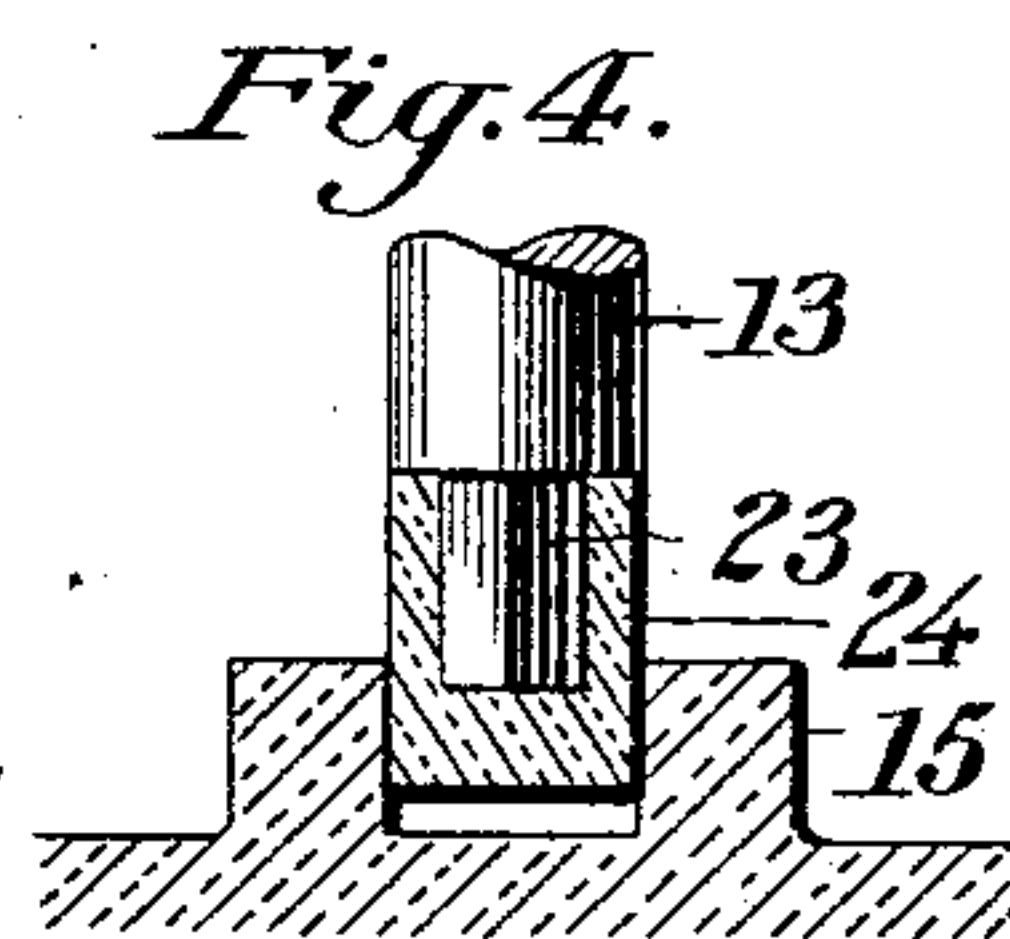
