W. S. BLAINE.

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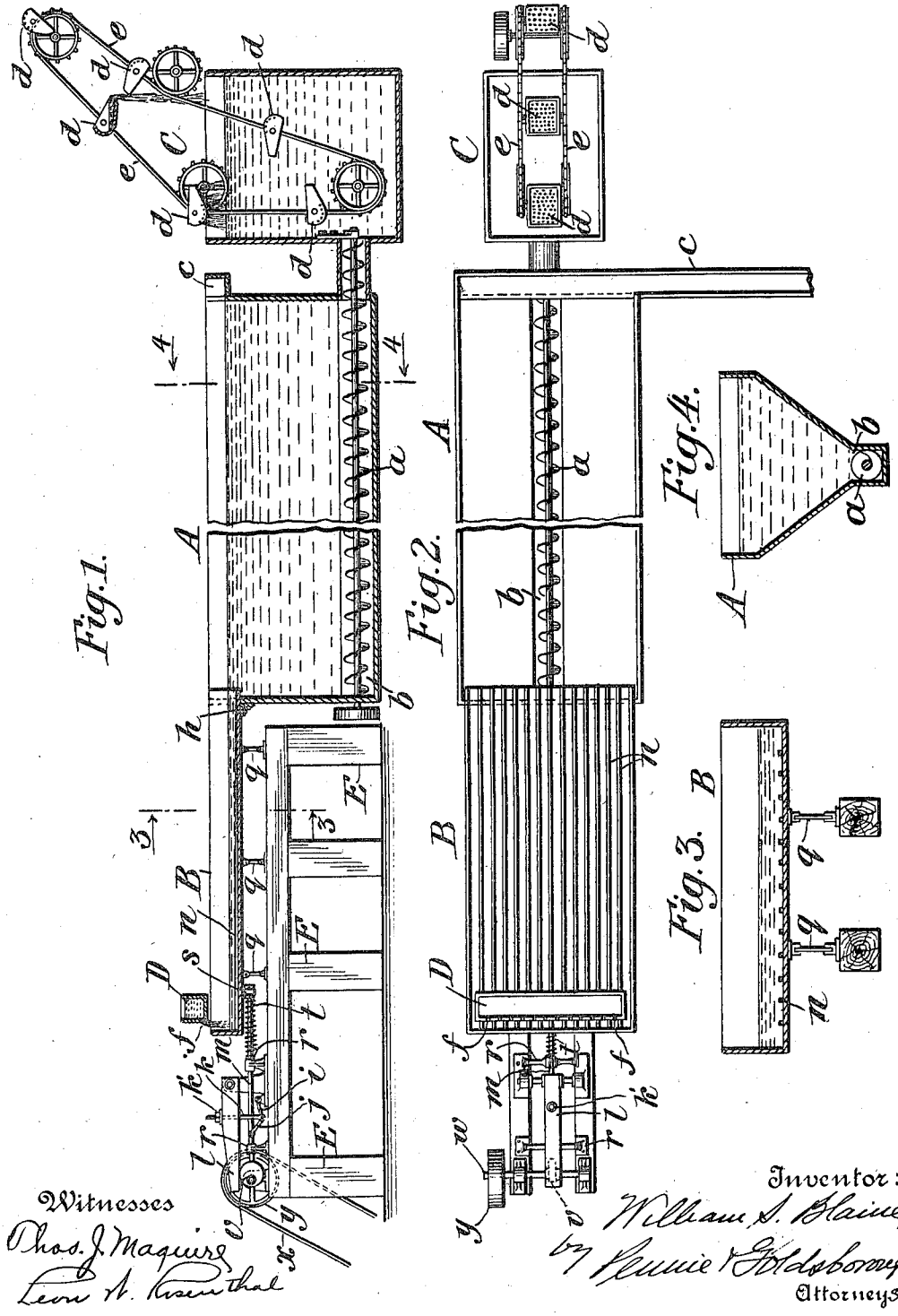
1,032,732. Patented July 16, 1912.



Witnesses
Thos. J. Maguire
Leon N. Rosenthal

Inventor:
William S. Blaine,
by Bennie F. Goldsborough
Attorneys.

# UNITED STATES PATENT OFFICE.

WILLIAM SULLIVAN BLAINE, OF TORREON, MEXICO, ASSIGNOR TO INTERCONTINENTAL RUBBER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

## APPARATUS FOR SEPARATING PARTICLES OF RUBBER FROM MATERIALS WITH WHICH THEY ARE COMMINGLED.

1,032,732 Specification of Letters Patent. **Patented July 16, 1912.**

Application filed November 1, 1910. Serial No. 590,149.

