May 31, 1932. W. E. H. BELL 1,860,351

DYEING MACHINE

Filed Dec. 7, 1927

Fig. 1.

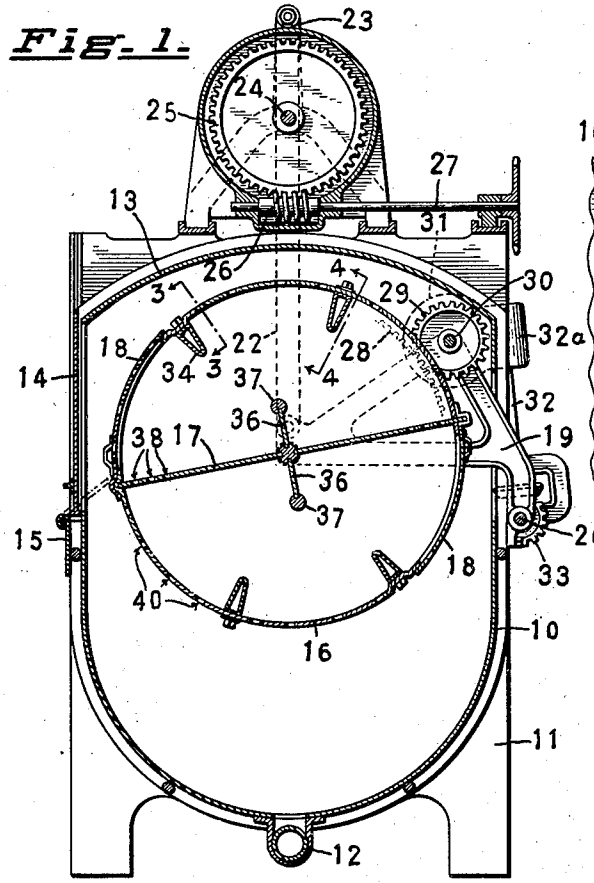


Fig. 2.

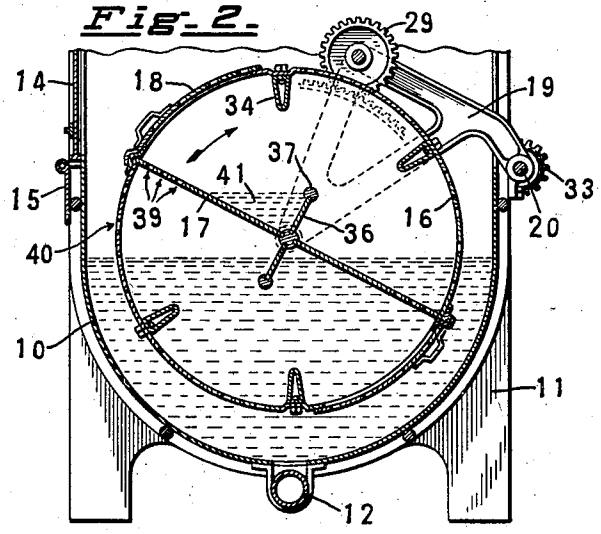


Fig. 3.

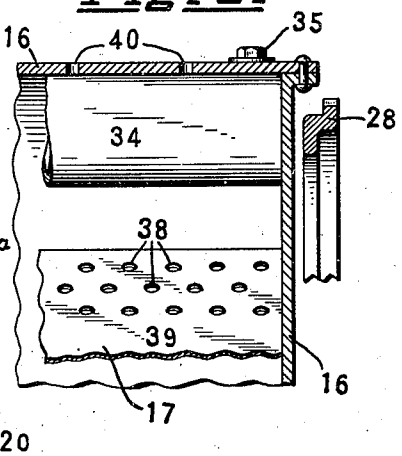
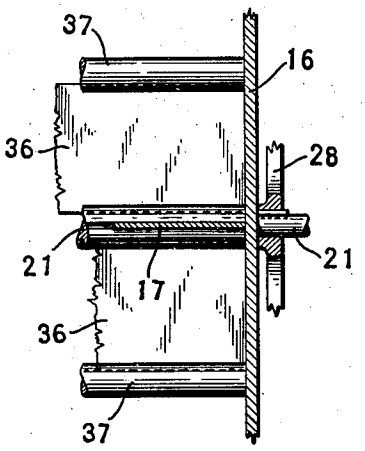


Fig. 4.