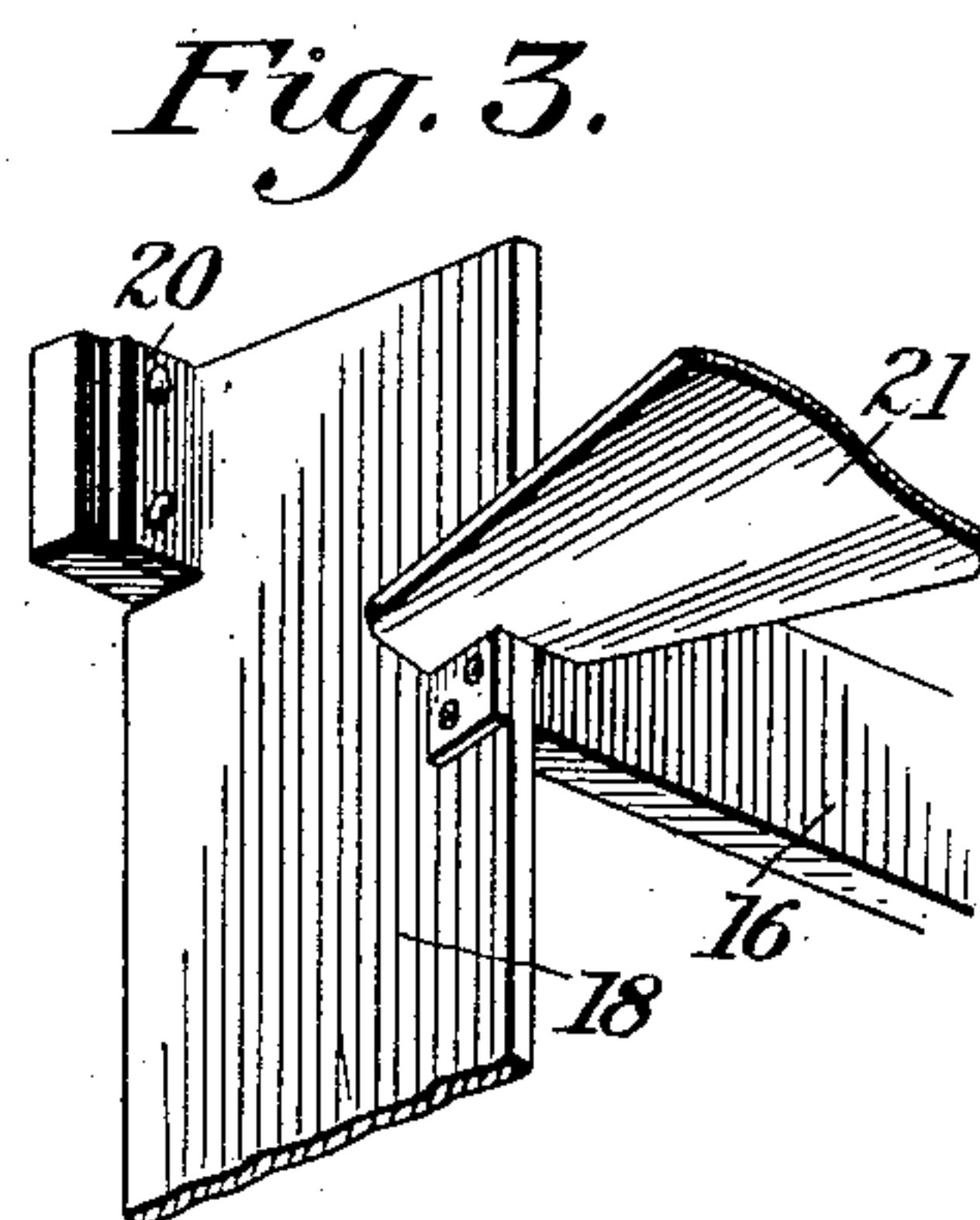
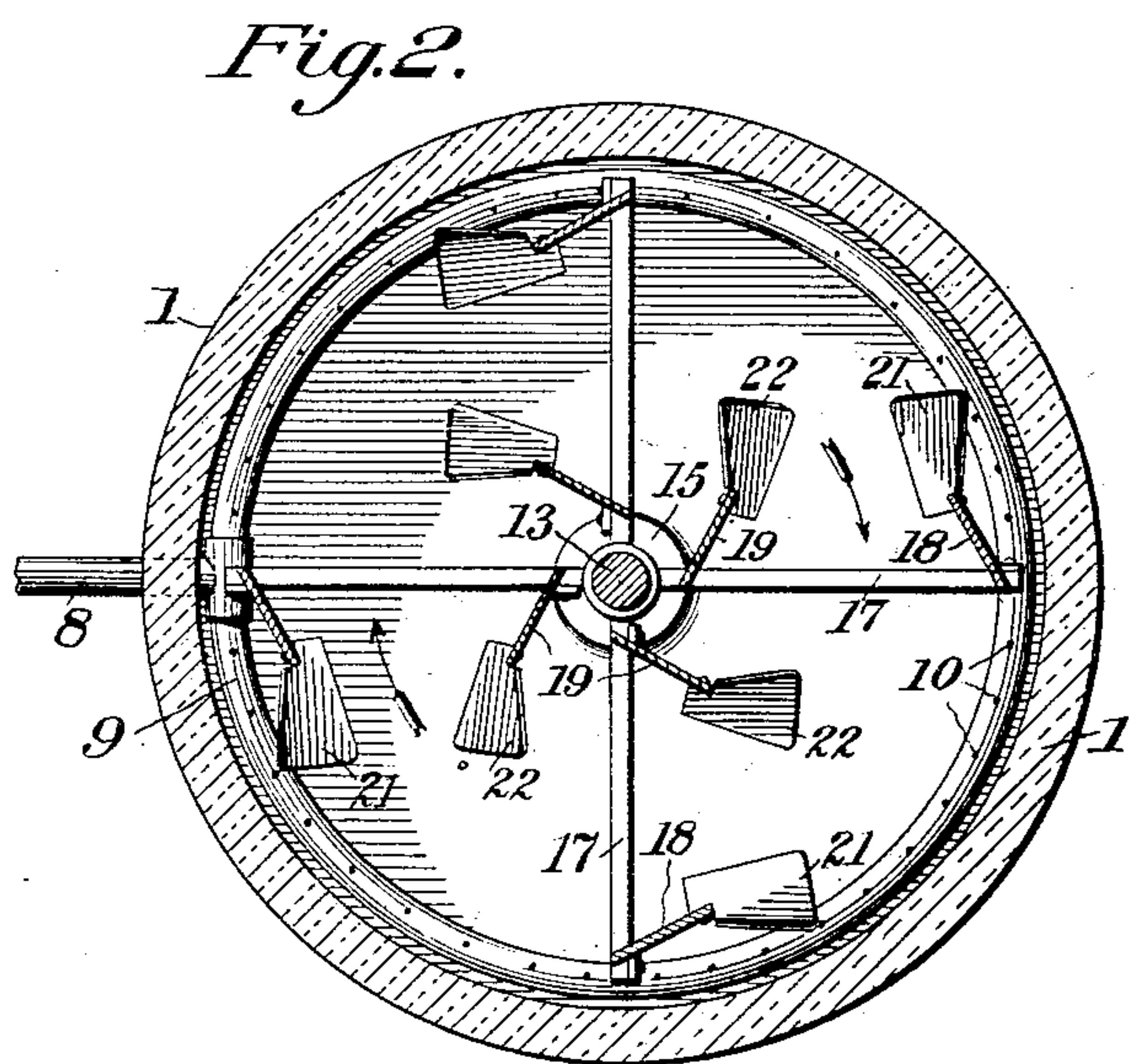
