969,591.

F. R. ABEEL.

CENTRIFUGAL SEPARATOR.

APPLICATION FILED JULY 27, 1909.

Patented Sept. 6, 1910

2 SHEETS—SHEET 1.

Fig. 1.

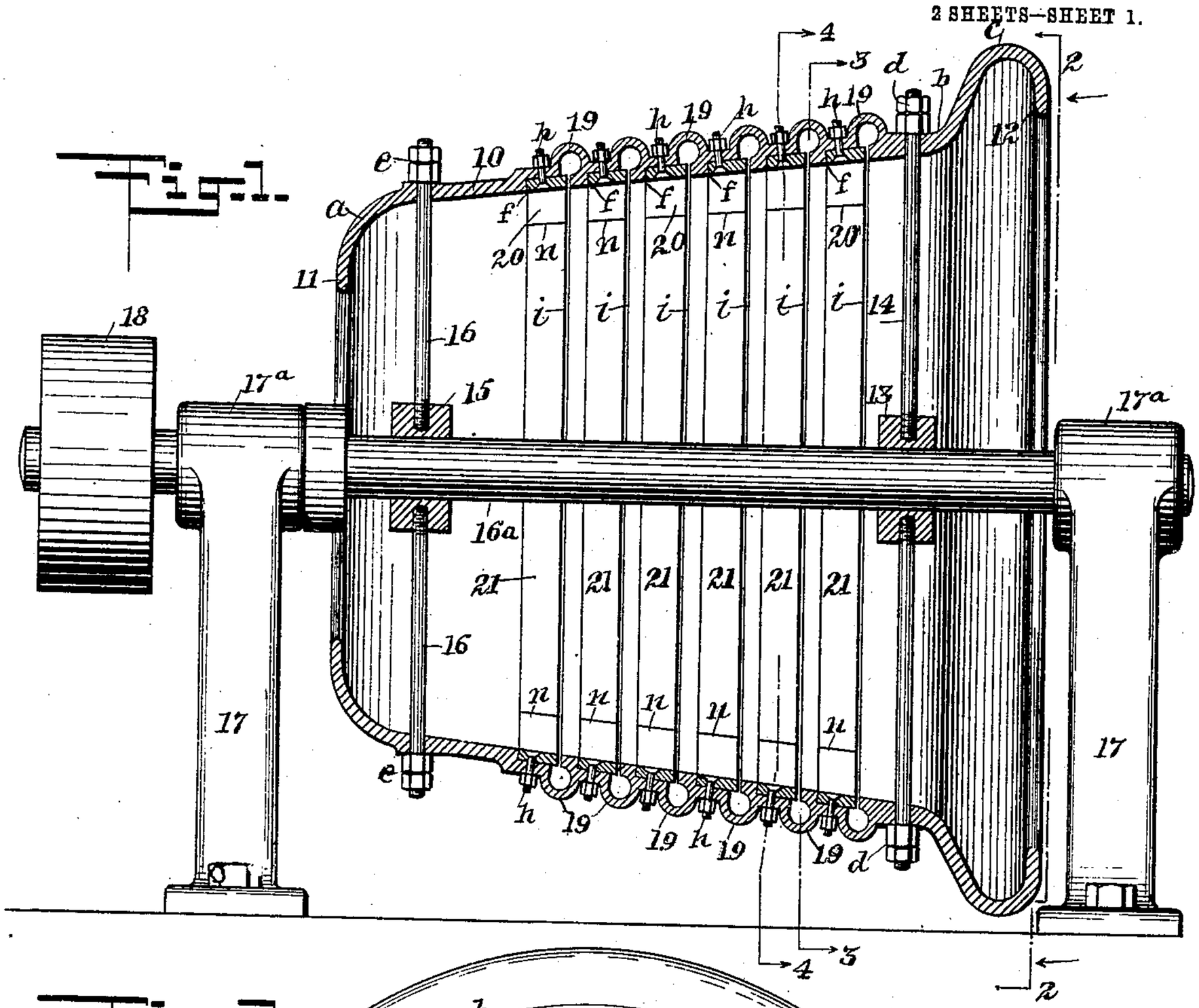
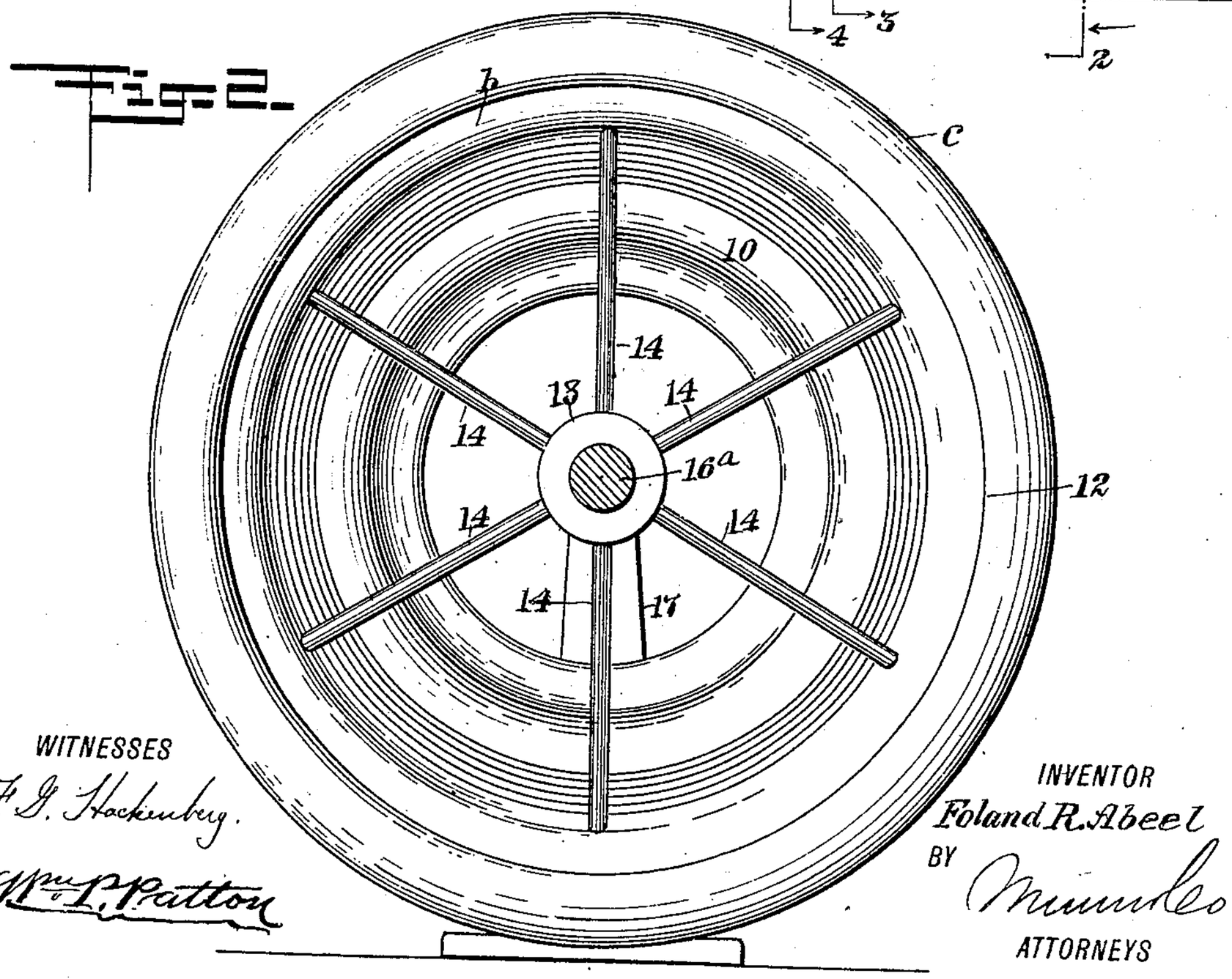


Fig. 2.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3.

