

(No Model.)

E. A. POND.

APPARATUS FOR MIXING SOLIDS AND LIQUIDS AND FOR OTHER PURPOSES.

No. 297,002.

Patented Apr. 15, 1884.

FIG. 1.

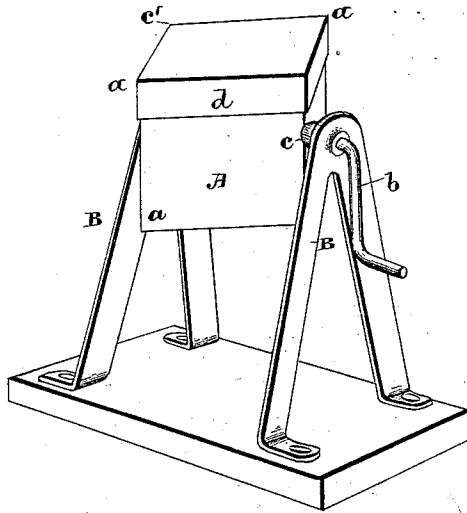


FIG. 2.

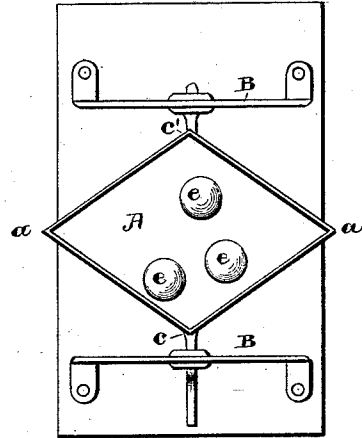


FIG. 3.

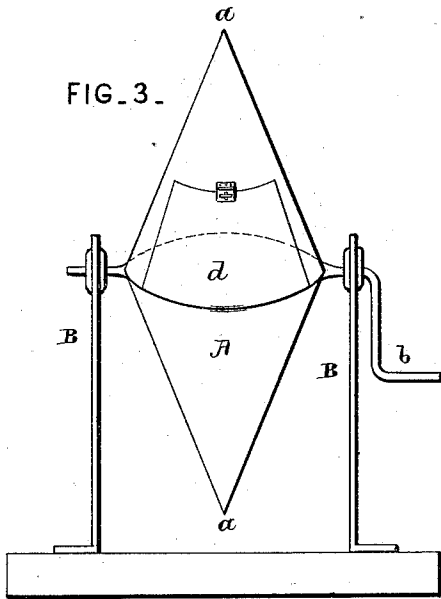


FIG. 4.

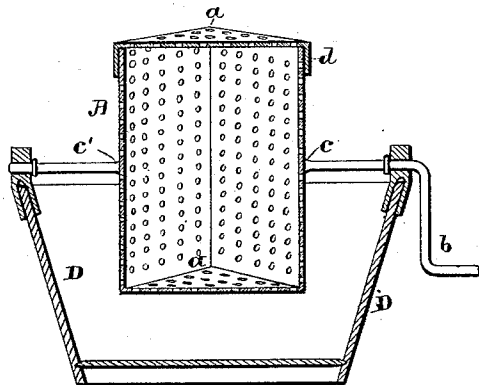
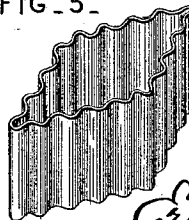


FIG. 5.



ATTEST

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INVENTOR.

*Erasmus A. Pond*  
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# UNITED STATES PATENT OFFICE.

ERASMUS A. POND, OF RUTLAND, VERMONT.

APPARATUS FOR MIXING SOLIDS AND LIQUIDS AND FOR OTHER PURPOSES.

SPECIFICATION forming part of Letters Patent No. 297,002, dated April 15, 1884.

Application filed October 5, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, ERASMUS A. POND, of Rutland, in the county of Rutland and State of Vermont, have invented a new and useful  
5 Improvement in Apparatus for Mixing Solids and Liquids and for other Purposes, which improvement is fully set forth in the following specification.

The present invention has reference more  
10 particularly to the construction of a device or apparatus for effecting the intimate and uniform mixture of finely-divided materials, and applicable also to the mechanical mixture of  
15 liquids, and to other uses, as hereinafter pointed out. Having had great experience in attempting to effect thorough mixture of such substances as medicinal powders and the like, I have found the means in common use insufficient to produce a uniform result; also, in  
20 mixing the materials constituting Portland cement, I have, during the past few years, tried all the different mills and apparatus in ordinary use, including pug-mills, atomizers, churns, &c., and found them all imperfect.  
25 It is essential, in the manufacture of Portland cement, that all the ingredients should be perfectly mixed, so that when burned each separate mass shall comprise the same ingredients in like proportions. When, as is the case  
30 with Portland cement, the materials to be mixed are of different densities, the difficulty of producing a uniform result is greatly enhanced. In using for this purpose apparatus  
35 like that class of churns which rotate on trunnions placed at diagonally-opposite corners, the contents of the box receive a zigzag motion, and the materials, especially if of different densities, are more or less separated, instead of being mixed. Apparatus like the  
40 square prism churn, having its trunnions in the center of opposite faces, will mix only in one direction, and will not mix in the line of its axis—*i. e.*, every inch on the line of axis represents, a gradually-increasing area of imperfect mixture, as will be seen if materials of  
45 different color are used. In the manufacture of Portland cement any imperfection in the mixture is readily detected from the different color of the clay and stone when burned. From  
50 my experiments I have found that to produce a perfect result the materials should not be stirred in the usual way or deflected out of

