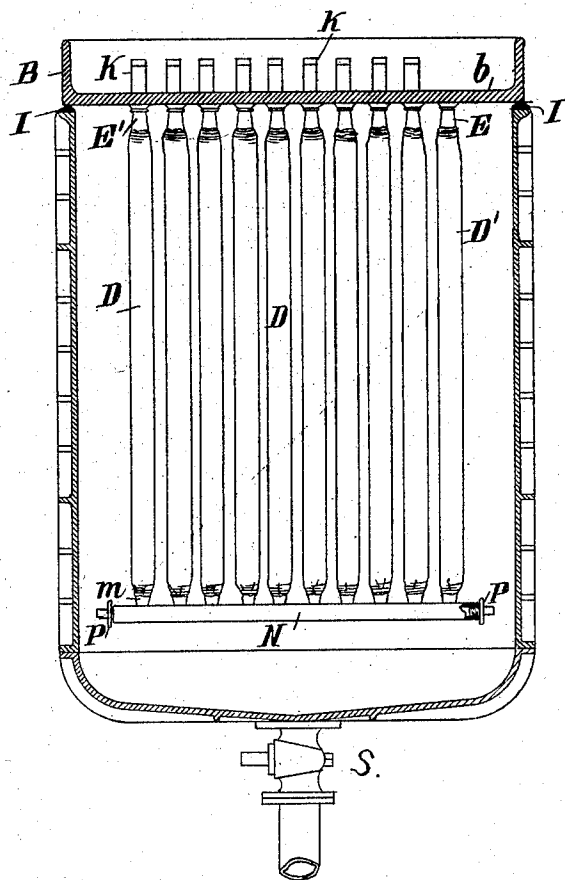


FIG. 9.

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BAG-FILTER.

SPECIFICATION forming part of Letters Patent No. 502,511, dated August 1, 1893.

Application filed April 23, 1892. Serial No. 430,310. (No model.)

To all whom it may concern:

Be it known that we, THOMAS OGILVY EASTON, ALEXANDER WATT, and JAMES BUCHANAN, Jr., subjects of the Queen of Great Britain, residing at Liverpool, in the county of Lancaster, in the Kingdom of England, have invented certain new and useful Improvements in Filtering Plants for Sugar, of which the following is a specification.

Bag filters, such as those known as Taylor's filters, in use at the present time, consist of a casing or tank, generally rectangular in form, having a fixed top plate jointed on to a flange usually projecting from the inside surface of the casing at a lower level than the top of the casing, thus forming a shallow upper tank, into which the sugar or other liquor to be filtered is run. A series of bags open at one end and closed at the other is fastened on to nozzles or "bottles," as they are technically termed, which bottles are secured into the fixed top plate itself, or into nuts, fixed into the top plate; the bags are in this way suspended vertically with the closed end down, in the interior of the chamber or casing, and the liquor runs into the top or shallow tank, then runs through the openings in the bottles and filters through the bags. The casings are provided with manholes or doors for access to the interior of the chamber, and for the purpose of fixing in position the nozzles with clean bags attached, and also for removal of the same when the filter has finished operation, and requires replenishing with clean bags for succeeding operations.

The disadvantages of this system are numerous and obvious, taking a long time to filter the liquor, besides being severe and laborious work for the men. After a time, the bags become inoperative from their pores being clogged, and the filtering surface of the bags being quickly reduced, and, toward the end, even before the bags are quite choked, the liquor only filters through very slowly, and eventually the supply of the liquor has to be stopped. The pores of the bags being choked, the liquor will not filter out, and a large quantity of unfiltered liquor remains in the bags. At present, in order to expel the remaining liquor, hot water is run into the top tank and into the bags, but it takes a long

time and requires a very large quantity of hot water to drive out the remaining liquor, and the resultant liquor is so diluted as to merely deteriorate the product and increase the cost of obtaining it. The product is deteriorated because it is found that weak solutions of sugar are much more rapidly and much more easily converted into glucose than stronger solutions.

