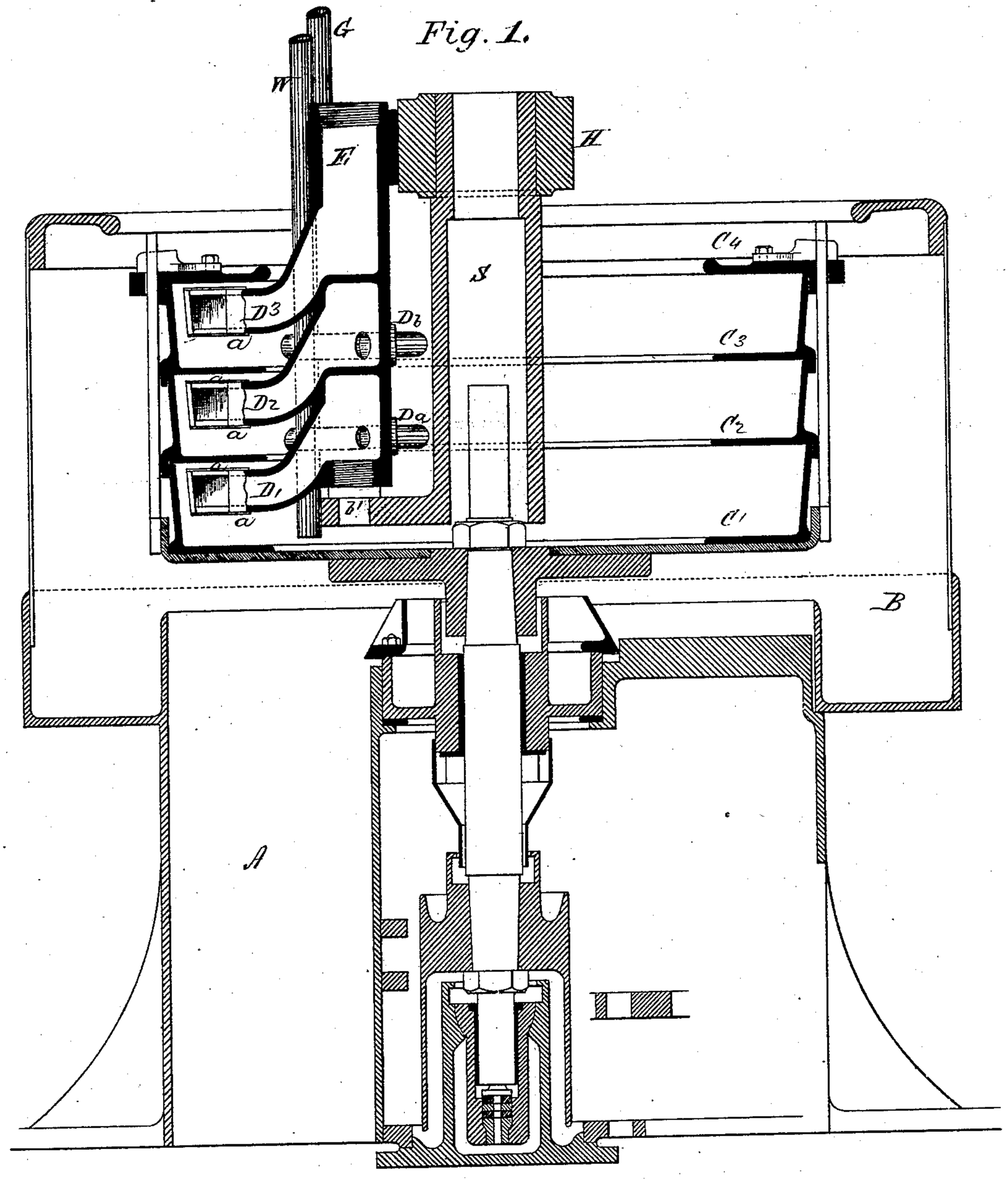
(No Model.) 2 Sheets—Sheet 1.

