(No Model.) 4 Sheets—Sheet 1.

J. LAIDLAW.

CENTRIFUGAL MACHINE.

No. 473,322. Patented Apr. 19, 1892.

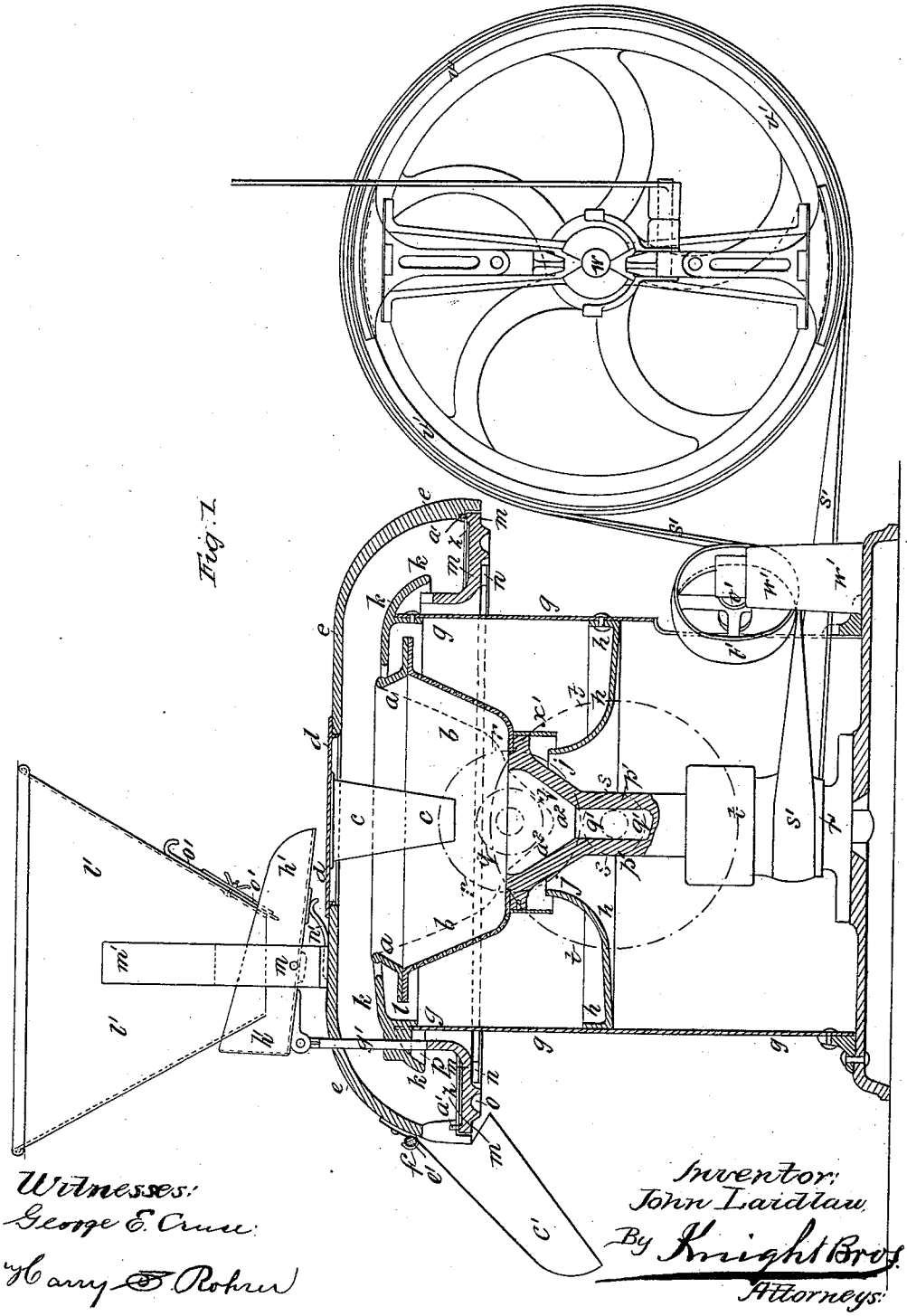

Fig. 1.