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UNITED STATES PATENT OFFICE

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DYEING MACHINE

Application filed December 7, 1927. Serial No. 238,277.

This invention relates to improvements in apparatus for treatment of textile and similar materials, and more particularly in some of its details to apparatus for dyeing or scouring such materials.

It is a general object of the invention to improve and perfect apparatus of the class mentioned whereby to turn and separate the material so the treating liquor may more uniformly reach all parts thereof and generally effect a more satisfactory treatment.

A further object is to provide an improved receiver drum construction for apparatus of the class mentioned so as to effect the proper amount of agitation of the goods under treatment without injury thereto and at the same time to assure thorough and uniform treatment.

A further object of the invention is to provide an improved receiver drum for apparatus of the class mentioned having receiving compartments with perforated walls, the perforations being so arranged as to maintain a constant balance of the treating liquor in all the compartments throughout the period of treatment; that is, as the drum rotates, the arrangement of perforations causes circulation of the liquor in the liquor tank so as to equalize the liquor throughout the compartments and tank whereby uniform treatment of the goods is assured.

Another object is to provide an improved receiver drum construction for apparatus of the class mentioned wherein as the drum operates, a liquid cushion is formed to receive the impact of the tumbling goods, thus to minimize any tendency to tear or otherwise damage the goods and also to assist in the turning and separation of the goods assuring more uniform treatment.

A further object is to provide an improved apparatus of the class mentioned whereby, through a simple construction and operation, the agitation or turning and separating of the goods under treatment may be varied as required under varying conditions of service and character of goods.

Still another object of the invention is to provide an improved receiver drum construction for dyeing and scouring machines of the hoisting type whereby agitation, turning, or similar mechanical action upon the goods under treatment, may be varied by simply raising or lowering the receiver drum.

Other objects will be in part obvious in connection with the following detailed description of a preferred embodiment of the invention, and will be in part particularly pointed out therein.

The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a complete understanding of the nature and objects of the invention, reference is had to the following detailed description of the preferred embodiment of the invention, and to the accompanying drawings wherein:

Fig. 1 is a vertical, transverse section through a dyeing or scouring machine embodying the invention;

Fig. 2 is a fragmentary transverse sectional view similar to that of Fig. 1 but illustrating the formation of the liquid cushion;

Fig. 3 is a fragmentary, sectional and elevational view taken substantially on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary sectional and elevational view taken substantially on the line 4—4 of Fig. 1.

Certain of the subject matter of this invention is the same as that disclosed in applicant's co-pending application for a dyeing machine, Serial No. 28,547 filed May 7, 1925, now abandoned, while other details of the present disclosure are not referred to in detail in the co-pending application. The present application, therefore, is a continuation in part of the said prior filed co-pending application.

Referring to the drawing for a complete description of the embodiment of the invention there shown, a tank 10 for the dye or other treating liquor is provided being supported by a suitable frame structure 11. The tank, preferably constructed of non-corrodible sheet metal, has end walls, and bottom

and side walls merging with each other and forming a curved or cylindrical bottom part which may be provided with a conduit 12 for admitting and draining off the liquor. A cover plate 13 overlies the tank, thus forming an entirely enclosed interior compartment.

The interior of the tank compartment is somewhat elongated in vertical dimension and a doorway is provided in one side wall in elevated position, being closed by a door 14 movably mounted to open and close the doorway. A loading and unloading apron 15 may be employed, being preferably pivotally mounted as shown adjacent the doorway and adapted to swing inwardly through the doorway as indicated in dot and dash lines so as to provide a bridge between the interior receiver drum and the wall of the tank for facilitating loading and unloading of the drum.