# T. H. MÜLLER & J. W. DECASTRO.

## APPARATUS FOR SEPARATING BODIES OF DIFFERENT SPECIFIC GRAVITIES.

No. 273,127. Patented Feb. 27, 1883.

*Fig. 1.*

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(No Model.) 2 Sheets—Sheet 2.

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## APPARATUS FOR SEPARATING BODIES OF DIFFERENT SPECIFIC GRAVITIES.

No. 273,127. Patented Feb. 27, 1883.

*Fig. 2.*

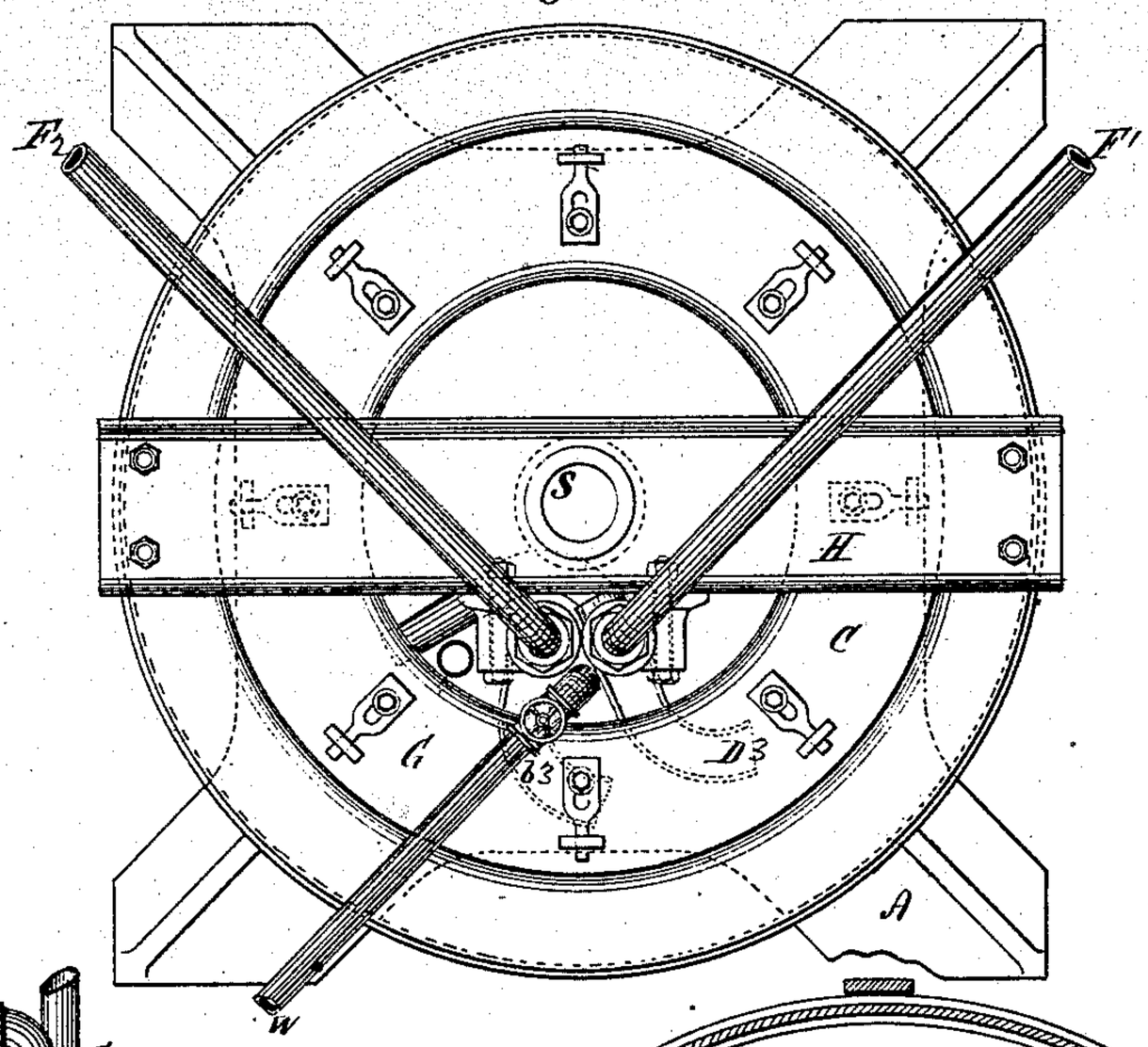



*Fig. 4.*

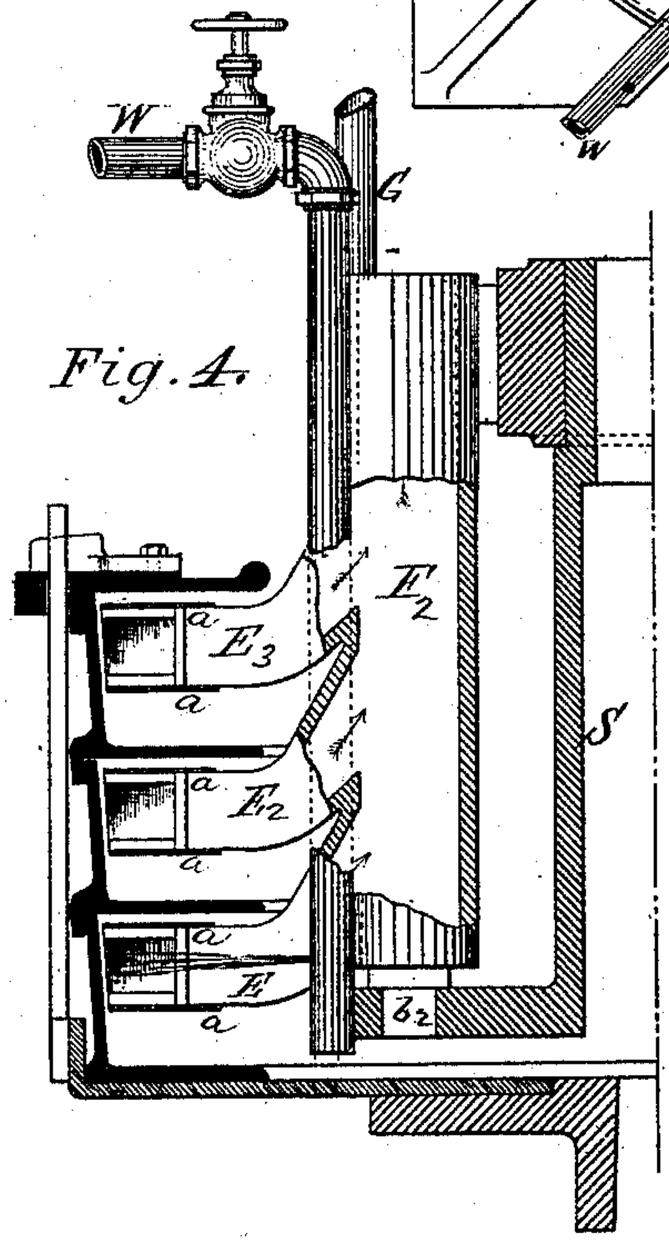
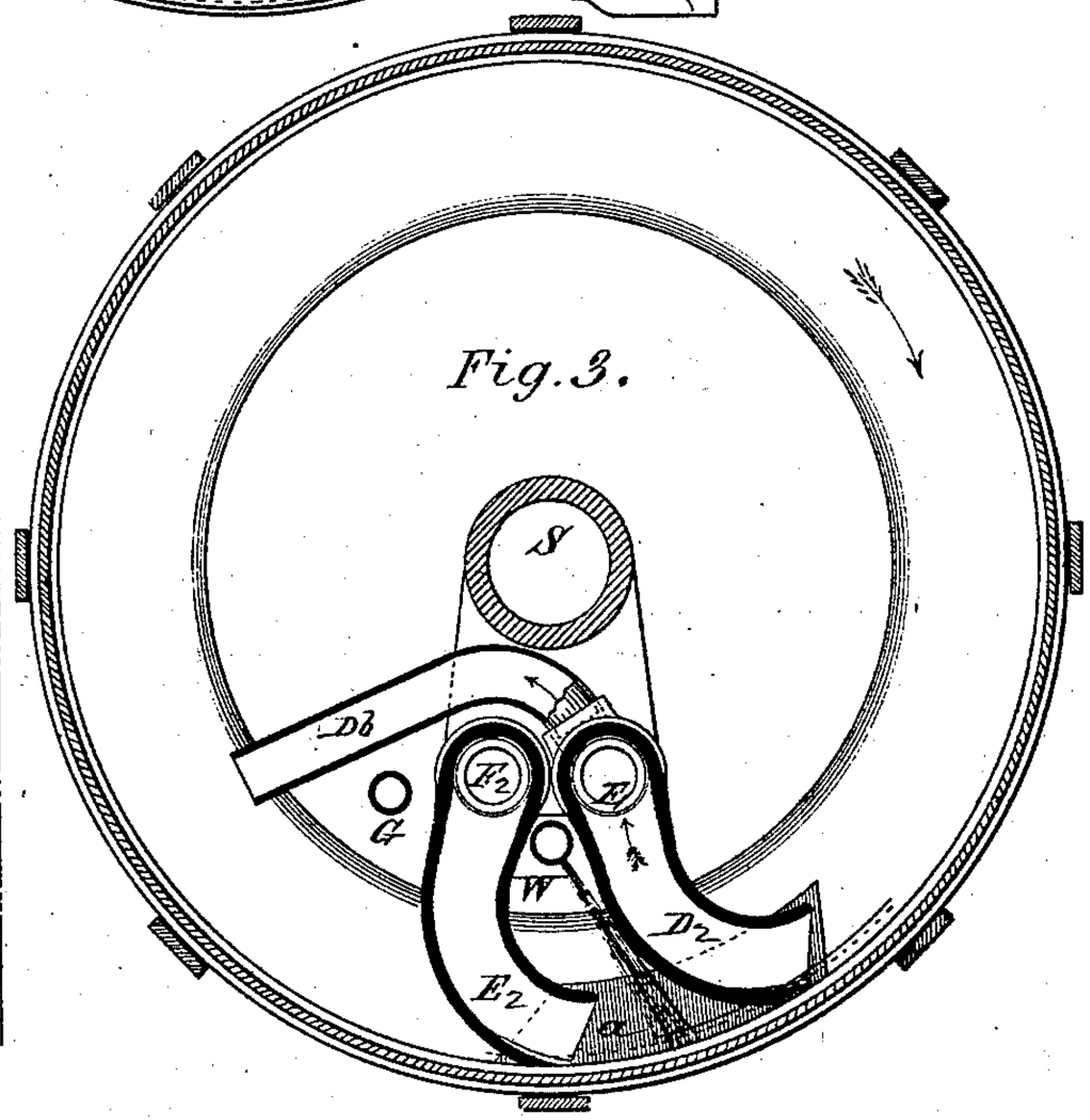



