(No Model.) 2 Sheets—Sheet 1.

H. PAPE & W. HENNEBERG.

MEANS FOR DRY SEPARATION OF MATERIALS OF DIFFERENT SPECIFIC WEIGHTS AND DIFFERENT SIZES.

No. 472,682. Patented Apr. 12, 1892.

Fig. 1.

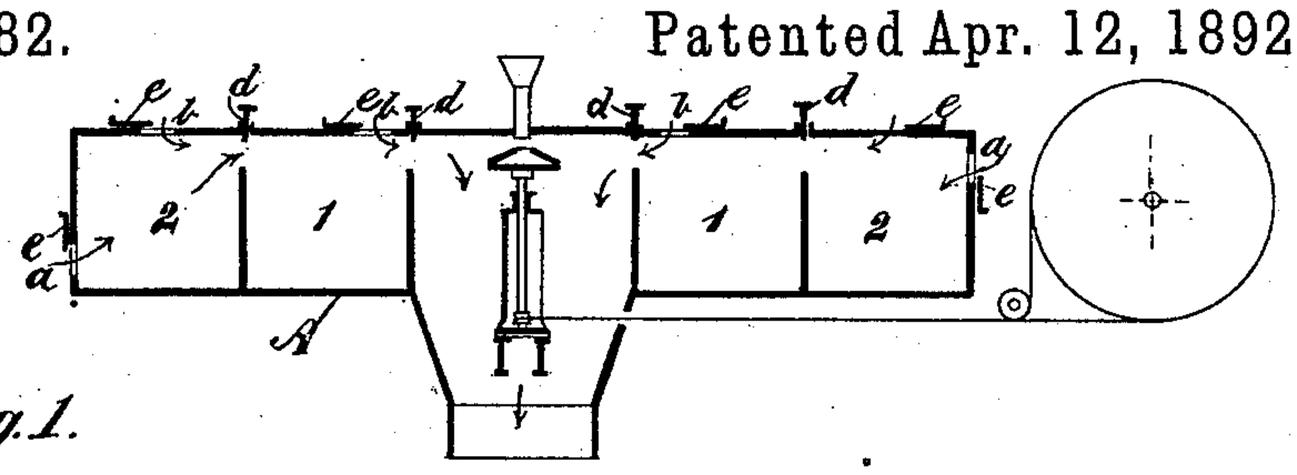


Fig. 2.

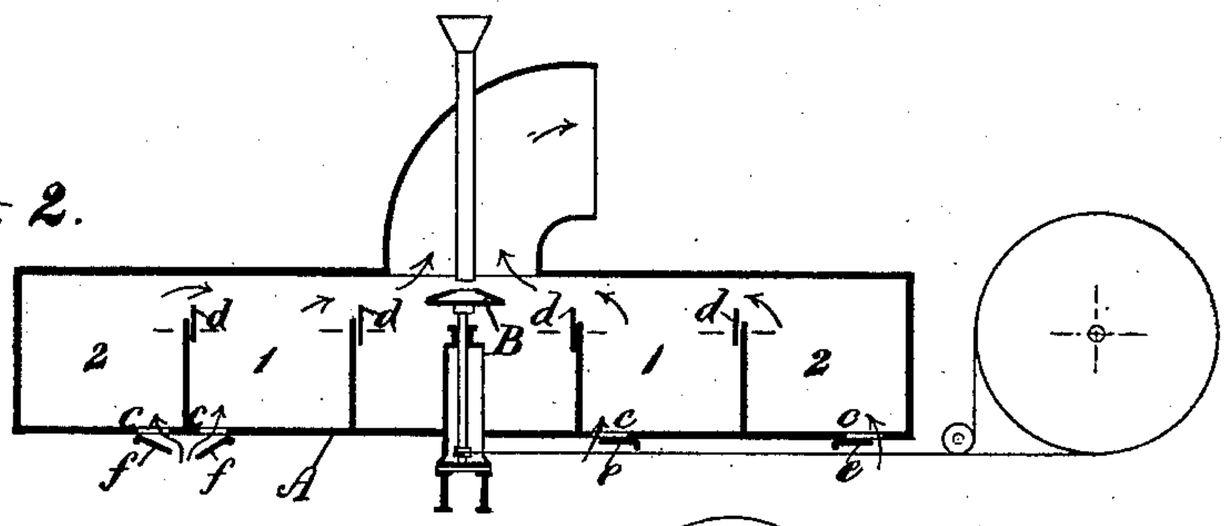


Fig. 3.

