No. 632,367. Patented Sept. 5, 1899.

A. ROBINSON.

CURD AGITATOR.

(Application filed Sept. 28, 1894. Renewed June 3, 1899.)

(No Model.)

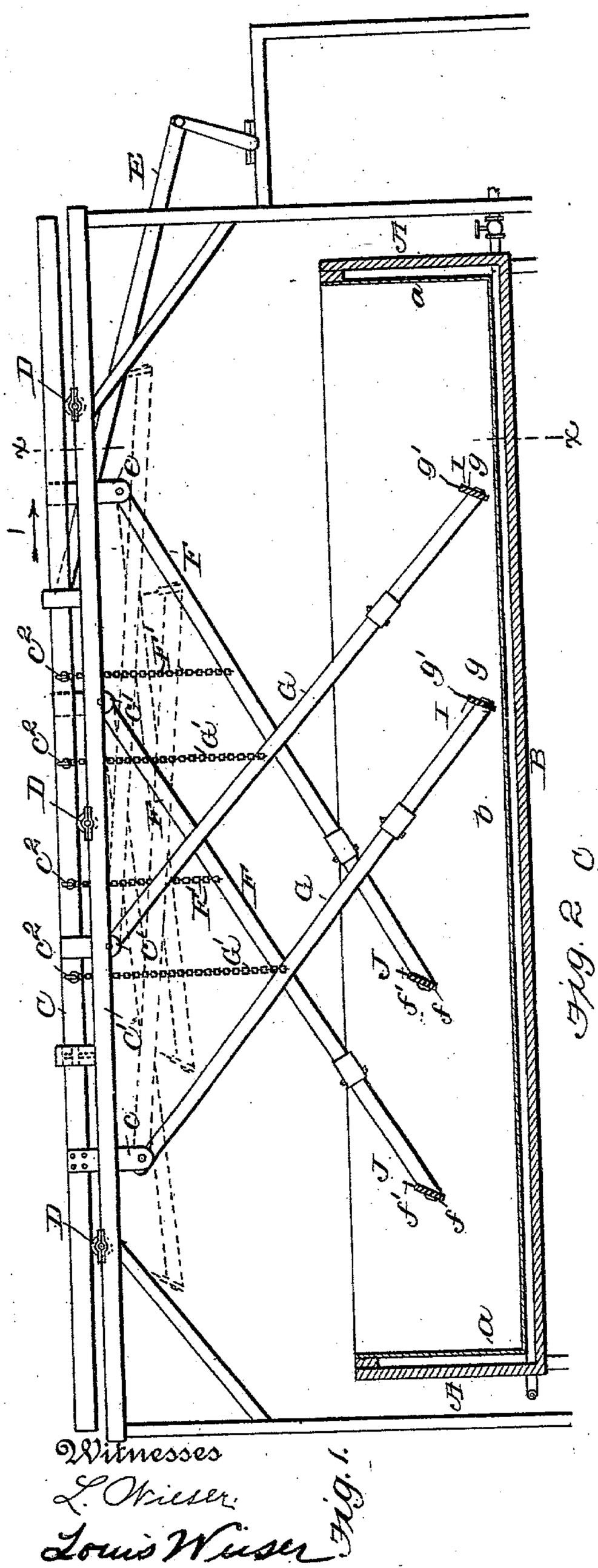

Fig. 1.