The receiver drum 16 is preferably in the form of a cylinder having foraminous walls to permit passage of the treating liquor and being mounted for rotary movement within the tank. The drum also is preferably constructed of non-corrodible sheet metal and may be divided into a plurality of interior compartments so as to separate the goods into different lots thus to facilitate handling and treatment thereof. For this purpose in the embodiment shown, a partition 17 extends across the interior of the drum dividing it into two separate compartments, each of which is provided with a doorway having a closure 18. The drum is mounted in the tank by means of a swinging supporting frame structure including spaced triangular brackets 19, one being disposed at either end of the drum and mounted for swinging movement about one apex on a driving shaft 20 suitably mounted in bearings secured to the tank frame. The drum is mounted on the free or swinging apices of the brackets 19 by means of a drum shaft 21 forming the axis of the drum and extending beyond the end walls thereof for connection to the respective brackets 19. The drum is thus mounted for up and down swinging movement within the tank with the end brackets 19.

Some convenient hoisting mechanism for raising and lowering the drum is desirable, the embodiment shown including connecting links 22 connected at opposite ends of the drum and to cranks 23 mounted upon a shaft 24 positioned above the drum. This shaft may be driven through a worm wheel 25 mounted thereon and a worm 26 driven by a shaft 27 which may be operated either by hand or by power. It will be observed that the liquor tank is proportioned so as to permit raising or lowering of the drum therein while said drum will be fully enclosed in raised, intermediate or lowered positions.

Agitating movement of rotation, which may be continuous in either direction or oscillatory, is imparted to the drum through suitable mechanism such for example, in the embodiment shown, as the large spur gear 28 mounted adjacent one end of the drum upon the drum shaft 21 and meshing with the gear 29 mounted on the shaft 30 which is conveniently supported upon the swinging brackets 19 at the third apex thereof. The shaft 30 is driven through a worm wheel 31 mounted thereon which in turn is driven by a worm mounted upon a shaft 32 within a housing 32^a, the shaft being driven from the driving shaft 20 through a pair of intermeshing bevel gears 33. Since the driving mechanism for the drum is mounted upon the swinging drum supporting frame, it will therefore be operative to rotate the drum in raised or lowered position or in any intermediate position within the tank.

For the purpose of effecting a satisfactory agitating or turning and separating or like mechanical action upon the goods under treatment, and for effecting control of the degree of agitation under varying conditions of treatment and of character of goods, a novel receiver drum is provided including a novel arrangement of agitators or baffles including agitator plates 34 extending inwardly from the peripheral walls of the drum and preferably mounted upon and supported thereby. There may be any preferred number of these agitator plates to effect the desired mechanical action, two being a satisfactory number in each compartment of a two-compartment drum such as shown. The agitator plates 34 may be of any suitable form of construction sufficiently strong to withstand the stresses thereon and to avoid damage to the goods under treatment. A convenient preferred construction is shown, being of flattened tubular form with rounded edge and secured in position by means of screws or similar securing means 35 extending into the outer edge wall of the tubular agitator member, said edge wall lying in contact with the inner surface of the peripheral wall of the receiver drum. This arrangement provides an entirely smooth outer surface which comes into contact with the goods under treatment, there being no protruding flanges or other projections which might damage the goods.

To aid and supplement the action of the agitator plates 34, additional agitators or baffles 36 are provided. These agitators, which may be in the form of plates, transect the spaces of the receiver drum, the outer edges thereof being disposed inwardly of the peripheral wall of the drum and spaced from the inwardly disposed edges of the outer agitator plates 34. The inner and outer agitator plates are disposed in staggered relation relative to each other, that is, each

outer agitator plate is spaced angularly from the adjacent inner agitator plate so as to facilitate passage of the goods under treatment throughout the receiver compartment and to effect the desired mechanical action thereon.

A preferred manner of supporting the inner agitators 36 is disclosed, including outer supporting bars 37 extending longitudinally of the drum and supported in any desired manner in the drum walls. The outer edges of the agitator plates are connected to these supporting bars 37 while the inner edges are supported by the longitudinal drum shaft 21.