*To all whom it may concern:*

Be it known that I, WILLIAM SULLIVAN BLAINE, a citizen of the United States, residing at Torreon, Republic of Mexico, have invented certain new and useful Improvements in Apparatus for Separating Particles of Rubber from Materials with Which They Are Commingled; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in apparatus for the separation of particles of rubber from materials with which they are commingled.

Among other uses, the invention is of particular importance in the recovery by flotation, of the particles of rubber mechanically associated with the bark and woody matter of the guayule shrub and like rubber-bearing shrubs and plants which have been subjected to attrition, in the presence of water, in the well known "pebble mill", familiar to the art.

In the accompanying drawing, Figure 1 represents a longitudinal sectional view of the apparatus, (suitable for the practice of the improved method) the flotation tank thereof being shown as partly broken away; Fig. 2 represents a top plan view thereof; and Figs. 3 and 4 represent, respectively, cross sectional views, taken on planes indicated by the dotted lines 3—3, and 4—4, Fig. 3 being on a somewhat larger scale.

Similar letters of reference indicate similar parts throughout the several views.

Referring to the drawing, it will be noted that the apparatus shown consists of three main elements, to wit, a flotation tank A, a concentrator B feeding the flotation tank, and an auxiliary tank C into which the heavier residues or sinkers, usually called rubber bagasse, are fed from the flotation tank.

In the usual practice of the invention, the separated body of rubber bagasse constituting the heavier residues or sinkers, is conveyed progressively along the lower part of the flotation tank, from end to end thereof, by means of a slowly moving conveyer, which may conveniently take the form of a screw conveyer *a*, located in a well *b*, midway of the bottom of the tank and between the inclined bottom walls thereof. So, also, it is preferred to progressively draw off the "floats", consisting mainly of the separated rubber particles, these floats finding their exit by way of the overflow *c*, to a suitable place of collection. The simultaneous and progressive withdrawal of both the sinkers and floats permits the flotation tank to be operated with a correspondingly high output per unit of time. Particularly, moreover, the progressive withdrawal of the sinkers is effected without interfering in any substantial way with the separating action of the flotation tank; or, in other words, without causing the reëntrance into the sinkers of any of the particles of rubber that have been released and are on their way upward in the intermediate water zone between the sinkers and the floats. To this end, I provide for preventing any such reëntrance of released rubber particles into the sinkers, by establishing a countervailing or compensating back-pressure, to balance the head of water in the flotation tank, and thereby suppress any tendency to the formation of a downward current of water from the flotation tank during the withdrawal of the sinkers. This back-pressure may be obtained in any convenient way, but preferably by the expedient of having the outgoing body of sinkers discharge into the auxiliary tank C, containing a body of water which will balance the head of the body of water in the flotation tank. The rate of revolution of the screw conveyer *a* is slow, and results in the gradual advance of the sinkers and their progressive discharge into the auxiliary tank. In the auxiliary tank, it is desirable to avoid any such amount of agitation or eddying as would tend to exert a suction action upon the charge in the flotation tank. Accordingly, for the removal of the sinkers as they are discharged into the auxiliary tank, there are employed elevating devices which likewise move slowly. These elevating devices, moreover, have a sieving function, in the sense that they drain the sinkers as they rise from the tank and permit the drippings to fall back into the main body of water therein. A chain elevator *e*, having perforated buckets *d*, is particularly appropriate for the purpose, for

the reason that not only are the drippings from the perforations of the buckets returned to the tank, but also those which are decanted from the top of the bucket charge as the individual buckets begin to tilt as they rise to the point of ultimate discharge of the drained sinkers. The accumulation or entrapping, on top of the bucket charges, of the small layer of water thus decanted, is due to the fact that the individual particles of the sinkers are small, and that some of them are so fine that they settle upon and within the coarser particles, as the buckets begin to drain, so that the mass becomes correspondingly less permeable, to the extent of preventing the down filtration of the small top layers of water referred to. The return of the drippings from the perforations of the buckets and from the top of the bucket charges maintains practically constant the body of water in the tank C.