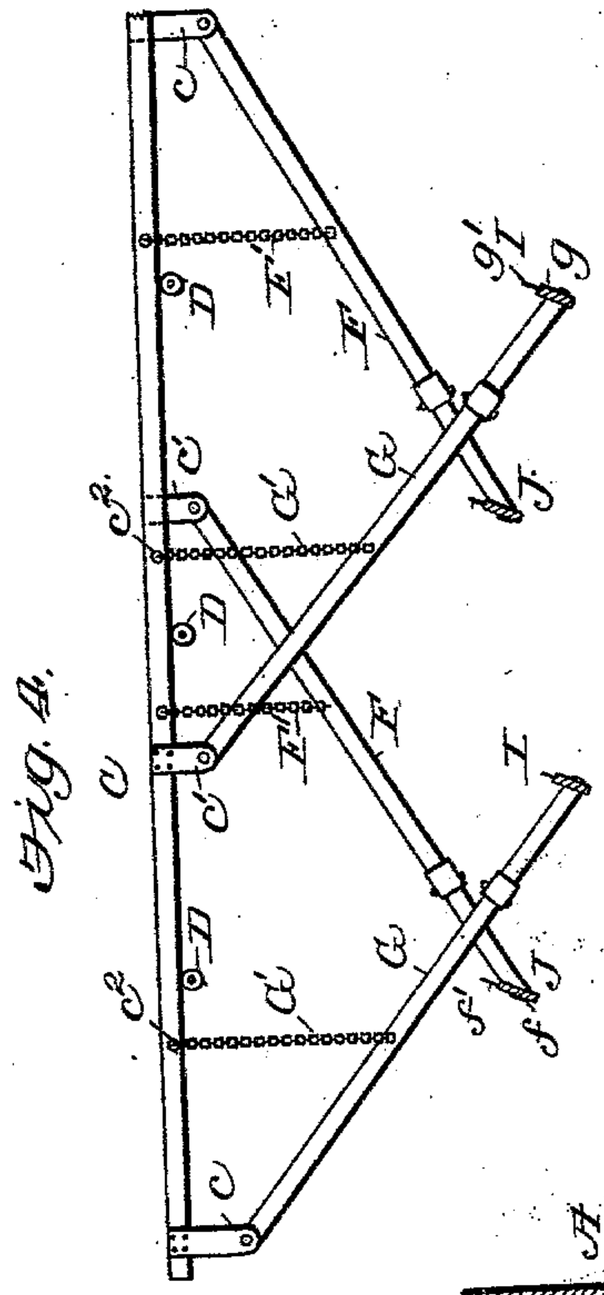

Fig. 4.

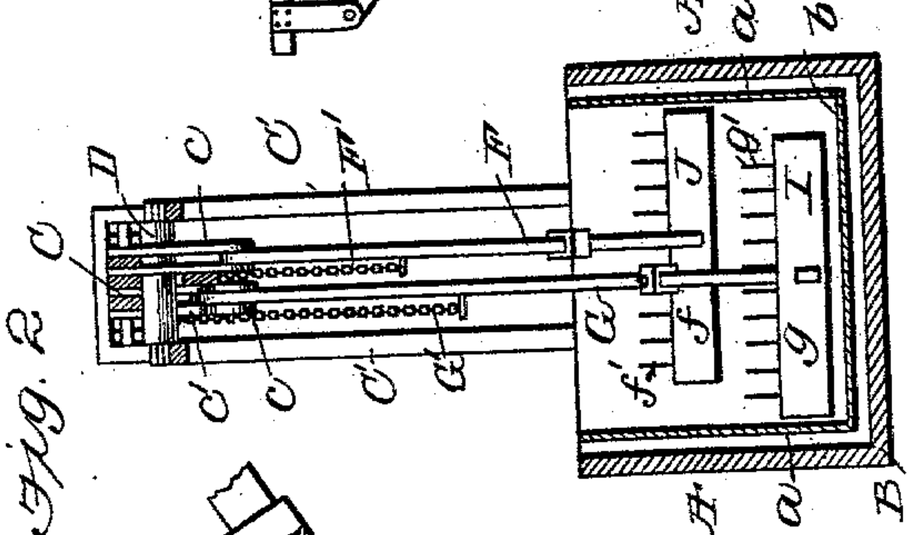

Fig. 2.