The division partition or plate 17 is provided with apertures 38 extending therethrough and preferably positioned at some distance outwardly from the center of the partition where the centrally disposed baffles 36 are located but an imperforate area or zone 39 is provided on this partition lying at either side of the baffles 36. This imperforate zone extends from the center outwardly from the baffle a considerable distance so as to provide in cooperation with the baffles also preferably imperforate, a trough like receptacle to entrap and hold the treating liquor as rotation of the drum progresses and reaches a particular point of its rotation, as will be clear upon reference to Fig. 2. This trough is so positioned and proportioned as to hold the liquor during a period of considerable rotation of the drum. The perforations 38 through the partition 17 are grouped outwardly toward the drum periphery beyond the imperforate zone 39, and permit some circulation of the liquor between the adjacent drum compartments as the drum rotates, but circulation in this respect is considerably restricted; that is, circulation through the partition 17 from compartment to compartment is considerably restricted by the imperforate zone 39. However, the peripheral shell 18 of the drum is provided with perforations 40 leading therethrough to the several receiver compartments and providing passageways permitting circulation of the liquor as the drum rotates in the treating liquor in the tank, this circulation taking place outwardly from the receiving compartments into the tank and inwardly from the tank to the receiving compartments.

This arrangement of the baffles and perforated compartment walls is advantageous from several standpoints. One advantage is that the flow of the treating liquor to and from the several receiving compartments is uniform during operation of the receiver drum with consequent increased uniformity of treatment of the goods within the several compartments. By means of this arrangement, the treating liquor within the liquor tank and within the several compartments is maintained uniform in mixture and in physical characteristics throughout the treatment. By means of the arrangement described, the circulation of liquor between the receiving compartments and the liquor tank is promoted and increased while the circulation from compartment to compartment is restricted. All of the dye or other treating liquor of the liquor tank is thus more effectively utilized and the whole body of the liquor is kept uniform, and redistribution is facilitated as parts of the liquor become partially exhausted.

A further important advantage of the arrangement described is accomplished by the formation of the water cushion mentioned. When the drum is rotating in a clockwise direction in Fig. 2, as soon as the imperforate zone 39 passes above the liquor line, the liquor is entrapped in the trough-like recess between the partition and the baffle 36 thus forming the liquid cushion 41 into which the goods will move as rotation continues reducing direct contact with the metallic surfaces and not only avoiding injury to the goods which are often of delicate character but also functioning to assist in the turning and separation of the goods, assuring more uniform treatment. This increased turning effect is accomplished in part due to the tendency of the goods to float in the liquor of the liquid cushion, and in part due to the action of the baffle 36 and of drum rotation.

It will be observed that the cushioning action of the liquid cushion 41 may be variant, dependent upon the position of the liquor level within the rotating drum. Take, for example, the condition wherein the liquor level is above the axis of the drum and nearly but not quite high enough to submerge the tumbler member 36 when the latter extends vertically upward, in which condition the effect of the liquid cushion will be very small, practically at a minimum. When, however, the liquor level is below the axis of the drum, as shown in Fig. 2, the effect of the liquid cushion is quite different, due, for one reason, to the fact that there is not much liquor above the partition 17 for the goods to float in when said partition reaches horizontal position. The cushioning effect may thus be graduated between the first and second mentioned conditions merely by raising the receiving drum as desired, by means of the drum hoisting mechanism. It will be observed, furthermore, that the cushioning arrangement described exerts some cushioning influence, even though the cushion pocket is entirely submerged when the drum is rotating low within the liquor, due to the imperforate walls of the tumbler 36 and the partition 17. This cushioning effect would not be present under conditions where either the partition or tumbler are perforated because such perforations would permit free passage of the liquor.

A further advantage of the arrangement of baffles and perforations in the partition 17 is that a smooth rather than a perforated

surface is provided at the central part of the partition on which the goods may move as rotation of the drum progresses.

