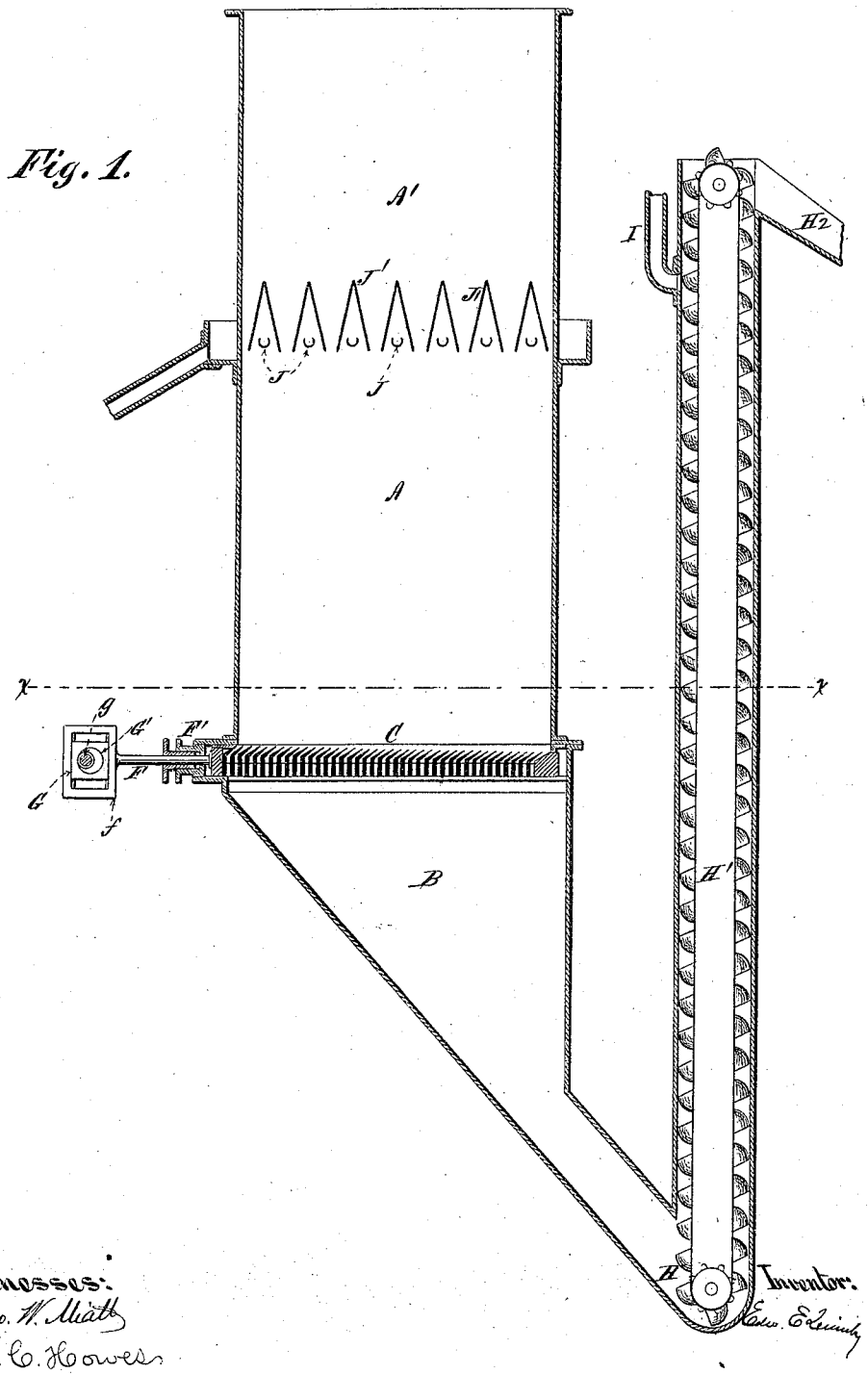
(No Model.) 3 Sheets—Sheet 1.

E. E. QUIMBY.

APPARATUS FOR DECOLORIZING SUGAR LIQUOR BY UPWARD FILTRATION THROUGH BONE BLACK.