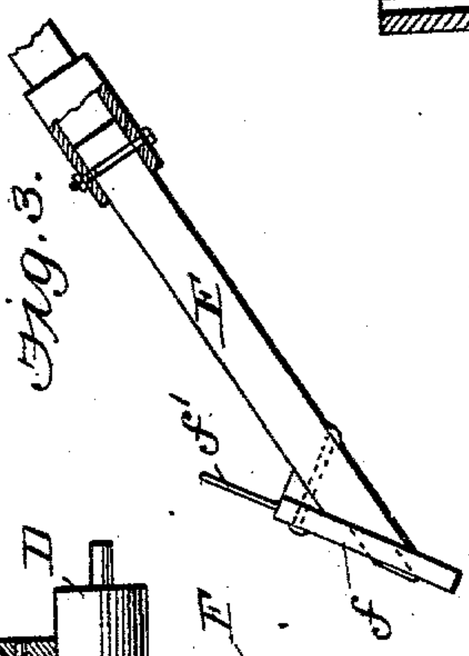

Fig. 3.

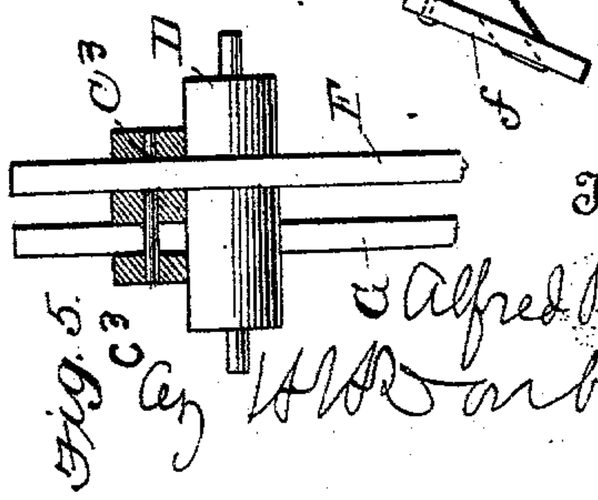

Fig. 5.

Witnesses
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UNITED STATES PATENT OFFICE.

ALFRED ROBINSON, OF ABERCORN, CANADA.

CURD-AGITATOR.

SPECIFICATION forming part of Letters Patent No. 632,367, dated September 5, 1899.

Application filed September 28, 1894. Renewed June 3, 1898. Serial No. 682,489. (No model.)

To all whom it may concern:

Be it known that I, ALFRED ROBINSON, a citizen of the United States, residing at Abercorn, in the Province of Quebec and Dominion of Canada, have invented certain new and useful Improvements in Curd-Agitators, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to that class of curd-agitators in which the devices used for breaking up the curd travel alternately in opposite directions in either straight paths or curved paths.

In operating the type of machines to which my invention pertains among the difficulties met with has been the tendency to swing the contents of the vat or other receptacle to and fro with the stirrers and to slop the material over the sides of said vat, a further objection to such surging motion being that it interferes seriously with an efficient breaking up of the curd into small enough particles. In order to overcome such defects, one part of my invention consists in the combination, with a series of curd-breakers, of means for moving them alternately in elliptical paths which lie in different horizontal planes, thus producing counteracting currents within the mass of material, another part thereof relating to the combination of two sets or series of curd-breakers and means for moving them in different paths, which are reciprocally interchanged, as will be hereinafter fully explained.

Figure 1 is a side elevation of so much of an agitator as is necessary to illustrate my invention. Fig. 2 is a transverse section on line *x x*, Fig. 1. Fig. 3 is a detached view of one of the rake-heads and its carrying-arm. Fig. 4 shows a modification of one part of my invention. Fig. 5 illustrates a modification in the carrier and the pivoting of the rake-shanks thereto.

A A B indicate, respectively, the side, ends, and bottom of a vat or tank having, preferably, an inside jacket *a b*, of metal, of less size in all dimensions, so as to form an annular space all around the metal lining for the reception of hot water or steam.

C is a horizontal carrier-bar supported on a framework C′ C′ at a suitable height aboye the vat, with preferably a series of antifriction-rollers D below the bar.

E represents an arm adapted to be used in moving the bar backward and forward, either by hand or by connecting one end of said arm to some suitalbe motor—such, for instance, as a crank or a vibrating lever.