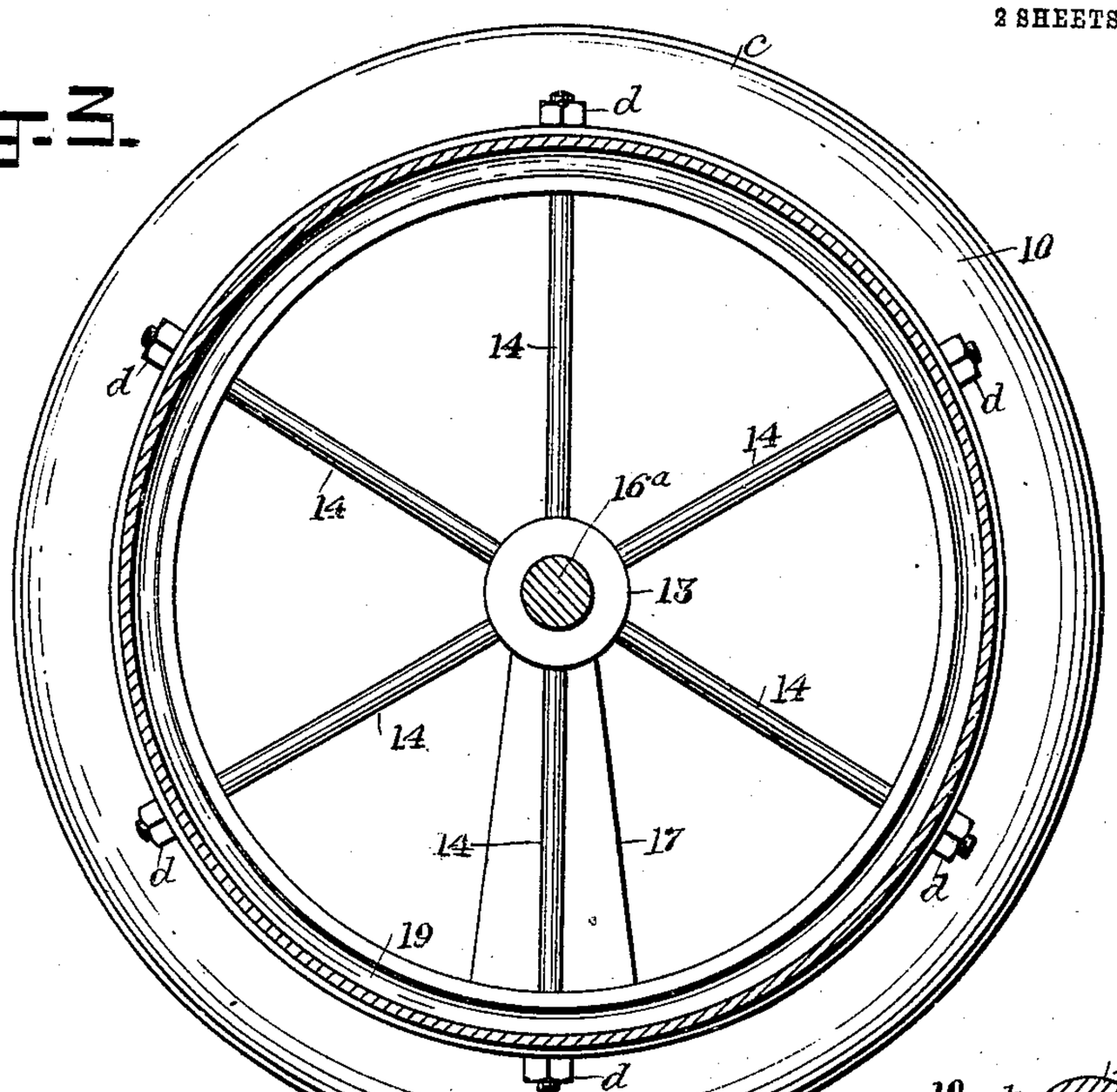