No. 329,210. Patented Oct. 27, 1885.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

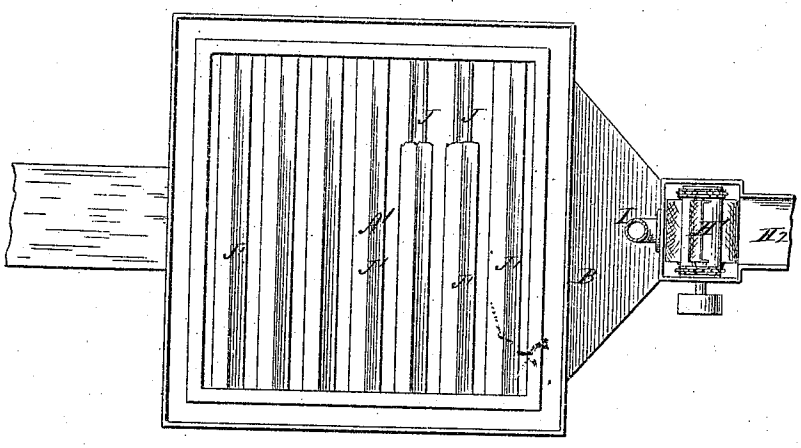
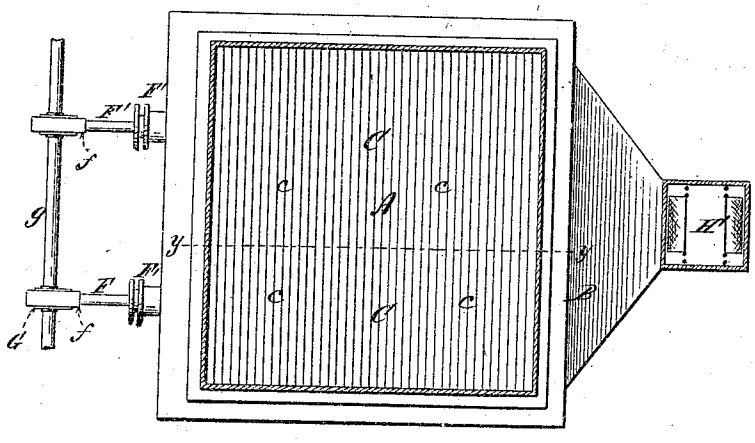


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

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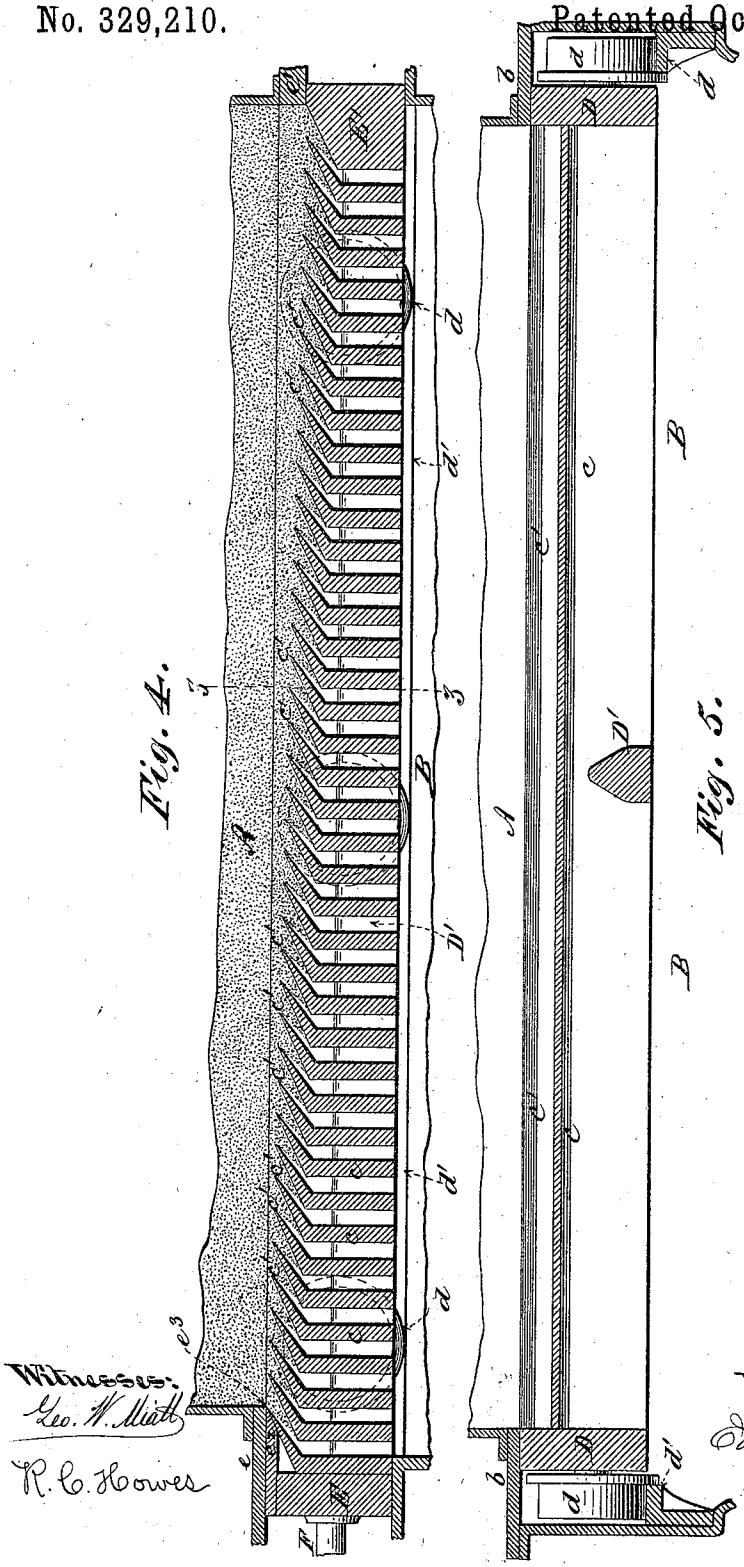