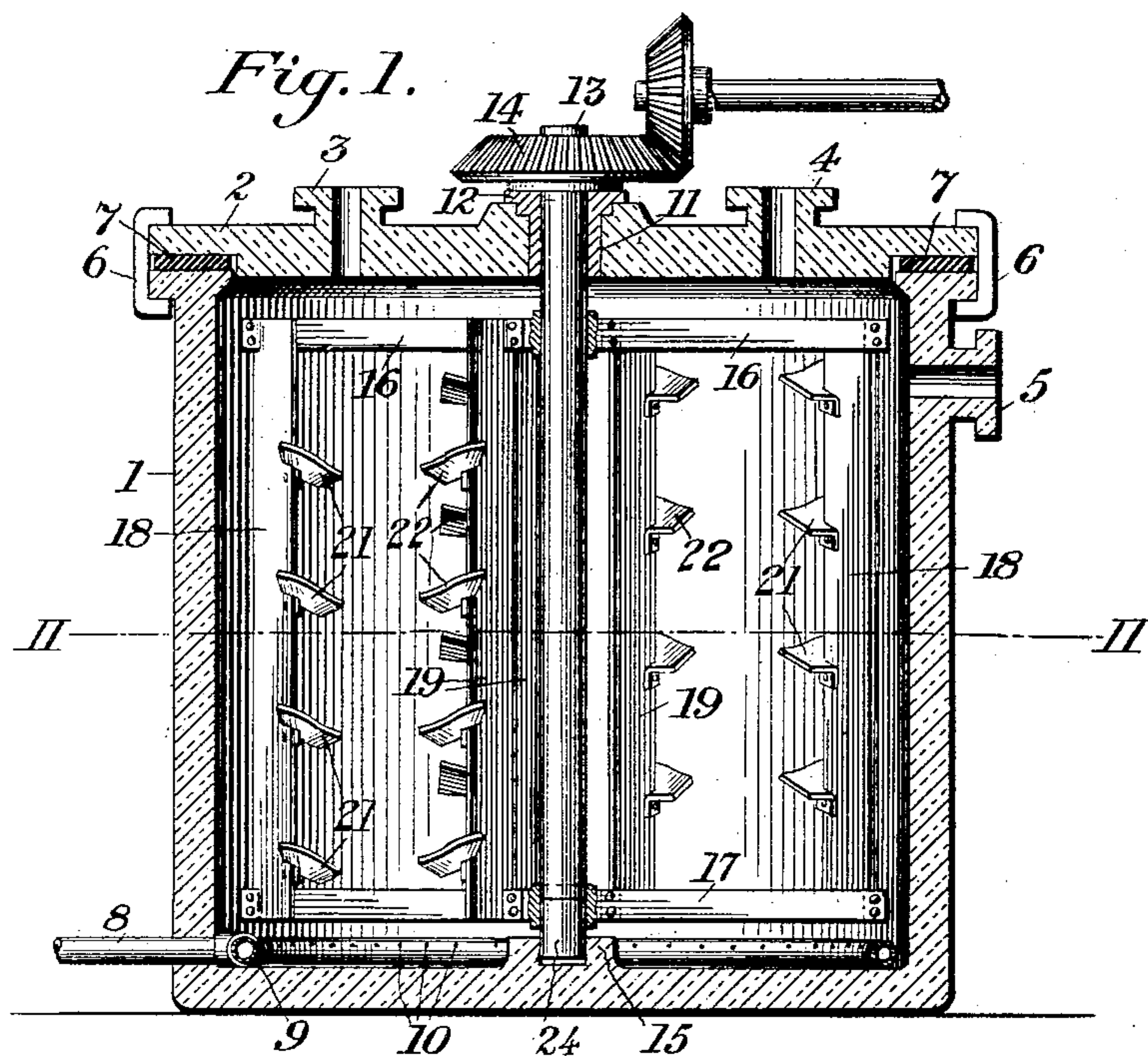


