

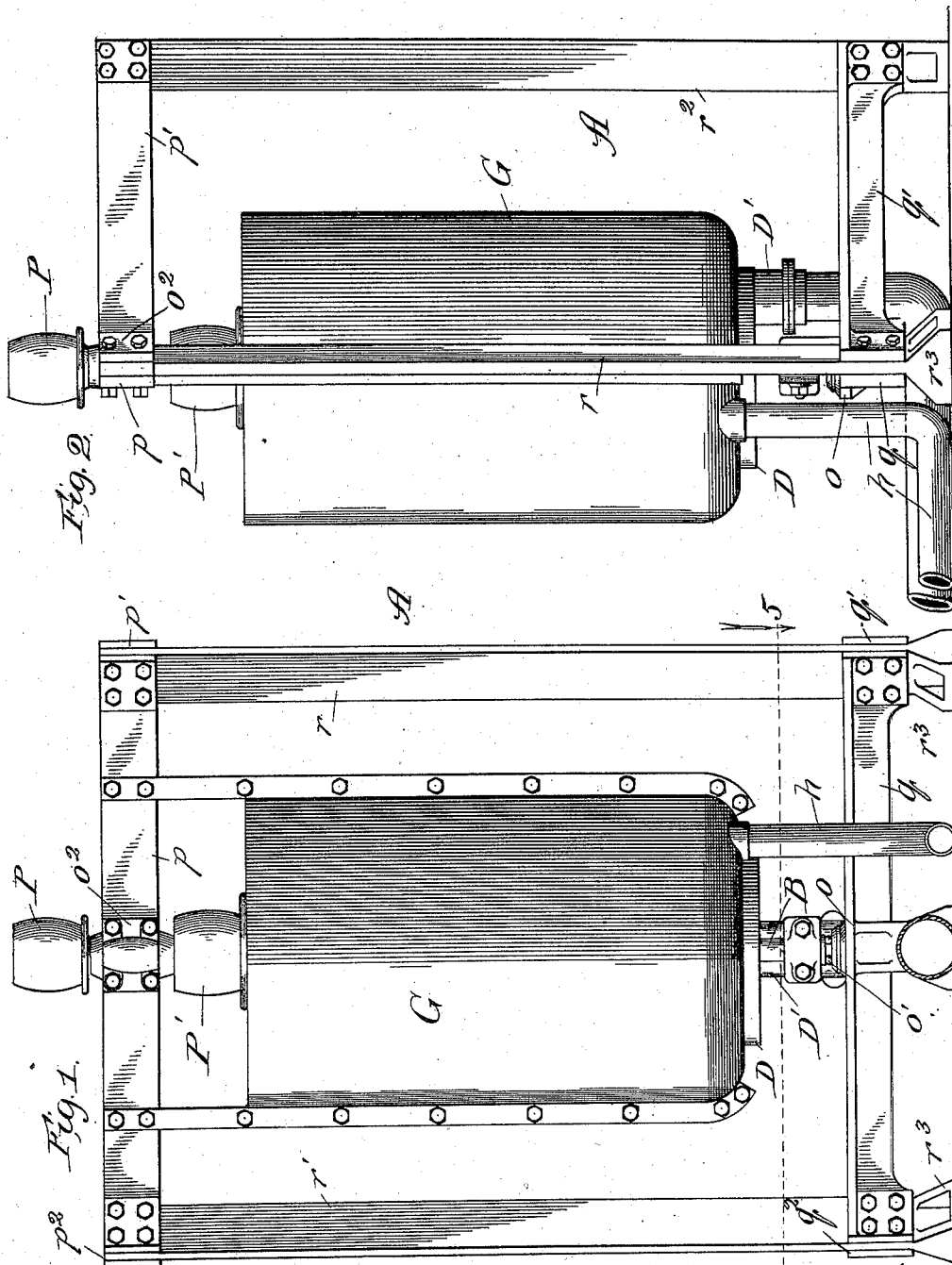
(No Model.)

3 Sheets—Sheet 1.

T. T. OLIVER.
CENTRIFUGAL MACHINE.

No. 576,412.

Patented Feb. 2, 1897.