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

EDWARD E. QUIMBY, OF ORANGE, ASSIGNOR TO THE F. O. MATTHIESSEN & WIECHERS SUGAR REFINING COMPANY, OF JERSEY CITY, NEW JERSEY.

APPARATUS FOR DECOLORIZING SUGAR-LIQUOR BY UPWARD FILTRATION THROUGH BONE-BLACK.

SPECIFICATION forming part of Letters Patent No. 329,210, dated October 27, 1885.

Application filed August 20, 1885. Serial No. 174,871. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. QUIMBY, of Orange, New Jersey, have invented certain Improvements in Apparatus for Decolorizing Sugar-Liquor by the Process of Upward Filtration through Bone-Black, of which the following is a specification.

It is the object of these improvements to provide for a continuous decolorizing operation, in which all the sugar-liquor which is passed through the filtering-chamber is subjected to uniform conditions with respect to the duration of its contact with a definite quantity of bone-black, the total decolorizing-power of which is maintained substantially unchanged by the gradual removal of the exhausted bone-black and collected impurities from the bottom of the filtering-chamber and the concurrent feeding of fresh bone-black into the top of the filtering-chamber.

In the type of apparatus to which the present improvements are applied the sugar-liquor is introduced into the bottom of the filtering-chamber under sufficient pressure or head to enable it to make its way upward through the column of bone-black contained in the filtering-chamber to the level of the outlets through which it escapes from the upper part of the filtering-chamber. The stratum of bone-black at the bottom of the column with which the sugar-liquor is first brought into contact as it enters the filtering-chamber is that which soonest becomes exhausted, and hence requires to be removed. When all portions of the bottom stratum are removed at a uniform rate, the column of bone-black descends bodily by its own gravity, provided the horizontal area of the stratum which is removed is equal to the greatest area of the column in horizontal section.

The present invention consists, essentially, of a movable supporting and discharging instrumentality, upon which the column of bone-black contained in the filtering-chamber is supported at the bottom, and which, when appropriately moved, shears or cuts off from the bottom of the column a stratum of bone-black of prescribed thickness.

The discharging instrumentality may have various forms; but the invention is present when the filtering-chamber and the discharging instrumentality are so constructed relatively to each other that the discharging instrumentality, when set in operation, effects the removal of the entire bottom stratum of a column which is of uniform cross-area from top to bottom.

The accompanying drawings represent these improvements applied to apparatus for effecting the decolorization of sugar-liquor by the process of upward filtration through bone-black, of the kind in which the exhausted bone-black and collected impurities removed from the bottom of the filtering-chamber by the discharging instrumentality fall into an inclined receiving-chamber, by which they are conducted to the bottom of a well provided with a chain-and-bucket elevator for elevating the exhausted bone-black and collected impurities from the bottom of the well, and discharging them from the top of the well upon a chute, which is above the level of the outlets through which the sugar-liquor is discharged from the filtering-chamber. The sugar-liquor is supplied to the apparatus through a service-pipe, which is introduced into the well at a suitable distance below the chute, and the elevator-buckets are made of wire-gauze or are perforated, so that the sugar-liquor may drain from them during the latter part of their upward journey. Thus the sugar-liquor passes down the well and upward through the filtering-chamber.