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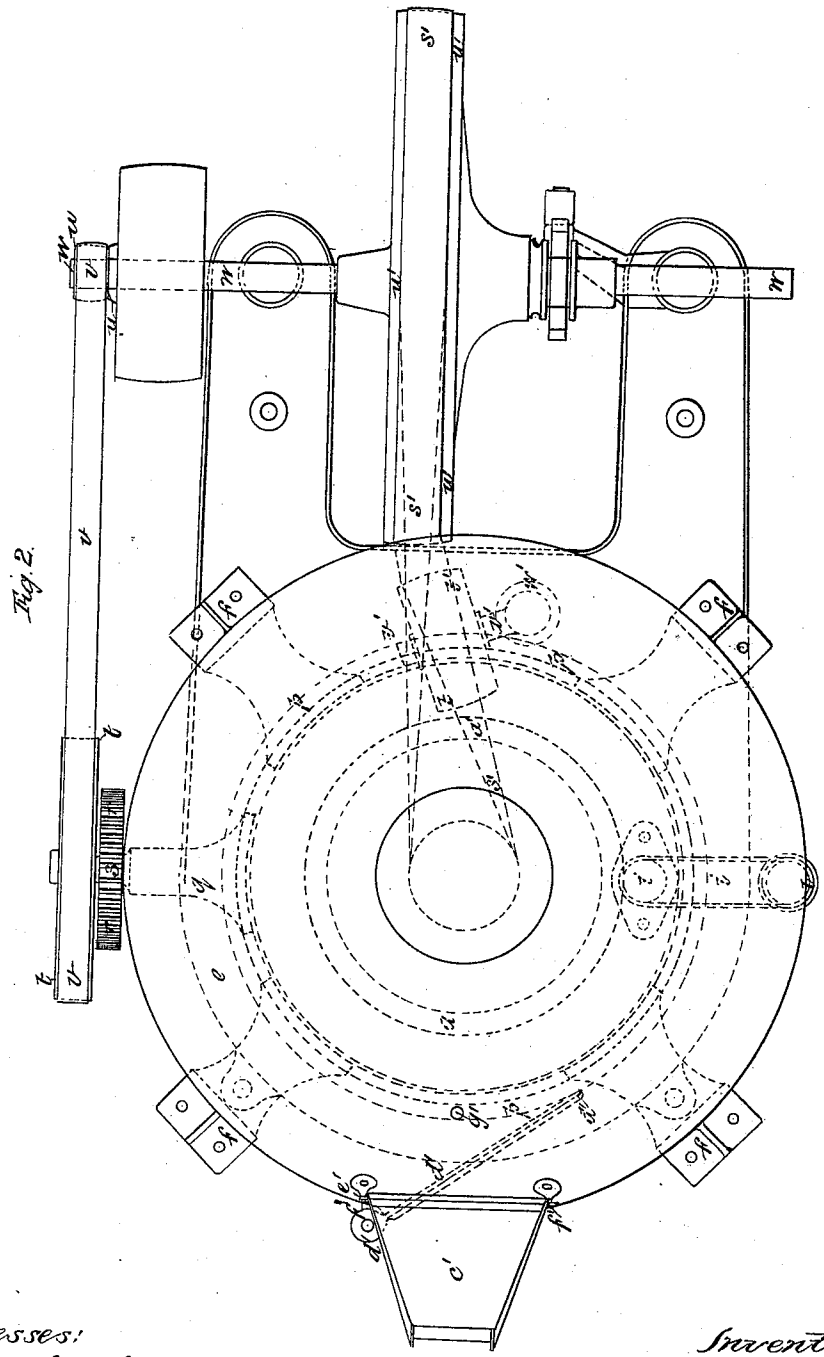
Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

J. LAIDLAW.

CENTRIFUGAL MACHINE.