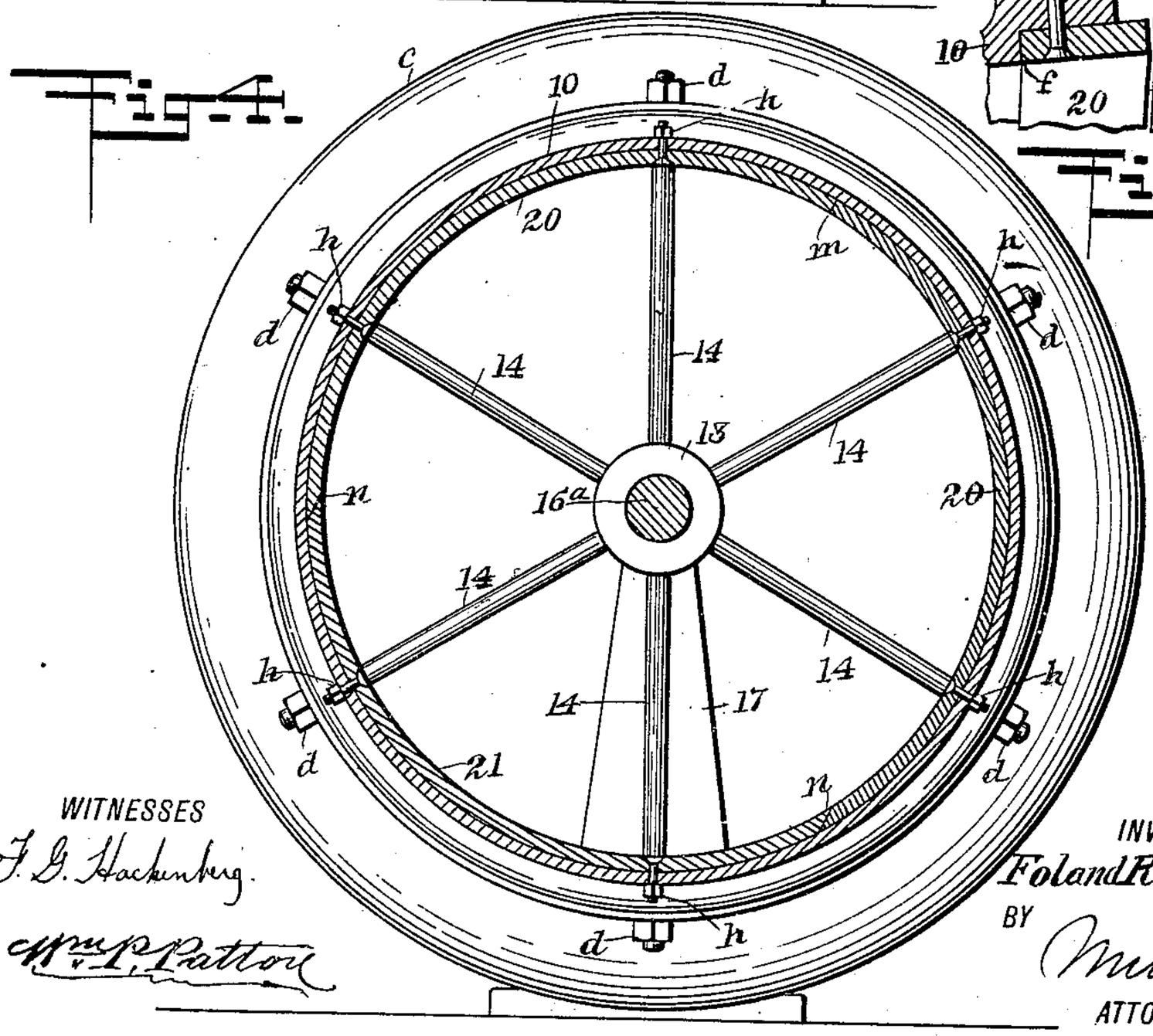