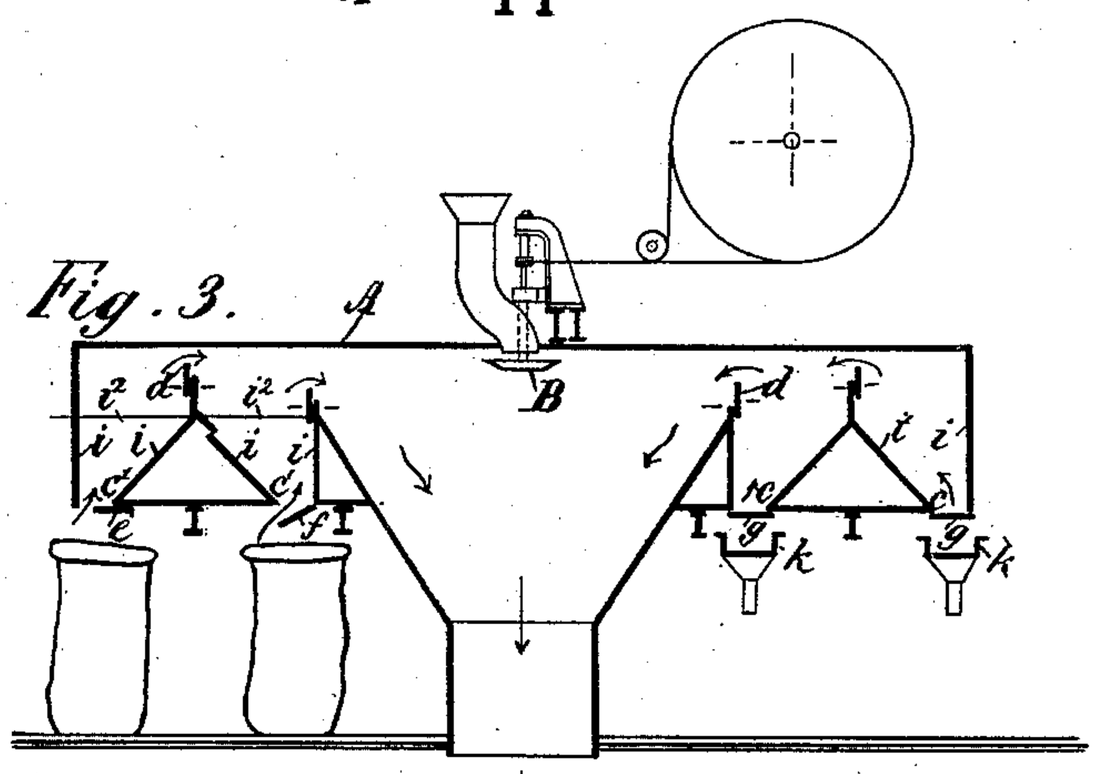
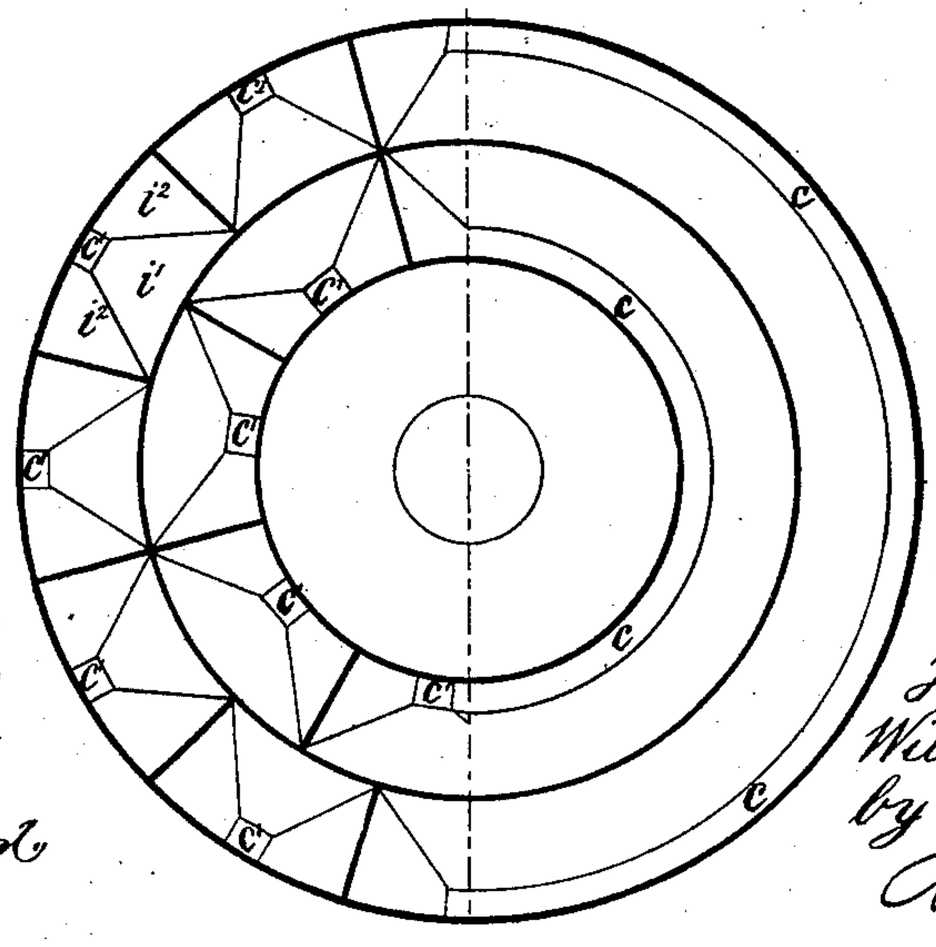