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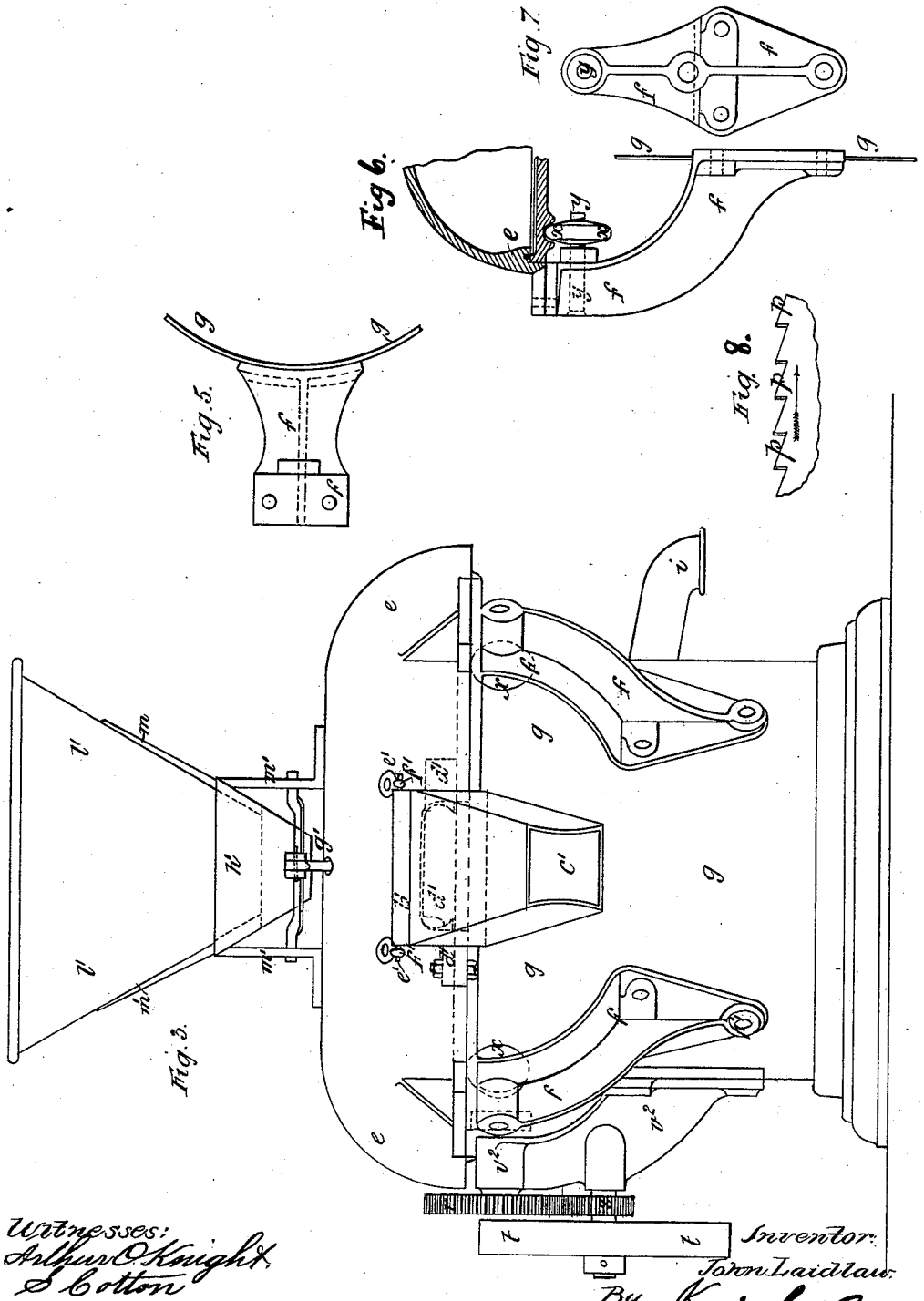

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(No Model.) 4 Sheets—Sheet 4.