Witnesses:
E. C. Chubb
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Inventor:
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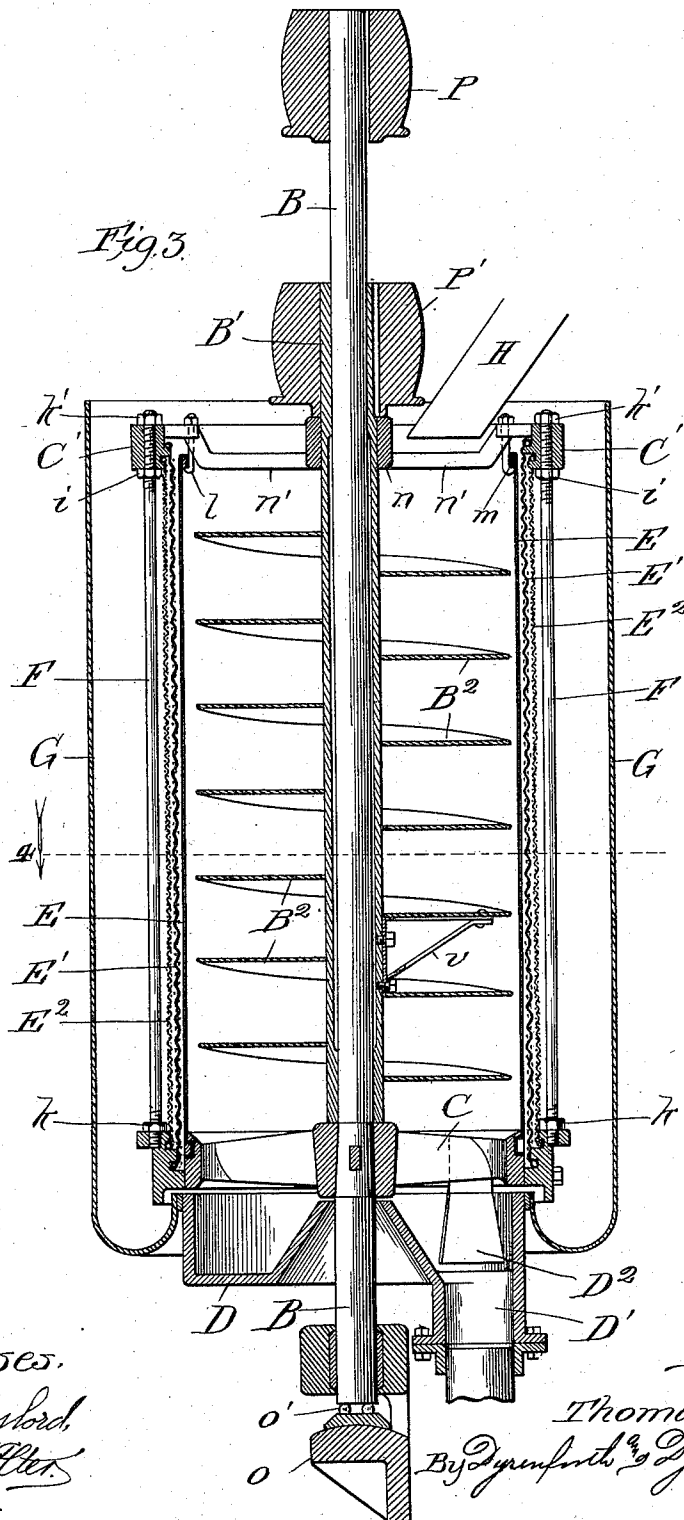
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3 Sheets—Sheet 2.