Fig. 4.



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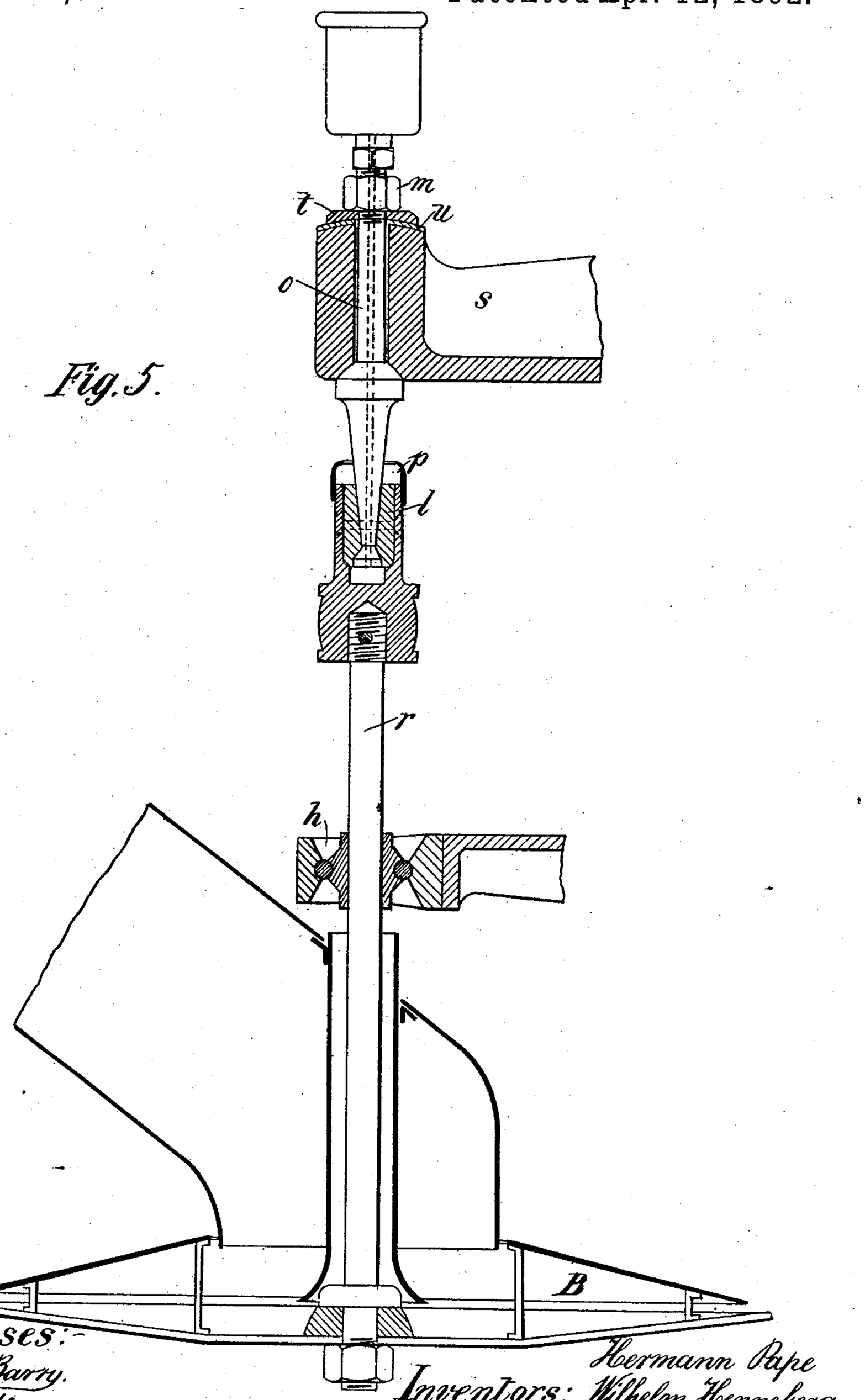
(No Model.) 2 Sheets—Sheet 2.