F F G G are the reversely-inclined shanks or handles of the rakes, I J being the rake-heads, which depend into opposite ends of the vat. The upper ends of the shanks are pivoted to the carrier-bar C either by means of lugs or brackets *c c c′ c′*, as indicated in Figs. 1 and 2, or by extending the shanks up through the strips of which the carrier is preferably composed, the strips being spaced far enough apart to admit the shank ends between them and constituting a flexible suspension-stop, as is indicated in Fig. 5, where the rake-heads are shown disposed on opposite sides of one of the rollers D, the shank G being pivoted at c^3, the other shank having, of course, a similar pivot, (not shown;) but on some accounts I prefer the other mode of hanging, it having advantages as regards permitting the folding of the shanks. When the lugs are used, I prefer to place the longer ones *c c* outside of the shorter ones to facilitate folding the parts into the position shown in dotted lines, Fig. 1, when it is desired to suspend the rakes entirely above the vat. Thus when the machine is in operation the carrier is reciprocated in unison with the crank, and the curd-breakers are also constantly moved backward and forward in the vat, my machine differing in this respect materially from those in which the breakers are pivoted to a carrier which is capable of being adjusted longitudinally of the vat, but which when the said breakers are at work does not reciprocate, but remains at the point to which it has been adjusted and imparts motion to the breakers by being rotated alternately in different directions about its axis.

F′ G′ are chains, each connected at one end to one of the shanks and at the other to the carrier to limit the position to which the rake-heads can drop, and thus keep them out of contact with the bottom of the vat. A convenient way of holding the rakes in the dotted-line position is to hitch the proper chain-links over the hooks c^2.

Any usual or approved kind of agitators may be used at the lower ends of the shanks; but I prefer to employ those indicated in the drawings, which consist, essentially, of a rib or head with a series of teeth or fingers projecting upward therefrom, as indicated at *f f' g g'*, those parts being attached to their respective shanks by means of pivots, which will permit the rake-heads to rock or tilt a little to facilitate shifting the planes of the heads toward and from a vertical line as they are being moved to and fro through the mass in order that such change in angle of the rake-heads may contribute toward the rakes following the desired paths as they are propelled forward and back.