their course by any faces or angles of the mixing apparatus, but should be rotated in such manner as to roll over or fall by their own  
55 gravity toward a common point. To accomplish this I have devised a mixing apparatus which from its construction and action while rotating effects the movements of the materials therein necessary to effect a thorough  
60 and uniform mixture. The said apparatus consists of a suitable box, of cubical or rhombic form, or of the shape of two cones placed base to base, hung on trunnions in such manner  
65 that the corners or points, when the box is rotated, will successively be at the lowest central point in the circle of rotation, or, in other words, so that the corners of the box or  
70 points of the cones lie in the vertical plane passing through the center of the axis of rotation. The materials in a box so formed and supported tend, as the same is revolved, to  
75 fall by their gravity toward the lowest central point, and as all the particles partake equally of this tendency, and as the faces of the box occupy such position as to facilitate rather  
80 than oppose this tendency, the materials are constantly projected toward a common point until, no matter how different their densities may be, a perfect and uniform mixture is effected. If the box is cubical, the trunnions  
85 would be placed at the center of diagonally-opposite edges; if rhombic, at the center of opposite edges, preferably of the shortest axis, since the greater the length of the  
90 points in the vertical line the more rapid will be the operation; if of double conical form, the trunnions will be at opposite points in the plane of the base-line of the two cones. Where  
95 there is a slight dampness in the materials to be mixed, they have a tendency to lump or adhere in masses, as is the case with flour and meal, slaked lime, &c. This slight cohesion may be overcome by passing them through a sieve previous to mixing, or more effectually  
by rotating with them a few small chilled-iron balls.

In order that my invention may be fully understood, it will now be described in connection with the accompanying drawings,  
100 which illustrate several ways of carrying it into effect.

Figure 1 is a perspective view of a rhombic box; Fig. 2, a top view of the same with the

cover removed; Fig. 3, an elevation of a conical form of box; Fig. 4, a sectional perspective of another form of apparatus, and Fig. 5 a detail view of a corrugated lining for the box.

The form of box used will depend more or less upon the nature of the ingredients to be mixed, and the shape therefore may vary, it being only essential to the carrying out of the invention that the shape of the receptacle will admit of its being in such way that its extreme points or corners, or the points farthest from the axis of rotation, shall always be in the vertical plane that cuts the center of said axis.

In Figs. 1 and 2, A is the box or receptacle, of rhombic form—*i. e.*, having its top and bottom of diamond shape. It is hung in the uprights or standards B by means of trunnions attached at the middle points of the opposite edges, *c c'*. When rotated by the handle *b*, the corners *a*, or points farthest from the axis of rotation, will successively occupy the lowest central point, and they move always in the vertical plane passing through the center of the box. The latter is fitted with an ordinary cover, *d*; but any desired means of obtaining access to the interior of the box may be adopted. The cover may be made air-tight or water-tight, as may be required. The chilled-iron balls *e*, Fig. 2, are to be placed in the box and rotated, with its contents, when the materials are moist or have a tendency to adhere in lumps. When the box A is made in the form of a double cone, as in Fig. 3, the trunnions are at opposite points in the line where the bases of the two cones meet.

In operation the materials (solid or liquid) are placed in the vessel A and the cover *d* replaced and secured. The said vessel is rotated at moderate speed by the handle *b* or by power. The materials fall constantly and with a regular movement from the sides toward the center, and as they are carried up in this line by the corners *a* other material takes their place, and in this way the entire contents of the box are equally and regularly acted upon until a thorough intermixture is obtained.

Apparatus constructed on this principle may be used for other purposes. Thus, in Fig. 4 the receptacle A is shown as having its walls perforated, to serve as a domestic washing-machine. It is hung so as to rotate in a tub, D, containing hot or cold water. The walls of vessel A may be corrugated; or a removable corrugated lining, Fig. 5, may be provided, which can be inserted and removed at pleasure. The corrugated interior acts as a rubbing-surface, and the contents of the box are

projected constantly toward the central line, producing alternate rubbing and pressing.

By providing suitable valves for the admission of air the apparatus may be used as a churn, and other applications of it will readily suggest themselves.

It is obvious that modifications within wide limits may be made in the shape of the vessel A without departing from the spirit of the invention, it being only essential that the vessel be of such shape and so hung as to give the contents the movement above pointed out as necessary to effect a thorough mixture.

Having now fully described my said invention and the manner of carrying the same into effect, what I claim is—

1. The method of mixing various materials by rotating them in such way that the particles will all be projected constantly and regularly toward a common point, substantially as described.

2. A box or receptacle journaled as set forth, so that in rotating the corners or points of the box or receptacle farthest from the axis of rotation move always in the vertical plane passing through the center of the box or receptacle, substantially as described.

3. A box or receptacle of cubical, rhombic, or similar form, hung on trunnions attached at the middle points of two diagonally-opposite edges, substantially as described.

4. The combination, with the box or receptacle constructed and operating as set forth, of the iron balls, substantially as and for the purpose described.

5. The box or receptacle hung on trunnions attached at the middle points of diagonally-opposite edges, and having a corrugated interior, substantially as described.

6. The combination, with a box or receptacle supported and revolving as set forth, of a removable corrugated lining, substantially as described.

7. A rotary box or receptacle made of open-work material in a conical, rhombic, or similar form, provided with a corrugated interior, and supported so that in rotation the corners or points farthest from the axis will in succession occupy the lowest central point, substantially as described.

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

ERASMUS A. POND.

Witnesses:

MAUD RADDIN,  
ANNA M. ATWOOD.