H. PAPE & W. HENNEBERG.

MEANS FOR DRY SEPARATION OF MATERIALS OF DIFFERENT SPECIFIC WEIGHTS AND DIFFERENT SIZES.

No. 472,682. Patented Apr. 12, 1892.

Fig. 5.



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by attorneys. Brown & Seward

UNITED STATES PATENT OFFICE.

HERMANN PAPE AND WILHELM HENNEBERG, OF HAMBURG, GERMANY.

MEANS FOR DRY SEPARATION OF MATERIALS OF DIFFERENT SPECIFIC WEIGHT AND DIFFERENT SIZE.

SPECIFICATION forming part of Letters Patent No. 472,682, dated April 12, 1892.

Application filed October 24, 1891. Serial No. 409,702. (No model.) Patented in France March 31, 1891, No. 212,453; in Belgium March 31, 1891, No. 94,358, and in Spain June 27, 1891, No. 11,951.

To all whom it may concern:

Be it known that we, HERMANN PAPE and WILHELM HENNEBERG, manufacturers, both of Hamburg, in the Empire of Germany, have invented a new and useful Improvement in Means for Dry Separation of Materials of Different Specific Weight and of Different Size, (for which we have obtained patents in France, No. 212,453, dated March 31, 1891; in Belgium, No. 94,358, dated March 31, 1891, and in Spain, No. 11,951, dated June 27, 1891,) of which the following is a specification.

It is a well-known fact that a mixture of granular matter—for instance, broken minerals, broken or hulled cereals, or any other mixture consisting of parts of different gravity or different size—can be sorted according to weight and size by throwing out the mixture centrifugally into a reception-vessel provided with different chambers for collecting the separated grains. In applying this principle it sometimes happens that the material treated contains dust or some other light stuff which is not fully subjected to the centrifugal force and has no tendency to fall quickly. This dust spreads through the whole of the reception-vessel and falls pretty equally in all collecting-chambers, and so soils all the sorted products. It is therefore necessary either to remove the dust, &c., from the granular mixture before passing the latter into the separating-machine, or this machine must be constructed in such a way that an efficient extraction of dust is combined with the process of separation. The latter is especially necessary when the hulling or grinding process is directly combined with the sorting by using a disintegrator, grindstone, or the like directly as a centrifugal throwing-disk. Further, it is desirable when the apparatus runs with high peripheral speed of the distributer or, which is the same, with high initial speed of the material to be separated to have a slowing counter force for the separated parts of the material, so that the breadth of the reception-vessel can be comparatively small. To attain these two purposes—that is, dust-extraction and speed-regulation of the flying grains in centrifugal dry separators either separately or combined with each other—we apply a current of atmospheric air or any other kind of gas which flows from all directions toward the center of the apparatus, so that the thrown material moves in an opposite direction to this current. In this case the separator consists of a rotating central distributer, disk, tube, turbine, grindstone, or such like, around which the reception-vessel is arranged concentrically, as shown in the accompanying drawings, in which—

Figure 1 represents a vertical central sectional view of a machine in which the air enters at the top and leaves at the bottom. Fig. 2 is a similar sectional view of a machine with air outflow at the top. Fig. 3 is a similar sectional view, and Fig. 4 a plan, partly in section, of a modified machine; and Fig. 5 is a detailed view in vertical section on a larger scale, showing the mode of suspension of the distributer.