My invention may be operated as follows: Suppose the carrier-bar to be moving in the direction indicated by the arrow 1, Fig. 1, it is evident that part of the pull upon the shanks F F will be exerted as a lifting force and will tend to elevate the rake-heads out of the material, but will be partially counterbalanced by the weight of the rakes, so that with a proper relation of parts the teeth or fingers *f'* will be submerged a suitable distance to do effective work; but upon reversing the direction of travel the thrust of the same shanks will push the said rake-heads *f f'* down toward the bottom of the vat, which, however, they cannot reach because of the chains F' acting as stops to limit their movement in this direction, as will be readily understood without further explanation. During the initial movement of the carrier-bar in the direction indicated by arrow 1 the shanks G G will, in addition to moving the rake-heads forward, tend to thrust them downward as far as the chains G' will permit until the limit of forward travel has been reached, when upon the return stroke the pull of the shanks will cause those rake-heads to rise and move over a path lying in a higher plane to their starting-point. Thus each rake-head will when moving forward travel in a path which is at a different distance from the bottom of the vat from that over which it moves when it returns to its starting-point. Considering the rakes I I as one series, it is obvious that when they are being pushed forward they travel in a path which may be not inaccurately described as representing the lower half of an ellipse, the greater part of which lies in a practically horizontal plane as near the bottom of the vat as the supporting-chains G' G' will permit, while on the return stroke or movement each rake of that series traverses the upper half of the same ellipse, the greater part of which lies nearer the surface of the curd and in a practically horizontal plane, but a much higher horizontal plane than was traversed by said rake when moving in the opposite direction. It is obvious that the movement of the curd produced by such motions of the rakes will be different from that resulting from rakes which travel in paths all parts of which are at the same distance from the bottom of the vat—that is to say, which lie in the same horizontal plane. Now considering rakes I I as one series and rakes J J as another series, it is obvious that when the machine is in operation their paths are reciprocally interchanged—that is to say, when the rakes of one series are traversing the upper portions of their elliptical paths the rakes of the other series are traversing the lower portions of their elliptical paths, and vice versa, and it is apparent that such difference in the movements of the agitators will not only result in a very thorough breaking up of the curd, but will produce such a series of counter-currents in the material as will effectually prevent the objectionable swing and slopping over of the material which has been heretofore referred to. It is also obvious that with the arrangement of parts shown in Fig. 1 the agitators *f f'* will traverse paths which are farther from the bottom of the vat than the paths of the agitators *g g'*, which will be found desirable under some circumstances—as, for instance, if the vat be nearly full of material—from the fact that the latter will when moving in the direction of the arrow draw after them some of the material from the lower part and opposite end of the mass, while the agitators *f f'* will on their return stroke draw after them some of the material from the upper right-hand end of the mass, thus inducing a slow round-and-round movement of the material in addition to the above-referred-to counter-currents which are caused by agitators traveling in the approximately elliptical paths, the resulting movement of the material being somewhat different from that of a comparatively shallow body with the agitators at both ends of the vat operating at substantially the same distances from the bottom, their paths being determined partly by the depth and density of the curd, as will be readily understood without further explanation. The creation of such counter-currents is further facilitated by arranging one rake-head in advance of another, and as a modification of my invention I propose to still further stagger the rake-heads by moving the left-hand shank G so far toward the end of the carrier that its rake-head shall occupy the position now occupied by the adjacent heads *f f'* and move the right-hand shank F so far toward the arm E that its rake-head shall occupy the place which has been vacated by the previously-moved rake-head *g g'*. (See Fig. 4.)

It is obvious that with the rakes arranged as in Fig. 1—that is to say, the pair I I at one end of the vat and the pair J J at the opposite end—each pair or set travels round and round in its own path or paths without crossing the path of either rake of the other series or set and that while one set is substantially the duplicate of the other set and operates in practically the same way at its own end of the vat, yet by reason of their dif-

ferent paths being reciprocally interchanged they produce movements of the material different from those which would result were only one set employed in a vat of, say, one-half the length of the one shown, a result which I think would be less desirable than that arising from the arrangement illustrated in the drawings.

While I have shown the carrier-bar and rakes supported from a framework rising from the floor, those moving parts may be mounted on a frame depending from the ceiling of the room, and thus leave a more unobstructed space below them for the use of the operator of the appliances.

Under all of the described arrangements the paths of the rake-heads will be approximately elliptical, the form of such ellipses depending, of course, in great measure upon the angles at which the rake-heads stand relative to vertical lines. Thus, if such angles be more obtuse with the lower edges to the rear their engagement with the material will tend more to lift them than would be the case if they stood at a more acute angle, and vice versa. By a suitable adjustment of the relations of the various parts of the machine, as above indicated, the paths of the agitators through the curd may be regulated to meet all the varying requirements resulting from different depths of material and other conditions within the vat or other receptacle. For instance, in Fig. 4 the length of the chains F′ is such that the agitators *f f′* will when moving backward on their return stroke in a direction the reverse of that indicated by the arrow 1, Fig. 1, travel much closer to the bottom of the vat than they can in Fig. 1, which is desirable with a shallow body of curd in order that they shall not rise above it when moving forward; but those agitators when moving forward describe the upper part of an approximately elliptical path and on their return stroke describe the lower part of said approximately elliptical path. On the other hand, in Fig. 4 the agitators *g g′* will when moving forward describe the lower part of an approximately elliptical path and will on their return stroke describe the upper part of said approximately elliptical path. Thus as each agitator travels to and fro it moves alternately in different paths, one of said paths being the upper part of an approximate ellipse, the other path being the lower part of an approximate ellipse.