The drawings are as follows: Figure 1 is a vertical section centrally intersecting the filtering and receiving chambers, and the well provided with the chain-and-bucket elevator. Fig. 2 is a top view. Fig. 3 is a horizontal section through the line $x\ x$ on Fig. 1. Figs. 4 and 5 are vertical sections of the supporter and discharger, taken at right angles to each other through the lines $y\ y$ on Fig. 3 and $z\ z$ on Fig. 4, respectively.

The filtering-chamber A may be circular, or, as it is represented in the drawings, may be rectangular in its horizontal section. In either event it surmounts a receiving-chamber, B, which at its upper end is of greater area in cross-section, in order that it may contain the supporter and discharger C, which is adapted

to be reciprocated in a horizontal path. The supporter and discharger, as represented, is in the form of a rectangular grate provided with parallel bars *c c c*, &c., the upper portions of which bars incline laterally in the same direction and terminate in short cutting-edges *c' c' c'*, &c. Although not absolutely essential, it is preferred to have the cutting-edges of the grate-bars all terminate in a plane which is slightly inclined from the horizontal in a direction the opposite of that in which the upper portions of the grate-bars are inclined, so that the cutting-edge of each grate-bar, starting from one side of the grate to the other, is a prescribed distance higher than the edge of the next adjoining grate-bar. This difference between the levels of two adjoining grate-bars influences the thickness of the chips or stratum of bone-black which are cut off from the bottom of the column by the forward movement of the supporter and discharger. To the end that there may be a uniform rate of removal from all portions of the bottom of the column of bone-black, the cutting-edges of the grate-bars are made to be equidistant from each other, and the supporter and discharger is made to have a range of reciprocating motion equal to the distance between the cutting-edges of two adjoining grate-bars.

The side members, D, of the grate-frame are each provided with rollers or wheels *d d d*, which run on horizontal tracks *d' d'*, affixed to the walls of the receiving-chamber B. The tops of the side members, D D, of the grate-frame fit loosely under the lateral extensions of the shell, which constitute the tops *b b* of the front and rear portions of the receiving-chamber. Similarly, the tops of the end members, E E', of the grate-frame fit under the lateral extensions which constitute the tops *e e'* of the side portions of the receiving-chamber. A shield, e^2, extends horizontally from the top of the frame to the cutting-edge e^3 of the adjoining grate-bar, which, as will be seen, is the highest cutting-edge. The object of this shield is to prevent during the movement of the grate any fall of bone-black behind the cutting-edge e^3.

The inner side of the end member E' of the frame is chamfered, as shown, and the top of the end member E' is the same distance lower than the cutting-edge of the grate-bar which adjoins it as that cutting-edge is below the level of the cutting-edge of the next adjoining grate-bar.

The proportions observed in constructing and arranging the grate-bars and filtering-chamber are such that when the inner edge of the top of the end member E' of the frame stands in vertical alignment with the inner surface of the side wall of the filtering-chamber on one side, the cutting-edge of the grate-bar adjoining the end member E of the grate-frame stands in vertical alignment with the inner surface of the opposite side wall of the filtering-chamber, and these positions are occupied at the commencement of the forward or cutting movement of the grate, which, in view of the special functions it performs, I have referred to as the "supporter and discharger."

To effect the movement of the supporter and discharger, the end member E of the frame is provided with two rods, F F, which project outwardly through stuffing-boxes F' F', arranged in the wall of the receiving-chamber. The outer ends of the bars F F are affixed, respectively, to the yokes *f f*, which, if desired, may be adapted to slide between the horizontal guides *f' f'*, formed upon the opposed sides of substantial brackets f^2 f^2, bolted to the side walls of the filtering-chamber and receiving-chamber, respectively.

Each of the yokes has parallel vertical sides, adapting it to receive one of the vertically-sliding boxes G G, which are perforated to afford the bearings for the eccentrics G' G', respectively. The eccentrics G' G' are affixed to the horizontal shaft *g*, to which power is applied for the purpose of rotating it, and thereby imparting reciprocating motion to the supporter and discharger.