No. 735,206.

PATENTED AUG. 4, 1903.

L. P. BURROWS.  
MIXING AND DISSOLVING APPARATUS.  
APPLICATION FILED NOV. 27, 1901. RENEWED JAN. 2, 1903.

NO MODEL.



Witnesses:  
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By *Eugene A. Dymee*  
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# UNITED STATES PATENT OFFICE.

LINUS PORTER BURROWS, OF WASHINGTON, DISTRICT OF COLUMBIA.

## MIXING AND DISSOLVING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 735,206, dated August 4, 1903.

Application filed November 27, 1901. Renewed January 2, 1903. Serial No. 137,570. (No model.)

*To all whom it may concern:*

Be it known that I, LINUS PORTER BURROWS, a citizen of the United States, residing at Washington, District of Columbia, have  
 5 invented new and useful Improvements in Mixing and Dissolving Apparatus, of which the following is a specification.

Referring to the accompanying drawings, Figure 1 is a vertical central section. Fig.  
 10 2 is a horizontal section on line II II of Fig. 1. Figs. 3 and 4 are detail views.

The apparatus consists of a containing vessel 1, the material of which is suited to the solvent or other liquid to be held therein.

15 The material shown is vitrified earthenware, and the cover 2 is of the same material. The cover has suitable inlet-openings 3 4, and the vessel has an outlet-opening 5. The cover is secured upon the vessel by clamps

20 6, a packing 7 of rubber being interposed. Through the side of the vessel at its base passes a steam-supply pipe 8, which is connected to a circular coil 9 near the bottom of the vessel. This coil has small openings 10,

25 preferably in its upper inner wall, to permit the injection of live steam into the contents of the vessel. The cover has a central opening 11, within which is arranged a metal bushing 12, serving as a journal and sup-

30 port for a shaft 13 and bevel-gear 14. The shaft 13 is guided at its lower end by a recess in a boss 15, rising from the bottom of the vessel. Shaft 13 carries near its upper and lower ends two sets of radial arms 16 17,

35 shown as four in number, the arms of the upper set being disposed directly above those of the lower set. These arms carry vertical stirring-plates 18 19. These plates are secured by rivets 20 or otherwise to the upper

40 and lower arms, the two plates carried by each pair of arms being spaced apart, but converging toward each other as they recede from the arms. To the rear edges of each plate are secured a number of blades 21 22,

45 each of which extends rearwardly or outwardly from its supporting-plate in a general horizontal direction. The blades 21 on outer vertical plates 18 and the blades 22 on inner vertical plates 19 have their adjacent