*Fig. 3.*

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# UNITED STATES PATENT OFFICE.

TEILE H. MÜLLER AND JACOB W. DECASTRO, OF NEW YORK, N. Y.

## APPARATUS FOR SEPARATING BODIES OF DIFFERENT SPECIFIC GRAVITIES.

SPECIFICATION forming part of Letters Patent No. 273,127, dated February 27, 1883.

Application filed August 25, 1882. (No model.)

*To all whom it may concern:*

Be it known that we, TEILE HENRY MÜLLER and JACOB W. DECASTRO, both of the city, county, and State of New York, have invented a new and useful Improvement in Apparatus for Separating Bodies of Different Specific Gravities, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

The object of our invention is to construct a new and useful apparatus based in principle upon a centrifugal machine, by means of which bodies of different specific gravities may be separated from each other; and our invention also relates to an improvement in said apparatus, by means of which the separated bodies may be continually removed without stopping the operation of the apparatus, thereby enabling the process of separation to be carried on continuously.

Our invention will be readily understood from the accompanying drawings, in which similar letters refer to similar parts.

Figure 1 represents a vertical section through my apparatus; Fig. 2, a top view or plan; Fig. 3, a horizontal section through the discharge-pipes; Fig. 4, a vertical section, partly in perspective, showing details of the circumference or periphery of the basket and the separating mechanism.

Our apparatus consists generally in an improved centrifugal machine, which machine may either be hung from above or supported from beneath; but in the form shown it is supported from beneath.

A represents the pedestal of the centrifugal machine.

B represents the curb surrounding the basket.

C represents the basket, which is divided in sections by the annular rings or shelves $C^2$ $C^3$. This basket is made up, as shown, of a series of independent castings or rings laid one upon the other, but may be arranged in any suitable way, but is preferably provided with two or more annular shelves, $C^2$ $C^3$, as shown. Projecting between the bottom and the first shelf and between each two subsequent shelves are pipes E′ D′ $E^2$ $D^2$, as shown. These pipes, which are arranged to withdraw the deposited material from the rings, are provided with lips or cutting-edges extending almost to contact with the ring-periphery. The pipes $E^1$ $E^2$, &c., should be adjusted so that their cutting-edges are closer to the periphery than the cutting-edges of the pipes D′ $D^2$, &c. These pipes, as shown, are supported upon an adjustable beam, H; but they might be arranged in many ways, and the position of their cutting-edges with reference to the periphery of the rings might be made adjustable by sliding or adjustable pieces upon the ends of the pipes, instead of by moving the whole pipes at once. The pipe D′ is provided with a connection, $D^a$, which delivers upon the upper surface of the next annular shelf, $C^2$. The pipe $D^2$ is provided with a similar connection, $D^b$, delivering upon the upper surface of the shelf $C^3$. The other pipes, E′ $E^2$ $E^3$, all connect with a delivery-pipe, $F^2$. As shown, the pipes E′ D′ $E^2$ $D^2$ $E^3$ $D^3$ are connected above and below by horizontal plates *a*. A pipe or pipes, W, are provided for delivering a stream or streams of water under pressure into the space between the shelves *a* and the pipes E′ D′ $E^2$ $D^2$, &c. The upper pipe, $D^3$, connects with the pipe F′, (shown in Fig. 2,) by which the waste products are removed from the apparatus, as will be subsequently explained. A pipe, G, is provided for delivering into the mill the material which is to be separated. This pipe is preferably located behind the discharge-pipes in the direction in which the mill is revolving, as shown in Fig. 3.

Our apparatus is well arranged for the separation of starch from triturated grain carried in suspension in water, and we will describe its operation in causing such separation. The grain itself should first be thoroughly ground and the husk and offal removed by a sieving or other suitable apparatus. The starch-water then, containing generally the starch and gluten is led to the apparatus by the pipe G, the object of the machine being to separate the starch from the gluten continuously. Starch has a greater specific gravity than gluten. The starch-water then is delivered onto the bottom of the basket through the pipe G. The solid particles in the starch-water will immediately be compacted against the periphery of the