The air enters the reception-vessel A through the outer shell of the latter by holes or slits *a a*, Fig. 1, or through the cover of the vessel by holes or slits *b b*, or the air can be introduced into the apparatus by holes or slits *c c*, Figs. 2 and 3, in the bottom of the vessel. In the latter case the separated grains are subjected to the action of the air not only during their flight, but also when fallen. Their freedom from dust is therefore more certain and they will fall down more smoothly. The current of air which is caused to flow into the center of the apparatus from all sides is carried away centrally either downward, Figs. 1 and 3, or upward, Fig. 2.

Sometimes it is desirable to regulate the speed of the air over the upper edges of the rims of the single annular collecting-chambers. For this purpose we arrange movable slides or valves *d d*, by which the distance between the cover of the reception-vessel and the edges of the rims of the single collecting-chambers can be altered, or we move the rims of these chambers with equal effect. We also provide at the air-inlets *a b c* slides *e e*, traps *f f*, plates *g g*, or any other form of mechanism by which the quantity of air entering the whole reception-vessel and each individual collection-chamber can be regulated. As the space is diminished the speed of the air is increased, and as the space is enlarged the speed of the air is decreased. In Figs. 1 and

2 the distributer B is attached in the well-known manner to a vertical shaft standing in a foot-bearing. As at times the lubrication of foot and collar bearings will be attended by difficulty, we may suspend the distributer so that every part requiring lubrication is situated above the reception-vessel. Fig. 3 shows the whole arrangement, while Fig. 5 shows the details of the suspension.

In Fig. 5, *o* is a fixed stationary shaft with central bore for the passage of the lubricating material to the cone at the lower end of the spindle. This cone carries the shaft *r*, which rotates and to which the distributer B is attached. The sleeve at the head of the shaft *r* contains the bearing *l*, by which the shaft *r* is supported and kept in the right position. When the machine runs, the oil rises out of the space under the cone of *o* by centrifugal force and passes along the surface of the bearing *l*, thus lubricating the sliding parts of the apparatus. The oil which goes over the rim of the bearing *l* is caught by the rotating box *p*, out of which the oil flows down again when the apparatus is stopped.

The shaft *o*, and so the whole machinery, is elastically carried on the frame *s* by means of an india-rubber plate *u*. The fact that the washer *t*, which is pressed down by the nut *m*, and the counterbearing of the shaft *o* toward the frame *s* are turned in spherical form, allows a sufficient movement of the shaft *o* in all directions, so that the apparatus, when started, easily gains its equilibrium.

The spindle *r* is journaled in an elastic collar-bearing *h*. It receives its motive power by a pulley or any other suitable means—for instance, by direct electric motor.

Fig. 5 shows as a distributer a disk, to which a rotating deflection-plate is attached. Of course any other kind of distributer could be mounted with our suspension construction.

Fig. 3 shows, besides the suspension of the distributer, also the construction of the bottom of the reception-vessel in the form of an appropriate number of hoppers, by which the separated grains are gathered in a continuous way. In the drawings two collecting-rings formed of hoppers are shown. There can be any number of hopper-rings. These rings can be formed by only two surfaces *i i'*, leaving a slit *c* for the outlet of the grains, or by addition of cross-plates $i^2\,i^2$, so that every ring has several smaller outlet-openings *c'*. In the former case the separated grains are collected in gutters *k k'* and removed therefrom by brushes. In the latter case the grains fall directly into bags or any other receptacles.

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

1. The combination, in a centrifugal separator, of a stationary inclosed vessel having a central opening and containing a series of concentric circular rims of a height less than the height of the vessel, by which the vessel is divided into a series of annular collecting-chambers having communication with each other in the upper part of the vessel, valves or slides for regulating the size of said communications, the said collecting-chambers having valved communications with the outside atmosphere, and a rotary centrifugal distributer, substantially as described.

2. The combination, in a centrifugal separator, of a stationary inclosed vessel having a central opening, concentric annular rims within the vessel and of a height less than that of the vessel, forming a series of collecting-chambers having communications at the upper part of the vessel, valves or slides for regulating the size of said communications, cross-plates within the collecting-chambers forming a series of hoppers, the said collecting-chambers having valved communications with the outside atmosphere in each of said hoppers, and a rotary centrifugal distributer arranged centrally within the vessel, substantially as herein set forth.

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WILHELM HENNEBERG.

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