The operation of effecting the mechanical action upon the goods as the drum rotates will now be apparent. As the drum rotates in the treating liquor there is considerable movement of the goods within the drum, and as the moving goods contact with the inner agitators 36 and the outer agitators 34 there is considerable tendency to turn, to separate and to open up the goods to the action of the treating liquor, even when each compartment of the drum is entirely submerged in the liquor. This agitating action may be materially increased however when the liquor does not entirely fill the compartment due to the tendency of the goods to float or come to the surface. Largely because of this floating tendency, the agitation is accentuated when the liquid surface is low within the receiver compartment, the lower the surface the greater the agitating effect, and the higher the surface the smaller the agitating effect.

It will be observed that the goods will be lifted upon the rising side of the partition or compartment wall 17 as the drum rotates, and there will be considerable similar lifting effect also by the outer agitator plates or baffles 34. After the goods have been lifted by the partition 17 to a certain elevation, they will tumble toward and over the inner baffle or agitator 36 and against the liquid cushion 41 which cooperates to effect the desired mechanical action as the goods fall by gravity. Similar mechanical action is also effected upon the goods which are lifted by the outer agitator plate 34 which lags angularly behind the inner agitator plate 36. In the latter instance, the goods will fall from the angularly lagging plate 34 toward and at least partially into contact with the inner agitator plate 36 and cushion 41, thus effecting the mechanical action referred to. If the liquid is so high within the compartment as to submerge the inner agitator plate 36 at the moment the goods tumble as described, said goods will, of course, not fall into direct contact with the inner agitator plate due to their buoyancy or tendency to float in the treating liquid, and the turning and tumbling or like mechanical action upon the goods will, therefore, not be so great. Also the mechanical tumbling and turning action upon the goods is additionally promoted as the goods fall from the inner baffles 36 outwardly against the outer baffles 34 at the descending side of the receiver drum. This tumbling mechanical action upon the goods thoroughly turns and separates them, thus facilitating the equal treatment of all parts thereof. Due to the tumbling mechanical action caused by the baffles 34 and 36 as above described, these members may be termed "tumbler members" or "tumble boards".

By means of the construction and arrangement described, it will be seen that the mechanical action upon the goods under treatment may be varied or controlled at will to meet varying conditions of service by simply raising or lowering the drum, it being unnecessary to vary the level of the dye or other liquor within the dye tank. It is therefore a simple matter to control the treatment to suit goods of different character or quality, or to effect different results where such results are controllable by varying the mechanical action upon the goods within the receiver drum.

It will be clear that the arrangement of baffles or agitators and of the liquid cushion may be utilized either in the hoisting drum type of machine as disclosed, or in the non-hoisting type in which the drum is positioned for rotation in fixed bearings within the liquor tank, but the hoisting type of construction will serve to provide more convenient and full use of the baffle and liquid cushion construction.

As above suggested, it will be apparent that the baffle as well as the liquid cushion will have a greater or less mechanical effect upon the goods dependent upon the level of the liquor within the drum. Due to the buoyancy of the goods with a high liquor level, the baffle will have but little effect in mechanically opening up the goods while with lower liquor levels, this action becomes more pronounced. In the hoist type of machine, this increase or decrease in mechanical action may be easily brought about in any degree from a maximum to a minimum merely by the simple operation of raising or lowering the drum within the liquor tank. In the non-hoist type of machine similar variation in the mechanical action may be brought about by adjusting the level of the treating liquor within the liquor tank, but this is much more difficult of satisfactory accomplishment than in the hoist type of machine.