Fig. 4.



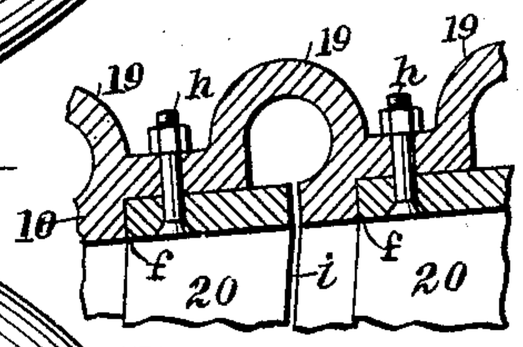


Fig. 5.

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UNITED STATES PATENT OFFICE.

FOLAND ROMEYN ABEEL, OF TACOMA, WASHINGTON.

CENTRIFUGAL SEPARATOR.

969,591. Specification of Letters Patent. **Patented Sept. 6, 1910.**

Application filed July 27, 1909. Serial No. 509,833.

To all whom it may concern:

Be it known that I, FOLAND R. ABEEL, a citizen of the United States, and a resident of Tacoma, in the county of Pierce and State of Washington, have invented a new and Improved Centrifugal Separator, of which the following is a full, clear, and exact description.

This invention relates to the separation and saving of gold from sand or other refuse material, and has for its object to provide novel details of construction for a gold separator, which operates by centrifugal force, which is simple, convenient in service, and that will separate fine gold from sand, or other debris that is passed through the machine.

This invention consists in the novel construction and combination of parts, as is hereinafter described and defined in the appended claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a sectional side view of the improved gold separator device; Fig. 2 is a partly sectional end view taken substantially on the line 2—2 in Fig. 1, seen in the direction of the arrows; Fig. 3 is a transverse sectional view of the separator substantially on the line 3—3 in Fig. 1; Fig. 4 is a transverse sectional view, substantially on the line 4—4 in Fig. 1; and Fig. 5 is an enlarged fragmentary sectional view of details taken on the same line with Fig. 1.

In the drawings 10 indicates the hollow body for the device, formed preferably of metal, and having a coniform shape. The smaller end of the body 10 is formed having an inwardly turned flange 11 which may be curved at the corner *a* where it joins the body, as shown in Fig. 1. The opposite end, which is of greater diameter, is flared outward at *b*, and then return bent at *c*, forming an annular recess, and providing an inwardly turned flange 12 thereon, as shown at the right in Fig. 1.

A spider frame is provided for the rotatable support of the end of the body 10 having greatest diameter, said spider consisting of a hub 13 from which radiate a plurality of arms 14. The wall of the coniform body 10 is perforated at suitable intervals near the flaring wall *b*, and, as shown, the end portions of the arms 14 are outwardly inserted through said perforations and secured therein by jam nuts *d*, thus disposing the hub 13 centrally in the body 10. A similar spider frame is provided for the smaller end of the coniform body 10, comprising a hub 15, and arms 16, that radiate from the hub, said arms passing through perforations in the peripheral wall of the body 10 near the flange 11 thereon, said arms being secured in place by jam nuts *e*, whereby the hub 15 is centrally positioned in the body 10.

The hubs 13 and 15 are bored centrally in alinement. These bores are of an equal diameter, receiving a shaft 16ª, that is extended at each end from the hubs, and is therein secured by suitable means. Two similar columns 17, that are vertically erected at proper distances apart on a suitable base, are provided at their upper ends with boxes 17ª, wherein the shaft 16 is journaled, thus disposing said shaft horizontally.