In practice, it is preferred to supply the commingled mass of water, and particles of wood, bark, and rubber, from the pebble mill, to a flow-box D, wherein, if desired, the mass may be further diluted with an additional supply of water, so as to find ready exit through the discharge apertures *f* of the flow-box. From the discharge apertures of the flow-box, the material is supplied to the bottom of the concentrator B, in such manner as to be distributed with substantial uniformity over the entire width of the concentrator bottom. The concentrator bottom is provided with a series of longitudinal projections *n* which may conveniently be of a height of about three-quarters of an inch at the flow-box end of the concentrator and which preferably taper to the discharge end of the concentrator bottom; so that as the particles advance toward the flotation tank, their distribution over the surface of the concentrator bottom will be maintained, and so that they will readily pass off from the verge or edge of the concentrator bottom without tendency to mass up or accumulate along said edge.

The concentrator bottom or table is appropriately mounted upon suitable oscillatory links or supports *g* and is connected, by a sheet of rubber *h*, forming a bellows fold, with the flotation tank A, so as to be capable of a limited longitudinal reciprocation. The desired reciprocation is of such a character that the concentrator bottom or table will be accelerated toward the end of the forward stroke, so that a corresponding series of minute impulses (usually about 250 per minute, more or less) will be imparted to the material, causing it to move forward toward the flotation tank. In this movement the material advances under a covering of about from three to five inches of water, the water level being established by water level existing in the flotation tank. The resultant effect is that there is produced a corresponding turning over of the particles of the mixture as they advance, thereby permitting them to release, to some degree, the lighter particles, and to obtain a certain amount of stratification in the mass by the time that it passes into the deeper body of water in the flotation tank. In passing over the verge of the concentrator bottom or table into the deeper body of water in the flotation tank, the mass has a relatively considerable drop and, in its descent through this deeper body of water, additional particles of rubber are released to join the floats on the surface of the water therein.

Suitable means for obtaining the desired acceleration of the forward stroke of the reciprocating concentrator bottom or table are illustrated in the drawing. These means may consist of a rod *m* adapted to move back and forth in bearings *r* and connected at its forward end to the lower part of the table at *s*, said rod *m* being enveloped by the spring *t*, which reacts between *s* and one of the bearings *r*. A toggle joint, one of whose lever arms *i* is fulcrumed to a support on the frame E and whose other lever arm *j* is fulcrumed on the rod *m*, is provided at the point of juncture of the two arms, with a vertical arm *k*, screw-threaded at its upper end and passing through a pivoted rock bar *l*, whose free end rests upon the continuously revolving cam *v* on the power shaft *w*, which power shaft may be run by a belt *x* and pulley *y* from any convenient source of power. The arm *k* is provided with an adjusting nut *k'* so as to determine the length of stroke of the rod *m* and consequently the rate of advance of the material on the concentrator bottom or table. It will, of course, be understood that the mechanism gives a corresponding retardation of movement on the return stroke of each reciprocation, thereby correspondingly increasing the effect.

What I claim is:—

1. Apparatus for separating particles of rubber from materials with which they are commingled, said apparatus comprising a flotation tank, a concentrating table communicating with said tank at one end thereof, and an overflow for the flotation tank, so arranged as to maintain a shallow covering of water upon the concentration table; substantially as described.

2. Apparatus for separating particles of rubber from materials with which they are commingled, said apparatus comprising a flotation tank and a conveyer located in the bottom of said tank, in combination with an auxiliary tank into which said conveyer discharges, said auxiliary tank being arranged at a level to exert a compensating back pressure upon the charge of the flota-

tion tank, and means for removing the sinkers from said auxiliary tank without exerting a substantial suction action on the flotation tank, substantially as described.

3. Apparatus for separating particles of rubber from materials with which they are commingled, said apparatus comprising a flotation tank and a conveyer located in the bottom of said tank, in combination with an auxiliary tank into which said conveyer discharges, said auxiliary tank being arranged at a level to exert a compensating back pressure upon the charge of the flotation tank, said auxiliary tank being further provided with a series of sieving elevator buckets; substantially as described.

4. Apparatus for separating particles of rubber from materials with which they are commingled, said apparatus comprising a flotation tank, a concentrating table communicating with said tank at one end thereof, and of a width substantially equal to the width of the flotation tank, and an overflow for the flotation tank, so arranged as to maintain a shallow covering of water upon the concentration table; substantially as described.

5. Apparatus for separating particles of rubber from materials with which they are commingled, said apparatus comprising a flotation tank, a concentrating table communicating with said tank at one end thereof, said concentrating table being provided with a series of longitudinal partitions and having a supply box at one end thereof, and an overflow for the flotation tank, so arranged as to maintain a shallow covering of water upon the concentration table; substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

WILLIAM SULLIVAN BLAINE.

Witnesses:
G. A. GUERRA,
N. ARCOS.