machine, lodging first in the lower corner. They will then move gradually upward, the separation between the starch and gluten being more thoroughly effected as the motion continues. When the surface of the compacted mass arrives at the point where the corner of the first tube, D′, meets it, it will be found that the starch is separated from the gluten which exists as an inner ring. The tube D′ is so adjusted that its cutting-edge will enter the compacted mass so deeply as to remove thoroughly the gluten and a portion of the starch. The amount of starch and gluten deposited in any given time will of course depend upon the amount fed to the machine, and the feed, therefore, should be so regulated as to accomplish the desired result. The starch and gluten removed by the pipe D′ are delivered upward through the pipe $D^a$ upon the second shelf, $C^2$, where the same operation is again repeated, a second separation occurring there, and the gluten with a portion of the starch being again removed upward and deposited in the same way through the pipe $D^b$ upon the third shelf, $C^3$. Another separation precisely similar is here again occasioned, and the last cutter, $D^3$, delivers to the pipe F almost pure gluten. A certain amount of starch may of course be removed with it, and this material being carried to another machine, the pure gluten may be removed, leaving but a very small residue of mingled starch and gluten, which may be further separated, if desired. It will now be seen that after the cutters D′ $D^2$ $D^3$ have acted upon the deposited starch and gluten nothing but pure starch exists in that part of the machine which has traveled past them. It is now desired to remove this pure starch. In order to do this it is necessary that it be once more put in suspension or floated in water. Water-jets therefore are provided, by means of which streams of water are caused to be jetted against the compacted starch now lying between the sides *a a*, and said starch being so removed from the sides, the starch-water is carried off through the pipes E′ $E^2$ $E^3$, delivering into the pipe $F^2$, from whence it may be taken either to be dried as laundry-starch in an ordinary separating centrifugal machine, or may be converted into glucose by well-known processes. The jets of water, W, should be projected against the sides with considerable force. The water is preferably forced through a number of small perforations or nozzles against the deposited hollow cylinder of starch. The plates *a*, extending between the nozzles $D^2$ and $E^2$, prevent the liquids which may have passed by the side of the nozzles $D^2$ from entering between the two plates, so that the tubes E′ $E^2$ $E^3$ received only such material as has passed the edges of D′ $D^2$ $D^3$.

Now, it will be readily seen that the tubes or nozzles D′ $D^2$ $D^3$ might all be connected with a single discharge-pipe, $F^2$, while the tubes E′ $E^2$ $E^3$ might deliver material taken up by them upon the shelves next above, in the same way as the pipes D′ $D^2$ $D^3$ do in the present apparatus. In this case the lighter material would be removed pure, while the heavier material would flow from the apparatus, together with a small amount of lighter material.

We have described our apparatus as applied to the separation of starch and gluten; but it may equally well be applied to the separation of any other bodies of different specific gravities.

It is plain that, if desired, but one section of the apparatus need be employed; or an apparatus might be employed having but one set of removing contrivances, and also that these removing contrivances might be arranged in various ways, for some of which I intend to make application.

It is important that the cutting-edges of the removing-tubes should maintain a constant distance with reference to the periphery of the basket. Therefore the basket should be caused to rotate constantly in the same plane, and guides may be employed to accomplish this result; or the cutting-guides should be caused to move with the basket. We do not in this application claim the process of separating starch and gluten described, intending to make a separate application therefor.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. A centrifugal machine provided with two cutting-edges located in the same horizontal plane and at different points in the circumference of the basket.

2. A centrifugal machine provided with two or more annular non-communicating compartments, arranged one above the other, and a cutting device adapted to remove material from one compartment and deliver the same into the next, substantially as described.

3. A centrifugal machine provided with two or more horizontal shelves and two cutters and removing contrivances located at different points of the circumference above each of said shelves, substantially as described.

4. A centrifugal machine provided with two or more annular compartments, arranged one above the other, and a cutting contrivance adapted to remove material from one compartment, and provided with an outlet into another compartment, substantially as shown and described.

5. A centrifugal machine provided with two cutters or removing apparatuses opening toward the circumference, and an apparatus adapted to throw a jet of water upon the compacted material between said removing contrivances, substantially as described.

6. A centrifugal machine provided with two cutting or removing apparatuses projecting toward the circumference of the apparatus and located at different points of said circumference, and a guard connecting said apparatuses to prevent the mingling of foreign substances with the deposited material which has passed

the first cutting apparatus, substantially as described.

7. A centrifugal machine provided with two cutting or removing apparatuses projecting toward the circumference of the apparatus and located at different points of said circumference, and two guards, one above and one below, connecting said apparatuses to prevent the mingling of foreign substances with deposited material which has passed the first cutting apparatus, substantially as described.

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