On an extended end of the shaft 16, a pulley 18 is mounted and secured, which is adapted to receive a driving belt (not shown) that has engagement with a source of power and rotary motion for the rotation of the body 10.

The coniform peripheral wall of the separator body 10 is formed having a series of spaced tubular receivers 19, that are circumferentially arranged thereon, integral with said wall, and preferably are of an equal diameter. The spaces that intervene between the tubular receivers 19 afford similar interior annular recesses *f* in the peripheral wall of the separator body, said recesses each being located partially beneath a respective receiver 19, so as to leave an opening thereinto, as shown clearly in Fig. 5. In each annular recess *f* a sectional ring 20, 21 is fitted and secured by a plurality of bolts and nuts *h*, as shown in Figs. 1, 4, and 5.

The rings that occupy the recesses *f* are of such thickness as adapt their inner surfaces to be disposed flush with the adjacent inner surface of the separator body 10, and their width is such that a narrow slot or opening *i* is formed between the adjacent side edges of each pair of rings. Preferably each ring consists of three segments 20, 20, 21, of about an equal length. The ends *m* of the ring segments 20, 20, that impinge upon each other are formed ra-

dially, and at right angles with the side edges of said rings, so that said ends have contact throughout their surfaces. The opposite ends *n* of the ring segments 20, 20, are beveled, as appears in Fig. 4, and the ends of the third ring segment 21, are correspondingly beveled, so that said sloped ends may be inserted between the beveled ends *n* of the ring segments 20, 20, thus completing the ring, that is substantially secured in place by the bolts and nuts *h*.

It will be seen from the foregoing description, that the series of sectional rings 20, 21, when secured in the recesses *f*, provide a series of spaced annular slots *i* that respectively have open communication with the corresponding tubular receivers 19.

It will be noted that with the shaft 16ª rotatably supported in a horizontal position, and the coniform shape of the separator body 10, the side of said body that becomes lowermost while rotated is inclined downwardly from the smaller end of the receptacle to the larger end thereof.

In preparing the improved separator for use, a suitable quantity of quicksilver is introduced within the smaller and higher end of the receiver 10, and the latter is rotated at a proper speed.

The gravity of the liquid mercury, coacting with the centrifugal force that results from the rapid rotation of the receiver body 10, causes the mercury to pass down into the receivers 19, through the annular slots *i*, this operation successively filling the receivers 19 and slots *i* from the smaller end of the body 10 toward the larger end thereof, until all the receivers 19 and slots *i* are filled.

Any surplus quicksilver that may have been introduced within the body 10 in charging the receivers 19, will pass into the annular recess at the larger end of said body, and will indicate that the apparatus is in condition for operating on gold bearing sand, or other granular material that may contain gold in flakes or grains.

The gold bearing material is mixed with water in proper quantity, and is fed into the smaller end of the coniform receptacle 10, that is now rotated with sufficient speed to produce centrifugal action, and cause the gold and waste material to pass slowly down the inclined surface of the hollow body 10.

As the material containing gold in flakes or grains, is distributed in a thin layer within the receptacle 10, and the valuable metal is heavier than the waste material it is mixed with, it will be seen that when granules or flakes of gold arrive at the uppermost slot *i*, its weight will cause it to enter the slot and pass thence down into the receiver 19.

The continuation of the operation will change the positions of particles of sand and gold that did not enter the first slot *i*, and may enter the second slot from the upper end of the body 10.

The progressive sliding and rotatable movement of the material being operated upon, will remove the gold from the waste material, and the latter will pass into the recess or annular chamber at the larger end of the body 10.

It is to be understood that as the gold that is heavier than the quicksilver amalgamates in certain proportion with the quicksilver, such portion of the latter as does not combine with the gold in the receivers 19 will be crowded out of the latter into the slots *i*, and thus be in position to receive values that may enter said slots.