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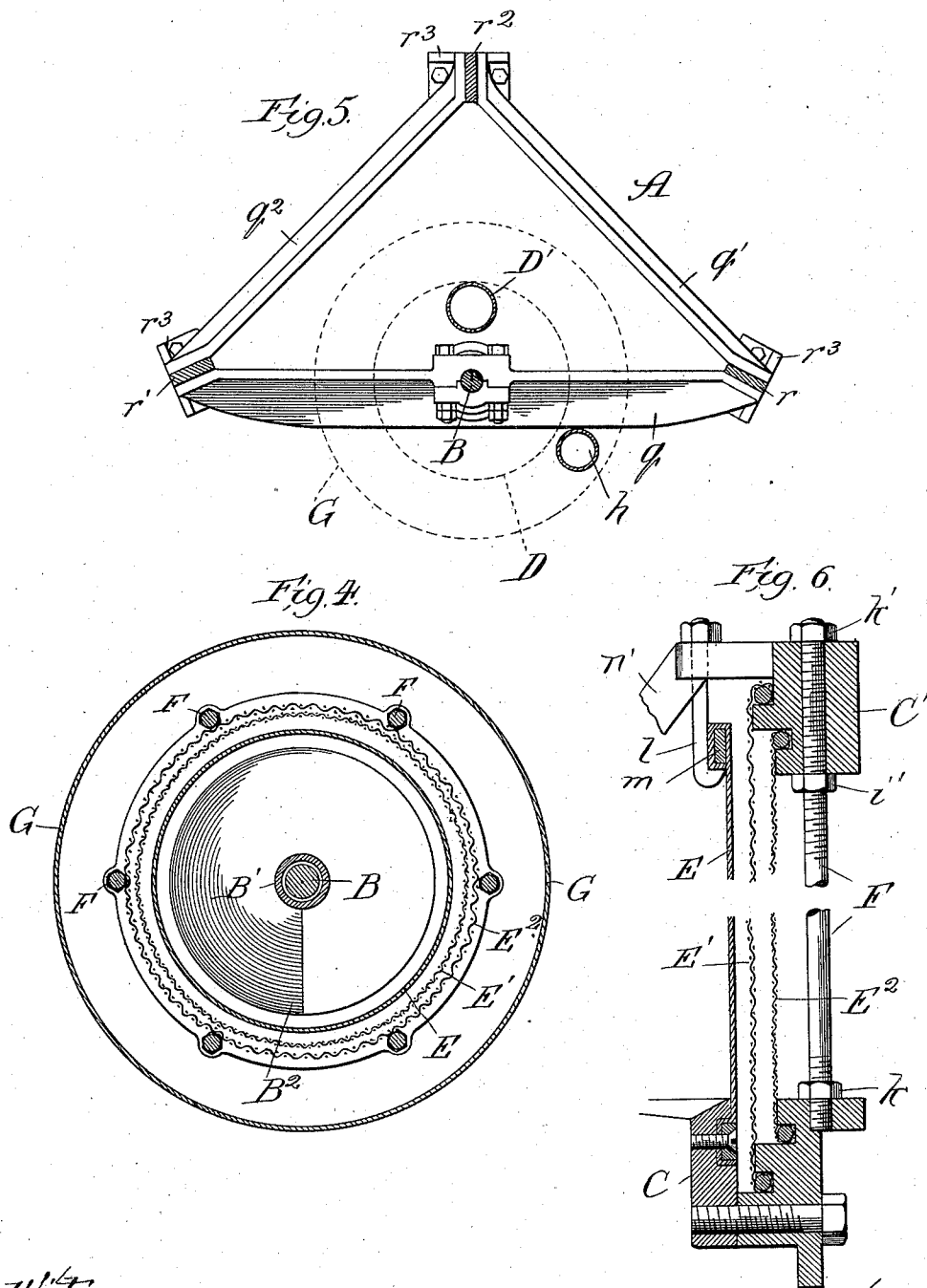
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3 Sheets—Sheet 3.

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Patented Feb. 2, 1897.



Witnesses:
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UNITED STATES PATENT OFFICE.

THOMAS T. OLIVER, OF CHICAGO, ILLINOIS.

CENTRIFUGAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 576,412, dated February 2, 1897.

Application filed February 26, 1896. Serial No. 580,804. (No model.)

To all whom it may concern:

Be it known that I, THOMAS T. OLIVER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Centrifugal Separators, of which the following is a specification.

My invention relates to an improvement in the class of apparatus for separating solid material from liquid with which it is mixed, such as the grains of brewers' and distillers' refuse and the refuse of sugar-refining, from the liquid; and my object is to provide a novel construction of centrifugal separator for the purpose which shall perform the work expeditiously and thoroughly.

Referring to the accompanying drawings, Figure 1 shows my improved separator by a view in front elevation. Fig. 2 is a view of the same in side elevation; Fig. 3, an enlarged vertical sectional view of the separator without its supporting-frame; Fig. 4, a section taken at the line 4 on Fig. 3 and viewed in the direction of the arrow; Fig. 5, a section taken at the line 5 on Fig. 1 and viewed in the direction of the arrow, and Fig. 6 a broken sectional view showing details of construction.