What I claim is—

1. In a curd-agitator, the combination with a series of curd-breakers, of means for moving them alternately in elliptical paths in different planes, substantially as set forth.

2. In a curd-agitator, the combination of two series of curd-breakers, with means for moving them in different paths which are reciprocally interchanged, substantially as set forth.

3. In a curd-agitator, the combination with a vat and a carrier which is reciprocated in a horizontal plane, of two series of curd-breakers which are pivoted to the carrier and project downward into the vat, and flexible suspension-stops which limit the downward movement of the breakers but permit them to rise freely, substantially as set forth.

4. In a curd-agitator, the combination with a series of curd-breakers, of means for moving part of them forward in a path near the bottom of the vat while part of them are moving in a path at a greater distance from the bottom of the vat, and means for reversing the direction of travel of the breakers and also their positions relative to the bottom of the vat substantially as set forth.

5. In a curd-agitator, the combination with a series of rake-shanks and rake-heads of devices whereby as the rake-heads are moved to and fro their angles relative to vertical lines are changed, substantially as set forth.

6. In a curd-agitator, the combination of the vat, the reciprocating carrier mounted upon a framework above the vat, curd-breakers pivoted to the reciprocating carrier with their free ends depending into the vat and adapted to rise and fall by gravity in the curd independently of each other, the shanks of the breakers being reversely inclined; whereby, when the machine is in operation part of the breakers are pushed down into the curd and part of the breakers are simultaneously pulled upward in the curd, substantially as set forth.

7. In a curd-agitator, the combination of the vat, the reciprocating carrier mounted upon a framework above the vat, two series of reversely-inclined rake-shanks pivoted at their upper ends to the carrier; a series of rake-heads attached to one series of shanks and depending into one end of the vat, and another series of rake-heads attached to the other series of shanks and depending into the opposite end of the vat, the two series of heads being adapted to rise and fall independently of each other, substantially as set forth.

8. In a curd-agitator, the combination of a movable carrier, a series of curd-breakers suspended from the carrier and adapted to be folded close below said carrier, with means for hanging the breakers from the carrier and above the vat, substantially as set forth.

9. In a curd-agitator, the combination with a series of vertically-movable curd-breakers, means for thrusting said breakers forward and downward, and stops for limiting their downward movement, substantially as set forth.

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

ALFRED ROBINSON.

Witnesses:
L. D. CORLISS,
A. F. HOLMES.

Affidavit having been filed by the patentee in the matter of Letters Patent No. 632,367, issued upon the application of Alfred Robinson, of Abercorn, Canada, September 5, 1899, for an improvement in "Curd-Agitators," in words and figures as follows, to-wit:

STATE OF VERMONT, }
COUNTY OF FRANKLIN. } *ss.*:

Alfred Robinson, being duly sworn, deposes and says that he is the Alfred Robinson to whom was issued letters patent of the United States number 632,367, for Curd-Agitators, dated September 5th, 1899, and that he signed the application papers upon which said patent was issued; that the statement appearing upon line 3, column 1, page 1, of the printed specification, attached to and forming part of the said patent that he, the said Alfred Robinson, is a "citizen of the United States," is erroneous, and should be that he is a citizen of Canada, and a subject of the Queen of the United Kingdom of Great Britain and Ireland; that this error arose from inadvertence or mistake; and with no fraudulent or deceptive intent; that this deposition is made for the purpose of rectifying the said error; and that he desires this affidavit to be made a part of the record in the Patent Office of the United States relating to his said patent.

ALFRED ROBINSON.

Sworn to and subscribed before me this 16th day of November, 1899.

[SEAL.]

J. H. CARPENTER,
Notary Public.

The same has been placed on file with the papers in the case and a copy attached to the patent and the printed copies thereof in compliance with the request of the patentee.

Signed, countersigned, and sealed this 21st day of September, A. D., 1899.

[SEAL.]

WEBSTER DAVIS,
Assistant Secretary of the Interior.

Countersigned:

C. H. DUELL,
Commissioner of Patents.