Now our invention is designed to obviate these evils generally, to largely increase the quantity of liquor filtered through an equal number of bags, or equivalent filtering surface, in a given time, to use a less quantity of hot water, to save dilution of the liquor, thus preventing deterioration of the product, facilitate the operations of working the filters, economize space, reduce manual labor, and to expeditiously transfer the unfiltered liquor remaining in the bags into the chamber of the filter in use, or into another filter direct, or into a suitable tank or vessel provided for the purpose, without dilution of the liquor, in which it can be re-treated and subsequently pumped or run out again for subsequent filtration.

Referring to the drawings:—Figure 1 is an elevation partly in section of an apparatus; Fig. 2 a partial plan view; Fig. 3 a section of a single filter; Fig. 4 details of bottles and accompanying parts; Figs. 5 and 6 details of joint between the top tank and the filtering chamber; Fig. 7 a plan view with cover partly removed from the filter; Fig. 8 an alternative arrangement of filter, and Fig. 9 a sectional view of a bag and its attachment.

A A, are a series of filtering chambers arranged preferably in two rows, side by side; B B, shallow tanks above these filters, the bottoms of which tanks consist of the bottle plates; C, a tray sometimes used hooked on to the top tank when transporting a tank with all its tubes attached to it over the line of filters, this tray C being employed to catch the drip from the bags and prevent them falling into the various filters *en route*; D D, the filtering bags; E E', the bottles; F, a traveling crane running on tracks suspended from the ceiling by brackets G; H, metallic troughs, placed between lines of filtering chambers and between them and the walls, serving as a floor

and also to catch any splashings or drip. This floor is preferably arranged with a slight downward slope toward the end where the washing tank is situated.

5 The tank B, having for its bottom the bottle plate *b*, shown in detail in Figs. 3, 4 and 5, rests on the top edges of the casing A. Preferably, however, we groove the top of the casing with longitudinal groovings and thereon
10 fix an india rubber plate I, having a longitudinal ridge on the top as shown. Casing A is fitted, at the corners, with swiveling eye bolts J to tighten down the tank B in place, and the tank B is fitted with eye bolts *j* in order
15 to be more easily suspended to the traveling crane.

The object of the india rubber plate I is to form a sirup-tight seal. It is, however, not indispensable, and, in place of this arrangement,
20 the top tank B could be provided with projections to guide it into its correct position, and could simply rest on the chamber A. In place of the ordinary bags closed at one end and fastened to the bottle at the other, we use bags D, Figs. 1 and 3, about
25 twice the length, inclosed in the usual form of sheath, which is also about twice the ordinary length and has a bottle E E' fastened at each end. One of these bottles E is attached
30 to the top in the usual manner. The other E' is attached to the top by screwing or otherwise fastening on to the neck the tube K, from the top side, which tube has a conical nut to fit and joint into a conical hole or cut in the
35 bottom plate of tank B. This tube rises above the level of the liquor in the shallow tank B, which is regulated by an overflow. The tube acts as a nut to hold the bottle in its place without the bottle being screwed into the bot-
40 tom plate of tank B.

It will be obvious that this device could be varied in numerous ways; thus the tube K could be fixed and the bottle unscrewed by means of a key, or the tube could be a continuation of the bottle. The bag fixed in this
45 manner forms a loop, and the advantage of this arrangement is that, when the liquor is run into the shallow tank in the first instance, it enters the bags through the opening not
50 provided with the tube; consequently, the air can at once rapidly escape through the other opening to which the tube is attached above the level of the liquor in the tank and no liquor enters through the end of the bag to
55 which this tube is attached. By this means, the liquor descends through the one half of the looped bag and ascends the other half, until it reaches its own level; moreover, as the liquor to be filtered passes down one side or half of the looped bag and up the other, the tendency is for the slimy matter, which
60 chokes the pores of the filtering bags and retards filtration, to deposit on the down half of the bag and at the bottom, and so leave the up bag comparatively clean, and, consequently, a greater quantity of liquor is filtered through
65 equal surface and in a given time. The bags