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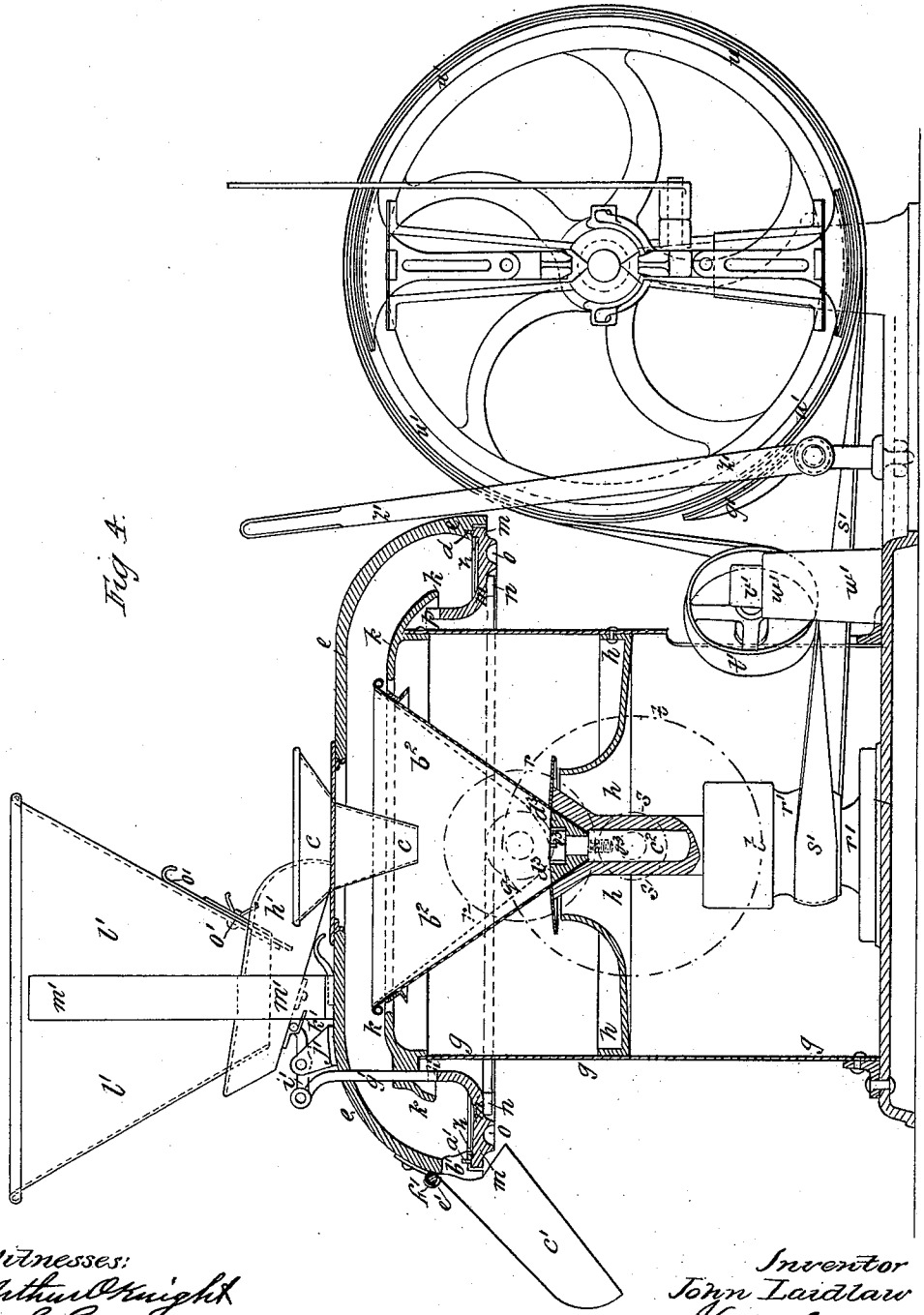

Fig 4.

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UNITED STATES PATENT OFFICE.

JOHN LAIDLAW, OF GLASGOW, SCOTLAND.

CENTRIFUGAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 473,322, dated April 19, 1892.

Application filed July 9, 1891. Serial No. 398,950. (No model.) Patented in England October 17, 1884, No. 13,737.

To all whom it may concern:

Be it known that I, JOHN LAIDLAW, of Glasgow, in the counties of Lanark and Renfrew, Scotland, have invented a Continuous-Discharge Centrifugal Machine, (for which I have obtained a patent in Great Britain, No. 13,737, dated October 17, 1884,) of which the following is a specification.

My invention, which relates to the separation of solid from liquid substances, has for its object to render such separation a continuous process—that is to say, to cause a separate flow of liquid—and the separated solid to be discharged continuously from the basket of centrifugal machines and to be also continuously collected therefrom.

In the construction of the centrifugal machine an essential point is that the formation of the basket thereof is such as to allow of the collection within itself of a sufficient quantity of the solid separated material as will enable that material to build up itself by centrifugal action therein, so as to produce a hollow whose section has a curve which is proper to the particular class of separated substances and corresponding to the velocity with which the basket is driven, the basket being otherwise so shaped as to prevent the accumulation or building up therein of such a quantity of solid separated matter as would by centrifugal action either destroy the mechanism or require an excess of power for driving it, at the same time having a sufficient quantity of such solid separated matter in the basket for absorbing liquid from the supply of raw material in the event of that supply becoming intermittent or irregular. To effect this the upper part of the centrifugal basket is formed of a conical shape or with a lip. Above the basket is a discharge pipe or chute, through which the liquid mass to be separated flows continuously into the basket, and around the perforated part of the basket is a receiver, into which the liquid is discharged by centrifugal action through the perforations, and inclosing the whole there is or may be a larger receiver, into which the solid substance is discharged. The centrifugal action causes the said solid substance to rise upon the curved or approximately conical foundation which is formed by that quantity of such substance collected within the basket. Each receiver is provided with one or more discharge-chutes, and it is to be understood that the centrifugal basket may be mounted on its axis, so as to be driven above or below vertically, or it may be situated horizontally or at any angle between the horizon and the vertical.