A is the frame, which I prefer to form in the triangular shape illustrated, with the three vertical beams r , r' , and r^2 placed in triangular relation to each other, with feet r^3 at their lower ends, and connected at their bases by the beams q , q' , and q^2 and at their upper ends by the beams p , p' , and p^2 . At the center of the base-beam q is provided a step o , carrying a ball-bearing support o' for a rotary vertical shaft B, formed, preferably, solid of steel and extending upward through a bearing o^2 on the front upper beam p of the supporting-frame A. Near the base of the shaft it carries a spider C, the radial arms of which should incline transversely, as represented, to form a species of delivery-screw, for a purpose hereinafter described, and which is keyed at its hub to the shaft to rotate with it, and toward its opposite end the shaft is surrounded by an annular head C' , containing depressed radial arms n' , extending from its hub n . At its upper end the shaft B carries a drive-pulley P, and about the lower portion of the shaft, below the spider C, is provided an annular trough D, having an out-

let-spout D' , and into which there depends a shovel D^2 from one of the arms of the spider. The shaft B is loosely surrounded by a hollow cylindrical shaft B' , which extends upward from the hub of the spider C through the hub n of the head C' , beyond which it carries a drive-pulley P' , shown as of larger diameter than the pulley P, and between the heads C and C' the hollow rotary shaft B' carries spirally-arranged blades B^2 , forming a species of conveyer, and which may, if required, be braced from one to the other by diagonally-disposed bracing-rods, such as the rod shown at v in Fig. 3.

The conveyer device is surrounded by a cylindrical casing of filtering-cloth E, preferably linen, which is confined at its lower end about the annular rim of the spider C and is engaged at its upper end at a hoop m , to which it is secured by hangers l , depending from the annular head C' . The filtering-cloth E is surrounded by a cylindrical screen E' , preferably of fine wire mesh, say three-sixteenths of an inch, and this is surrounded by a similar screen E^2 of coarser mesh, say three-quarters of an inch, and both screens, which reinforce the filtering-cloth, are fastened at their lower ends about the annular head C and at their upper ends about the annular head C' , as shown.

The head C' is supported from the head C by rods F, threaded at their opposite ends where they pass through the heads and carrying at their lower ends above the head C the stop-nuts k and at their upper ends above the head C' the stop-nuts k' and below the upper head the screen stretching or adjusting nuts i , which, by turning them when the nuts k' are loosened, serve to raise the annular head C' and accordingly to stretch taut the cylinders E, E' , and E^2 . These cylinders, which afford the strainer or filter of the apparatus, are inclosed in a casing G, preferably of sheet-iron, which is closed at its bottom and open at its top to permit the material to be treated to be fed into the apparatus through a stationary trough H.

To operate the apparatus, the wet material to be dried by separating the liquid from it is fed into it at its upper end while the shaft B, and with it the pervious cylinders E, E' , and E^2 , and the shaft B' , and with it the con-

veyer thereon, are being rapidly rotated in the same direction by power applied to the pulleys P and P' to drive the two shafts at differential speed, the shaft B at, say, one thousand revolutions per minute and the shaft B' at, say, nine hundred revolutions in the same period of time. This may be accomplished by providing the pulleys of differential diameter or otherwise. By the action of the apparatus the conveyer forces the material centrifugally against the filtering-cloth E, which intercepts the solid portions of the material while the liquid passes through it and through the screen-cylinders E' and E² into the casing G, whence it discharges through an outlet-spout h, leading from its base. Owing to the difference in speed between the conveyer and the cylindrical body of the apparatus the solid material gradually descends by gravity and is worked down through the spaces at the ends of the conveyer-blades from each of the latter to the next, meantime being subjected to the centrifugal action of the conveyer and consequent filtering off of the liquid till the residue of solid material eventually reaches in a comparatively dry condition the trough D, into which the inclined arms of the spider C tend to direct it and from which it is discharged through the spout D', toward which the shovel D² scrapes it.