In some classes of production, it is satisfactory to maintain constant liquid level and therefore the non-hoist machine will operate satisfactorily with the arrangement of baffles described. On goods widely different in nature, or where increased or decreased mechanical action will be required during the process of treatment of one lot of goods, the hoist type of machine will be of particular advantage, since the desired mechanical action can be obtained without reducing or increasing the dye bath and without interfering with formulas, permitting the dyer to secure just the degree and duration of mechanical action that may be required.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intend-

ed that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A cylindrical rotary receiver drum for textile treating machines, having an interior partition dividing the drum into a plurality of receiving compartments, centrally disposed radially arranged tumbler members mounted adjacent the partition and extending outwardly, and outwardly disposed, inwardly extending tumbler members mounted adjacent the peripheral wall of the drum and being displaced radially from the inner tumbler members, said partition having an imperforate zone adjacent to either side of said centrally disposed tumbler members, said zones cooperating with said tumbler members to provide liquid cushions as the drum rotates.

2. In a textile treating machine, in combination, a rotary receiver drum having a compartment for receiving the goods under treatment, tumbler members extending inwardly from the peripheral walls of the drum into the receiving compartment and terminating at inner parts thereof short of the opposing compartment wall whereby as the drum rotates the goods may pass over said inner parts, means for raising and lowering said drum with reference to the level of the treating liquor so as to vary the agitating and turning action upon the goods by said tumbler members as the drum rotates, and means for rotating said receiver drum in raised or in lowered positions.

3. In a textile treating machine, in combination, a rotary receiver drum having a compartment for receiving the goods under treatment, tumbler members extending inwardly from the peripheral walls of the drum into the receiving compartment and terminating at inner parts thereof short of the opposing compartment wall whereby as the drum rotates the goods may pass over said inner parts, means for raising and lowering said drum with reference to the level of the treating liquor so as to vary the agitating and turning action upon the goods by said tumbler members as the drum rotates, a liquor tank in which said drum is rotatably mounted, and enclosing the drum both in raised and in lowered positions, and means for rotating said receiver drum both in raised or in lowered positions within said tank.

4. In a textile treating machine, in combination, a rotary receiver drum for receiving the goods under treatment, a tumbler member mounted in stationary position within the drum and transecting the interior receiving space thereof, and having its outwardly disposed edge lying inwardly of the peripheral wall of the drum, means for raising or lowering said drum with reference to the level of the treating liquor so as to vary the agitating and turning or like mechanical action upon the goods by said tumbler member, and means for rotating said drum in raised or in lowered positions.

5. In a textile treating machine, in combination, a rotary receiver drum for receiving the goods under treatment, a tumbler member mounted in stationary position within the drum and transecting the interior receiving space thereof, and having its outwardly disposed edge lying inwardly of the peripheral wall of the drum, means for raising or lowering said drum with reference to the level of the treating liquor so as to vary the agitating and turning or like mechanical action upon the goods by said tumbler member, a liquor tank in which the receiver drum is rotatably mounted and enclosing the drum both in raised and lowered positions, and means for rotating said drum in raised or in lowered positions within the liquor closed tank.

6. In a textile treating machine, in combination, a rotary receiver drum having a compartment for receiving the goods under treatment, tumbler members within the drum and mounted adjacent to the peripheral walls of the drum and projecting into the receiving compartment, a tumbler member transecting the receiving compartment and having its outwardly disposed edge positioned inwardly of the peripheral wall of the drum and being displaced radially from the first mentioned tumbler members so the goods under treatment are tumbled from the outer to the inner tumbler member, and vice versa, means for raising and lowering said drum with refernce to the treating liquor to vary the agitation or like mechanical action upon the goods by said tumbler members, and means for rotating said drum in raised or in lowered positions.

7. In a textile treating machine, in combination, a rotary receiver drum having a compartment for receiving the goods under treatment, tumbler members within the drum and mounted adjacent to the peripheral walls of the drum and projecting into the receiving compartment, a tumbler member transecting the receiving compartment and having its outwardly disposed edge positioned inwardly of the peripheral wall of the drum and being displaced radially from the first mentioned tumbler members so the goods under treatment are tumbled from the outer to the inner tumbler member, and vice versa, means

for raising and lowering said drum with reference to the treating liquor to vary the agitation or like mechanical action upon the goods by said tumbler members, means for rotating said drum in raised or in lowered positions, and a liquor tank in which said receiver drum is rotatably mounted and enclosing the drum in raised and in lowered positions.