It will of course be understood that other well-known mechanical means may be substituted for the eccentrics for effecting the reciprocating movement of the supporter and discharger.

The other appurtenances of the apparatus illustrated in the drawings do not in themselves constitute any portion of the present invention, but are shown for illustrating the relation which they sustain to the supporting and discharging instrumentality. These appurtenances consist of the well H, with the bottom of which the downwardly and laterally inclined receiving-chamber B communicates, and which is provided with the chain-and-bucket elevator H', for elevating the exhausted bone-black and collected impurities from the bottom of the well and discharging them upon the inclined chute H^2 at the top of the well, by which they are conducted to a prescribed depository; also, the service-pipe I, for supplying the sugar-liquor which is to be decolorized, and which is inserted into the well at a suitable distance below the chute H^2; also, the discharger-troughs J and their shields J', which transversely intersect the column of bone-black at the elevation at which it is desired to effect the discharge of the sugar-liquor from the filtering-chamber, and, finally, the upward extension A' of the filtering-chamber, which is made sufficiently high to contain a prescribed quantity of fresh bone-black, the weight of which suitably compresses the lower portion of the column through which the sugar-liquor is forced, and which also serves to continuously supply the quantity of fresh bone-black required to compensate for the quantity of exhausted bone-black removed from the bottom of the column by the operation of the supporting and discharging instrumentality.

For convenience of reference, that portion

of the vessel into which the fresh bone-black is introduced, which is beneath the discharge-troughs J and above the supporting and discharging instrumentality, is herein designated as the "filtering-chamber" A. It will be seen that the column of bone-black contained in the filtering-chamber is of uniform cross-area from top to bottom, and that the supporting and discharging instrumentality is adapted to remove from the column its entire bottom stratum.

If in constructing apparatus of very large dimensions it should be found necessary to strengthen the grate frame and bars, an intermediate girder, D', may be introduced, as shown in transverse section in Fig. 1, in which, as will be seen, the intermediate girder is of less depth than the grate-bars, and at the top is rounded or chamfered on both sides, so that there will be no lodgment upon it of the exhausted bone-black removed by those portions of the cutting-edges of the grate-bars which are immediately above it.

I claim as my invention—

1. In apparatus for effecting the decolorization of sugar-liquor by the process of upward filtration through bone-black, a filtering-chamber for containing a column of bone-black of uniform area in cross-section from top to bottom, and a movable supporting and discharging instrumentality whose area of action equals the cross-area of said column, and means for imparting movement to the said supporting and discharging instrumentality for removing from the lower end of the said column a stratum of bone-black of prescribed uniform depth.

2. The combination, with the filtering-chamber A and the receiving-chamber B, of the horizontally-reciprocating supporting and discharging instrumentality herein described, the same consisting of a grate the bars of which are set parallel to and equidistant from each other, and have their upper portions inclined laterally in the same direction.

3. A reciprocating supporting and discharging instrumentality consisting of a grate the bars of which are set parallel to and are equidistant from each other, and have their upper portions inclined laterally and formed into cutting-edges terminating in a plane inclined in the direction opposite to the direction in which the upper portions of the grate-bars are inclined.

4. The supporting and discharging instrumentality herein described, provided with the shield e^2, as and for the purpose set forth.

5. In a supporting and discharging instrumentality, substantially such as herein described, the girder D', having its upper surface rounded or chamfered, as and for the purpose set forth.

6. In apparatus for effecting the decolorization of sugar-liquor by the process of upward filtration through bone-black, the combination, as herein set forth, of a filtering-chamber for containing a solid column of bone-black of uniform area in cross-section from top to bottom, a supporting and discharging instrumentality for supporting said column, outlets for the escape of the sugar-liquor from the filtering-chamber at a prescribed elevation above the said supporting and discharging instrumentality, means for supplying fresh bone-black at the top of the filtering-chamber, a receiving-chamber for receiving the exhausted bone-black and collected impurities discharged from the filtering-chamber, means for removing the said exhausted bone-black and impurities from the said receiving-chamber, and means for introducing into the receiving-chamber sugar-liquor under sufficient pressure or head to enable it to make its way upward through the column of bone-black contained in the filtering-chamber and escape therefrom through the outlets aforesaid.

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