can also be arranged in a group with one or more inlets for liquor, the remaining bags all forming ascension filters as shown in Figs. 8
70 and 9 and hereinafter described. When the filter has been running such a length of time as to make it practically inoperative for the purpose of efficient and economic filtration, the usual discharge valve or cock in the bottom of
75 the casing, shown at S in Fig. 8, which runs the filtered liquor into a gutter or pipe, can be shut off, and, by screwing off the tube, one end of the bag will at once fall down and allow the unfiltered liquid contents to escape into the
80 filter chamber, from which it can be run off by another outlet into a pipe or gutter leading to a suitable receptacle or tank provided for the purpose. The result is our bags begin
85 filtering and are emptied of the unfiltered liquor at the end of the operation in an extremely short time. The other advantages previously described are obtained by filling the casing with hot water. The sweet or sugar
90 liquor can be washed out with a small quantity of water prior to the bags going to the final washing or scum room; or the bags may be emptied of their contents, and washed as hereinafter described.

The mode of working the apparatus may be
95 described as follows:—The filters generally stand on a floor in rows (or may be suspended, as positions demand) touching each other at the top and jointed together between the rows. The second flooring of metal trays H
100 or flat troughs is arranged near the top of the filter casings, covering the entire space not occupied by the filters. This flooring or troughing preferably slopes slightly to the end where the washing apparatus is placed,
105 and is arranged so that it can be washed down into the latter or into a liquor tank and thus spilling on the floor is prevented and the splashes and drips are recovered. The traveling crane F above the filters is employed
110 for lifting the portable tops off and on the casings A, and, when these double bags are used, the crane should be of sufficient height above the filter to carry the tank, a set of double bags with their ends released, and a
115 tray C hooked on to the bottom of these bags. In the drawings, Fig. 1, the bags are shown in elevated position to commence operations, the tray C being shown in dots, and another shown in full on the top of filter B. At the
120 beginning of the operations, the shallow tank B, forming the top of the filter, is placed in a convenient position by the crane. The bags are attached thereto, the first row of holes being supplied with bottles screwed in, in the
125 usual way; and, to the next row, the other bottles of the same set of bags are attached by screwing the tube on to the top of the bottle from the top side of the shallow tank. This is continued until the entire sets of bags
130 are fixed in position. The cover or top of the filter, with all its bags attached, is now carried by the traveling crane, as shown in Fig. 1, and lowered into position on the top

of the filter casing, the machined surfaces or the india rubber joint or seal making it tight. The crude liquor is then run into the shallow tank and descends through the opening into the bags to which no tubes are attached; at the end of the filtering operation, the tubes are screwed off the bottles at the other end, and the bags fall down, into the chamber as before described. The filter top is then attached by chains to the traveling crane and hoisted off the casing, the bags hanging down vertically discharging their contents into the casing of the filter as before described. The filter top with the bags hanging from it is carried away to the washing room by the aforesaid traveling crane. Previous to its being carried away, however, the tray C is suspended by chains to the tank B immediately under the lower bottles, so as to catch the drip and prevent the latter from falling into the other tanks while traveling over these. The whole is then traveled over the other tanks B, and the thick liquor in the tray emptied into a liquor tank. The top and bags then pass on to a washing tank. By this arrangement the tray retains the drippings from the bags while passing over the other filters, and thus liquor of inferior class is prevented from falling into the other filters, which might be working a superior class of liquor. In some cases, however, in place of allowing the bags to empty into their own case A, the top with the bags looped up is lifted out of the filter casing and traveled by the crane over another filter. The tubes are then unscrewed and the bags fall down and discharge their contents into the tank B of this second filter. The top is then still farther lifted, the tray attached, as before described, and the whole traveled to the washing room; or the top with the bags looped up may be lifted out of the filter casing, and, with or without the tray attached, traveled by the crane over a liquor tank into which the bags would be lowered, the tubes being unscrewed, the ends of the bags falling down, and the thick liquor emptied into the tank. The top is then hoisted up and traveled over another tank where the liquor would be washed out of the bags prior to their subsequent removal to the scum room.