The operation is continued as long as it is considered profitable, which is determined by testing the material that passes into the annular recess at the larger end of the apparatus.

When about to remove the amalgamated gold and mercury from the apparatus, the rings that are secured on the inner side of the coniform receptacle 10, are successively removed, commencing with the one nearest to the smaller end of the same.

It will be noted that the segment 21, should be the first section of each ring removed, which will permit the free removal of the other sections 20, 20 thereof.

The displacement of the segmental rings 20, 21, opens wider annular slots into the respective receivers 19, which permits the removal of the gold and quicksilver amalgam therefrom.

Obviously, when the apparatus has been denuded of the gold it has saved, the segmental rings are to be replaced, commencing with the one nearest to the large end of the body 10, and when all are replaced, there may be a filling of quicksilver introduced into the slots *i* and receivers 19, as hereinbefore explained, for resumption of the operation.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. A centrifugal separator comprising a hollow body, a horizontally arranged shaft mounted to turn and carrying said hollow body, receivers on the side wall of the body having imperforate outer walls and each communicating by an opening with the interior of the body, means for reducing the width of said opening, and means for rotating the shaft to turn said body and the receivers.

2. A centrifugal separator, comprising a coniform hollow body open at each end, a series of spaced tubular receivers formed on the side wall of the body and having imperforate outer walls, each receiver having an annular opening between it and the

interior of the body, means for reducing the width of said opening between the body and each receiver to form a narrow slot opening directly into the receiver at the longitudinal center thereof, and means for rotatably supporting said body and the receivers.

3. The combination with a coniform separator body, consisting of a side wall, and a series of spaced tubular receivers formed on said side wall, and constructed to receive and retain quicksilver, each receiver having an annular opening between it and the interior of the body, of a series of closing rings secured within the separator body, one over each annular opening and reducing the width thereof so as to form a narrow annular slot, the inner surfaces of said rings being flush with the inner surface of the separator body.

4. The combination with a rotatably supported shaft and means for rotating said shaft, of a centrifugal separator, comprising a coniform hollow body having an inwardly turned flange at its smaller end, and an annular pocket formed at its larger end and terminating in an inwardly turned flange, two spiders, each having a central hub and radial arms thereon, said arms engaging respective ends of the hollow body, and the shaft engaging the hubs, and a series of spaced tubular receivers formed on the hollow coniform body, each receiver having an imperforate outer wall, and communicating with the interior of the body.

5. In a centrifugal separator of the character described, the rotatably supported coniform hollow body, the series of spaced tubular receivers on the exterior of the hollow body, each receiver being constructed to receive and retain quicksilver and having an annular opening between it and the interior of the body, the wall of the separator body having interior annular recesses in the spaces between the receivers, and a series of closing rings, each formed of a plurality of segments, secured in sequence in said recesses on the side wall of the hollow body, each completed ring reducing the width of the opening it occupies, to provide a narrow slot between the interior of the hollow body and a respective tubular receiver, the inner surfaces of said rings when in position being flush with the adjacent inner surface of the separator body.

6. A centrifugal separator, comprising a horizontally arranged coniform hollow body open at both ends, a series of circumferentially arranged receivers formed on the exterior of the body, the said receivers having imperforate outer walls and constructed to receive and hold quicksilver, each receiver having independent communication with the interior of the body to permit the quicksilver to pass from the body into the said receivers, and means for rotating the body and the receivers.

7. A centrifugal separator, comprising a horizontally arranged coniform hollow body open at both ends, a series of circumferentially arranged tubular receivers formed on the exterior of the body, the said receivers having imperforate outer walls and constructed to hold quicksilver, each receiver having communication with the interior of the hollow body, and means for rotating the body, the said body having an inwardly turned flange at its smaller end, the larger end of said body being flared outward and then return bent forming an annular recess or pocket.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FOLAND ROMEYN ABEEL.

Witnesses:

O. D. COCHRAN,

INEZ COCHRAN.