From the foregoing description of my improvement it will be seen that the principle of its operation is not that of a vertical conveyer feed in the sense that the material is carried by the blade of the conveyer through its spiral course from the feed to the discharge and compacted between adjacent sections of the blade to express from it the moisture, which is filtered off by the centrifugal action of the differentially-rotating conveyer and its surrounding strainer. This describes in a general way an old construction of centrifugal extractors. My improvement involves a novel principle of construction, the essence of which is the spaces afforded between the edges of the spirally-arranged conveyer-blades B² and the strainer-cylinder surrounding them. It is these spaces which render the apparatus gravity fed in contradistinction to being fed by the carrying action of a compressing-conveyer. According to my improvement, the spirally-arranged conveyer-blades enable the centrifugal action of the machine, which throws the material outward against the strainer, to separate the moisture to overcome partially the force of gravity, and thus hold the material in partial suspension in the annular space between the conveyer-blades and the surrounding strainer, whereby its feed through the apparatus is retarded and it is subjected the longer and the more thoroughly to the straining influence of the centrifugal action against the straining-surface while traversing by gravity the annular space through the machine to the discharge. The substantial screw

construction of the spider C at the delivery end of the apparatus is important, since it prevents clogging of the delivery, to which there would otherwise be a tendency owing to the rapid speed of rotation of the parts if the radial arms of the spider were straight, but by their spiral arrangement they tend to convey out the dried material as it accumulates against them.

The superior efficiency of my improved apparatus is attributable to the principle of construction and operation thus explained. Hence I do not limit my improvement to the particular details of construction shown and described, as these may be variously modified without departure from the aforesaid principle.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a centrifugal separator, the combination of a vertical rotary filtering-screen, a vertical rotary spiral conveyer in said filtering-screen affording a gravity-feed space between the edges of the conveyer-blades and the screen, and means for simultaneously rotating said screen and conveyer at differential speed, substantially as and for the purpose set forth.

2. In a centrifugal separator, the combination of a vertical rotary shaft carrying and surrounded by a filtering-screen, a hollow rotary shaft loosely surrounding said vertical shaft and carrying spirally-arranged conveyer-blades affording a gravity-feed space between the edges of said blades and the screen, and means for simultaneously rotating said shafts in the same direction at differential speed, substantially as and for the purpose set forth.

3. In a centrifugal separator, the combination of a vertical rotary shaft carrying and surrounded by a filtering-screen, a casing surrounding said screen and having a discharge-outlet at its base, a trough at the base of said screen and having a discharge-spout, a hollow rotary shaft loosely surrounding said vertical shaft and carrying spirally-arranged conveyer-blades affording a gravity-feed space between the edges of said blades and the screen, and means for simultaneously rotating said shafts in the same direction at differential speed, substantially as and for the purpose set forth.

4. In a centrifugal separator, the combination of a vertical rotary filtering-screen comprising an inner cylinder of filtering-cloth and outer wire-screen cylinders of differential mesh, a vertical rotary spiral conveyer in said filtering-screen affording a gravity-feed space between the edges of the conveyer-space and the screen, and means for simultaneously rotating said screen and conveyer at differential speed, substantially as and for the purpose set forth.

5. In a centrifugal separator, the combination of a vertical rotary shaft carrying and surrounded by a filtering-screen comprising

an inner cylinder of filtering-cloth and outer wire-screen cylinders of differential mesh, a casing surrounding said screen and having a discharge-spout, a hollow rotary shaft loosely surrounding said vertical shaft and carrying spirally-arranged conveyer-blades, a gravity-space between the edges of the conveyer-blades and said screen and means for simultaneously rotating said shafts in the same direction at differential speed, substantially as and for the purpose set forth.

6. In a centrifugal separator, the combination of a vertical rotary filtering-screen, a vertical rotary spiral conveyer in said screen affording a gravity-feed space between the edges of the conveyer-blades and screen; a spider at the lower end of the screen having spirally-arranged arms affording a species of delivery-screw and means for simultaneously rotating said screen and conveyer at differential speed, substantially as and for the purpose set forth.

7. A centrifugal separator comprising, in combination with a supporting-frame, a shaft

B journaled in vertical position in said frame, and carrying a lower annular head C provided with a shovel D², a hollow shaft B' loosely surrounding said shaft B and carrying the spirally-arranged conveyer-blades B², an annular trough D below said head, having an outlet-spout D', an annular head C' loosely surrounding said hollow shaft, concentric filtering-cylinders E, E' and E² extending between and connecting said annular heads, rods F supporting the upper head from the lower head and provided with means for raising the upper head to stretch said cylinders, a casing G surrounding said cylinders and having an outlet in its base, and means for driving said shafts simultaneously in the same direction at differential speed, the whole being constructed and arranged to operate substantially as and for the purpose set forth.

THOMAS T. OLIVER.

In presence of—

J. H. LEE,

RICHARD SPENCER.