The bags, instead of being attached to the top, as before described, at each end only, forming a single loop, can be of longer length and have multiple loops, the inlet of the liquor of the tube end, as before described, being common to the lot.

Figs. 8 and 9 show the arrangement of bags in a group.

The bags, instead of having each but one upright portion which receives the liquor at its upper end, and but one upright portion through which the liquor enters at its bottom, as represented in Fig. 1, have as seen in Fig. 8 one upright portion, indicated by D', which receives the liquor from the tray B, and numerous upright portions, indicated

by D, all of which are connected below with the upright portion D' and receive the liquor at their bottoms. In this construction of Fig. 8, the bight or loop at the bottom of the bag, seen in Fig. 3, is replaced by a connecting pipe N which is the equivalent of said bight or loop and performs the same function, namely, that of connecting the lower ends of the respective upright portions of the bag. The portions of the bag are coupled to the pipe N by means of bottles *m*, as indicated in the enlarged sectional view Fig. 9. Of course more than one of the upright portions of the bag may receive the liquor at the upper end, it being only necessary to remove one or more of the pipes K to allow the liquor to enter. As a bag constructed as seen in Fig. 8 cannot be conveniently emptied by releasing its filling end from the tray B, the connecting pipe N is provided with a screw plug P, which may be removed for discharging the bag. Indeed the substantially U-shaped bag we employ whether it has two or many upright portions may be provided with simple means for emptying it at the bottom, either by letting down one end, or by a plug, as described.

We declare that what we claim is—

1. A bag filtering apparatus comprising a filtering chamber and a substantially U-shaped bag pendent therein, the extremities of the bag providing respectively an inlet for the liquor to be filtered and an air outlet substantially as set forth.

2. A bag for a filtering apparatus comprising two upright portions connected by a liquid passage at one end and at their other ends provided respectively with an air escape passage and a liquid inlet substantially as described.

3. In a filter, the combination with a filtering vessel A having a tank cover B of a filtering bag comprising two upright branches connected by a liquid passage at their lower ends, and at their upper ends secured to the bottom plate of the cover and a tube K mounted in the upper end of one of said branches and forming an air outlet substantially as set forth.

4. An apparatus for bag filtration, comprising a chamber A, a removable tray-like cover B, for same, substantially U-shaped filtering bags suspended from said cover, and means for emptying said bags while they are still attached to the cover, substantially as set forth.

5. In a bag filter, the combination with the bottle plate *b*, of the bottle E screwed into it in the ordinary manner and a second bottle E' and tube K projecting above the liquor in the tank, the bag of one bottle being connected below with that of the other whereby the liquor shall run into the bag through bottle E and the air shall escape through tube K.

6. In a bag filtering apparatus, the combination of a tank B to contain the liquor, a bottle E, open to the liquor in the tank, a bottle E', open to the air above the liquor in the tank, whereat the air can escape, and a filter-

ing bag suspended by its upright portions from said bottles, said upright portions of the bag being connected at their lower ends by a liquid passage.

5 7. A filtering apparatus comprising a stationary filtering chamber, a removable tank like cover or top, B, for the same, the filtering bags suspended from said cover, the tray C, and means for suspending said tray from
10 the cover when the latter is hoisted for removal, as set forth.

8. The combination of the filtering chamber A, tank top B, bottles E' and E, one adapt-

ed for receiving the liquor and the other for emitting the air, and the U-shaped bags D 15 substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

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