In the drawings, Figure 1, Sheet 1, is a section through a continuous-discharge centrifugal machine provided with a basket having curved sides and at its upper part an inwardly-projecting lip, all as hereinafter more particularly described. Figs. 2 and 3, Sheets 2 and 3, are respectively a plan and a side elevation of the same. Fig. 4, Sheet 4, is a section through a continuous-discharge centrifugal machine, the revolving basket of which is of the form of a hollow inverted cone. Figs. 5 to 8, inclusive, are views of detached portions of the mechanism common to both the machines represented at Figs. 1 to 4.

The upper part *a*, Fig. 1, of the centrifugal basket is formed, as shown, of a conical shape or with a lip projecting inward, and the lower part *b* thereof is perforated with holes of a size and number adapted to the nature of the substances to be dried or partially dried therein. The basket *b* is connected at its bottom to the upper part a^2 of the hollow revolving shaft p', the inner surface of which is slightly tapered to fit the shaft q', and which is or may be cast in one piece with the driving-pulley r', so that the whole is rotated together. Around the upper flanged end of the tubular shaft p' the band x' is secured, so as to prevent any of the liquid products splashing or otherwise falling down below the plate *h*. The revolving basket *b* (represented at Fig. 1 with its lower recess a^2 formed by the tubular shaft p' and shaft q') is of such shape that when rotating and charged with produce the solid portion of the said produce builds itself up against the perforated sides of the said basket to a depth or thickness determined by the depth of the lip *a*—that is to say, to a depth somewhat approximately to that indicated in dotted lines at Fig. 1. Having built itself up to this depth the product by centrifugal action creeps up over the curved foundation which is so formed, and which form will vary with the nature of the substance under treatment, the liquid portions being absorbed and separated by passing

through the solid portion of the produce already collected, and thence through the perforations of the basket *b*. The solid portions are thrown onto the plate *m*, from which they are collected, and discharged into suitable receptacles, as hereinafter more particularly explained.

The charging-chute *c* hangs from the plate *d*, which rests upon the cover *e* of the machine. This cover *e*, as represented more particularly at Fig. 6, is secured to the upper ends of the brackets *f*, which are bolted at their lower ends to the inclosing casing or receiver *g*. One of the brackets *f* is shown detached from the machine in plan at Fig. 5, in side elevation at Fig. 6, and in front elevation at Fig. 7. The casing *g*, which is preferably formed of wrought-iron plate, has riveted or otherwise secured within it the plate *h*, which forms the bottom of the receiver whereinto the liquid products are thrown by centrifugal action and from which they are drawn off through the outlet *i*, Figs. 2 and 3, into suitable receptacles. The central portion of the plate *h* curves upward at *j* in the form of an annular lip. At its upper edge the casing *g* has secured to it the ring *k*, which is curved, the inner part projecting over the flanges *l* of the basket *b* and lip *a* and the outer part projecting over the circular plate *m*. A toothed rack *n* and an annular groove *o* are formed at the under side of the plate *m*, while at its inner part the said plate curves upward and is formed with a series of teeth or cams *p*, the formation of which is represented more particularly in the detached portion shown at Fig. 8. With the rack *n* the teeth of the pinion *q* engage, the said pinion being rotated through the medium of the toothed gear-wheels *r* and *s*, respectively, and the pulley *t*, to the latter of which motion is imparted from the pulley *u*, Fig. 2, by the driving-band *v*. The toothed gearing-wheels *q*, *r*, and *s* and the pulley *t* are carried on shafts supported in the bracket v^2, which is secured at its lower part to the casing *g*, and the pulley *u* is secured to the driving-shaft *w*, hereinafter more particularly referred to.