8. In a textile treating machine, in combination, a rotary receiving drum for receiving the goods under treatment, a partition dividing the interior of the receiver drum into a plurality of receiving compartments, an inwardly disposed tumbler member extending laterally from said partition and terminating short of the peripheral wall of the receiver drum, an outwardly disposed inwardly extending tumbler member mounted adjacent the peripheral wall of the drum and being displaced radially from the inwardly disposed tumbler member, means for raising and lowering said drum with reference to the treating liquor to vary the agitation and turning or like mechanical action of said tumbler members upon the goods, means for rotating said drum in raised or in lowered positions, and a liquor tank in which said receiver drum is rotatably mounted and enclosing the drum in raised and in lowered positions.

9. In a textile treating machine, in combination, a rotary receiver drum for receiving the goods or stock under treatment, and adapted to rotate about its longitudinal horizontal axis, an inner tumbler member mounted in stationary position within the drum and transecting the interior receiving space of the drum and having its outwardly disposed edge disposed inwardly of the peripheral wall of the drum and an outwardly disposed tumbler member mounted adjacent the peripheral wall of the drum and extending inwardly therefrom and terminating short of said inner tumbler member, said inner and outer tumbler members being radially displaced from each other, whereby the stock is tumbled by gravity from the outer to the inner tumbler members, and vice versa, as the drum rotates.

10. In a textile treating machine, in combination, a rotary receiver drum for receiving the goods or stock under treatment, and adapted to rotate about its longitudinal horizontal axis, an inner tumbler member mounted in stationary position within the drum and transecting the interior receiving space of the drum and having its outwardly disposed edge disposed inwardly of the peripheral wall of the drum and an outwardly disposed tumbler member mounted adjacent the peripheral wall of the drum and extending inwardly therefrom and terminating short of said inner tumbler member, said inner and outer tumbler members being radially displaced from each other, whereby the stock is tumbled by gravity from the outer to the inner tumbler members, and vice versa, as the drum rotates, and an interior partition dividing the drum into a plurality of receiving compartments.

11. In a textile treating machine, in combination, a rotary receiver drum for receiving the goods under treatment, a partition dividing the interior of the drum, a baffle adjoining an intermediate part of said partition and cooperating therewith to form a liquid cushion for cushioning the tumbling action of the goods during drum rotation, means for raising and lowering the drum with reference to liquid level to vary the cushioning effect of the liquid cushion and means for rotating the drum in both raised and lowered positions.

12. In a textile treating machine, in combination, a rotary receiver drum for receiving the goods under treatment, a partition dividing the interior of the drum, a baffle adjoining an intermediate part of said partition and cooperating therewith to form a liquid cushion for cushioning tumbling action of the goods during drum rotation, tumbler members within the drum mounted adjacent to the peripheral walls thereof and projecting into the receiving compartment and radially spaced from said baffle, means for raising and lowering the drum with reference to the liquid level to vary the cushioning effect of the liquid cushion and the tumbling action of said tumbler members, and means for rotating the drum in raised and lowered positions.

13. In a textile treating machine, in combination, a rotary receiver drum for receiving goods under treatment, tumbler members within the drum mounted adjacent the peripheral walls thereof and projecting into the receiving compartment, said drum having an interior recess adapted to entrap the liquor during drum rotation to form a liquid cushion positioned inwardly of the drum from said tumbler members for cushioning the tumbling action of the goods during drum rotation, said tumbler members being circumferentially positioned to urge the goods toward said liquid cushion during drum rotation, means for raising and lowering said drum and means for rotating the drum.

In testimony whereof I affix my signature.

WILLIAM E. H. BELL.

CERTIFICATE OF CORRECTION.

Patent No. 1,860,351. May 31, 1932.

WILLIAM E. H. BELL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, line 64, claim 3, before the word "tank" insert the word closed, line 95, claim 5, strike out the word "closed", and line 112, for the mispelled word "refernce" read reference; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of August, A. D. 1932.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.