The plate *m* is, by means of the mechanism herein last described, caused to travel round or rotate horizontally at a slow rate of motion, the said plate being supported by the rollers *x*, which are carried upon the studs *y*, supported by the brackets *f*, all as shown more particularly at Figs. 3 and 6. The upper face of the plate *m* is provided with a turned rim *z*, so that when the said plate *m* travels round this rim is continuously in contact with the leather packing *a'*, which is inserted in the stationary cover *e*, and thus prevents the escape of any fluid or solid matter at the junction of these parts, excepting at the discharge-orifice *b'* thereof. The heavier particles or products deposited upon the plate *m* are thrown continuously thereunto by centrifugal action outward from and when leaving the upper part or lip *a* of the rotating basket *b* and are collected and discharged from the machine through the outlet *b'* and delivered by the chute *c'* into any required receptacle. The products are directed to the outlet *b'* by means of the scraper *d'*, the angular position of which is represented more particularly at Fig. 2 and which scraper removes or scrapes off the said products from the surface of the plate *m* as it travels under the same. The discharge-chute *c'* is supported by the rod *e'*, which is laid in the hooks *f'*. The teeth or cams *p*, hereinbefore described as formed on the plate *m*, in their rotation impart an up-and-down vertical motion to the rod *g'*, the lower end of which rests thereon. This rod *g'* is guided in the ring *k* and cover *e*, and at its upper end is connected with the delivery-chute *h'*, either directly as shown at Fig. 1 or as shown at Fig. 4 through the pivoted lever *i'*, the latter construction being preferable. The lever *i'* is supported in the brackets *j'* and at its end is provided with a transverse head which is capable of sliding between the surface of the chute *h'* and the arms *k'*. The hopper *l'* is secured to the cover *e* by the legs *m'*, in and between which the chute *h'* is pivoted, and the vertical motion imparted to the rod *g'* is transmitted to the said chute, and thereby the products to be dried within the machine are continuously charged through the chute *c* and into the basket *b*, the spring *n'* preserving the necessary contact between the rod *g'* and the teeth or cams *p*. The hopper *l'* is provided with a slide *o'*, the lower edge of which may be adjusted nearer to or farther from the bottom of the delivery-chute *h'*, so as to regulate the quantity of produce passing into the machine.

The driving-band *s'* passes out from the pulley *r'* through an opening in the lower part of the casing *g* to the driving-pulley *u'*, the upper part passing under the guide-pulley *t'*, as shown. The pulley *t'*, as shown more particularly in dotted lines at Fig. 2, is carried by the shaft *v'*, one end of which is pivoted to the pedestal *w'*, and the free end thereof, carrying the said pulley *t'*, is capable of motion about this axis. The driving-pulley *u'*, as represented upon the annexed drawings, is fitted with Weston's patent centrifugal clutch, which, constituting no part of my present invention and being a well-known mechanical device, need not be herein further referred to. The machine may be provided with a brake *g'*, Fig. 4, which may be applied to the driving-pulley *u'* by means of the lever *z'*.

In place of forming the rotating basket in the manner hereinbefore described and shown at Fig. 1 I may construct the said basket as shown at Fig. 4 of the annexed drawings—that is to say, of the form of an inverted hollow cone. Under this construction the basket b^2, which is preferably formed of perforated sheet metal, is secured to the upper end of the rotating shaft c^2 by means of the conical plug d^3 and the screw c^3.

For some kinds of produce—such, for example, as sugar—it is sometimes desirable, after it has left a centrifugal machine, to spread it over a large surface—such as a floor—in order to cool and still further dry it. When so using my continuous-discharge centrifugal machine, the cover *e* is removed and the charging-spout *c* is suspended from any convenient overhead support, when the crystals, in place of being collected closely together, are by the centrifugal action scattered through a distance and spread out over a large area of floor-space.

I claim—

1. The combination, with the revoluble foraminous receptacle or basket, of the chute adapted to receive the contents of a hopper and to discharge the same into the basket through suitable means and the toothed ring adapted to be rotated and to vibrate said chute through suitable means, substantially as set forth.

2. The combination of the revoluble basket, the vibrating chute adapted to discharge into said basket, the rod attached to said chute, and the rotatable toothed ring engaging said rod for vibrating the chute, substantially as set forth.

3. The combination of the revoluble basket or foraminous receptacle, the rotatable toothed ring, the pivoted spring-pressed chute, and the rod having a lever connection with said chute and engaged by said toothed ring, substantially as set forth.

4. The combination of the casing or closure, the chambered cover having its bottom secured to the upper end of said casing and provided with a discharge outlet and spout, the basket or foraminous receptacle having at its upper end an overhanging lip or rim and means for rotating it, the chamber within said casing or closure whose bottom curves upward centrally around and stands at an interval from the support for said basket, the toothed plate or ring supported upon rolls or trucks hung in brackets secured to said casing, and means for rotating said ring or plate, the pivoted chute having connected to it the rod adapted to engage said toothed ring, the spring interposed between said cover and chute, and the hopper arranged above said chute, substantially as specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN LAIDLAW.

Witnesses:

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JOSEPH HENRY PEARSON,

Both of 154 *St. Vincent Street, Glasgow.*