50 inner edges twisted downwardly, giving the blades a helical curve transversely. The

corresponding blades which are carried by each pair of vertical plates are in substantially the same horizontal plane. The several pairs of blades on the vertical plates 18 55 19 which follow next after the first set are respectively situated at a higher level than those of the first set, and the same is true of the blades of each succeeding set, the difference in elevation depending on the number 60 of radial arms and being such that all of the blades substantially form an interrupted screw, the pitch of which is equal to the distance between any adjoining superposed blades. There being four sets of radial arms 65 in the construction shown, the horizontally-aligned blades of each pair are situated above the blades of the preceding pair by a distance equal to one-fourth of that between any two adjoining superposed blades. The radial 70 arms, vertically-converging plates, and rearwardly-trailing twisted blades form an effective stirring device and serve to bring into thorough contact all particles of any solid material and liquid which may be in- 75 troduced into the vessel.

This apparatus is especially intended for use in the treatment of ores with a solvent solution, such as one of potassium cyanid, chlorin, dilute acid, &c. The entire stirring 80 device may be made of metal and if used in an acid solution is then protected by a resisting coating—for instance, of enamel. The injection of steam, hot air, &c., into the contents of the vessel through perforated pipe 9 85 in many cases greatly increases rate of solution. The vessel and its cover are preferably of such strength as to enable a considerable superatmospheric pressure to be maintained within it, the openings 3 4 5 having flanged 90 bosses to furnish tight joints with any inlet or discharge pipes. In some cases the stirrer when of conducting material, such as metal or carbon, may be connected to the positive terminal of a source of electric current, a 95 negative electrode of any suitable material being placed in the vessel or in an adjoining vessel communicating through opening 5, the solvent solution serving as an electrolyte.

When shaft 13 is of metal and vessel 1 of 100 ceramic material, the lower end of the shaft is preferably protected by bushing 24, also of



ceramic material, ground to fit smoothly in boss 15 and secured on the squared end 23 of the shaft.

The arrangement of the blades 21 22 in spiral lines around the shaft is especially useful where a mixture of substances of different specific gravity is to be thoroughly intermingled, since it tends to continuously lift any heavier material, which would otherwise gravitate to the bottom of the vessel.

The apparatus shown is capable of various modifications within the scope of the generic claims. For example, the shaft and stirrers may be stationary and the vessel revoluble around them, the vessel and stirrer may be used in other positions than a vertical one, and the stirring-blades may be omitted or carried by other supports than the converging vertical blades 18 19.

This stirring apparatus may evidently be used with advantage for thoroughly mixing or agitating any liquid, semiliquid, or granular materials.

I claim—

1. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to the vessel, and a set of radially-twisted stirring-blades carried by said shaft and arranged in a spiral line around the shaft, as set forth.

2. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to the vessel, and an outer and an inner set of stirring-blades carried by said shaft and arranged in a spiral line around the shaft, as set forth.

3. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to the vessel, and an outer and an inner set of twisted stirring-blades carried by said shaft and arranged in a spiral line around the shaft, as set forth.

4. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to the vessel, and an outer and an inner set of stirring-blades carried by said shaft and arranged in a spiral line around the shaft, the corresponding blades of the outer and inner sets being twisted in opposite directions, as set forth.

5. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to the vessel, a stirring-plate carried by said shaft, and a set of radially-twisted stirring-blades secured to one edge of said plate, as set forth.

6. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to the vessel, a plurality

of stirring-plates carried by and arranged around and substantially parallel to said shaft, and sets of stirring-blades secured to the edges of said plates and arranged in a spiral line around the shaft, as set forth.

7. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to the vessel, an inner and an outer set of stirring-plates carried by and arranged around and substantially parallel to said shaft, and twisted stirring-blades secured to the edges of said plates, as set forth.

8. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to said vessel, an inner and an outer set of stirring-plates carried by and arranged around and substantially parallel to said shaft, and twisted stirring-blades secured to the edges of said plates and arranged in a spiral line around the shaft, as set forth.

9. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to said vessel, an inner and an outer set of stirring-plates carried by and arranged around and substantially parallel to said shaft, and stirring-blades secured to the edges of said plates, the corresponding blades of the outer and inner sets being twisted in opposite directions, as set forth.

10. A mixing and dissolving apparatus, comprising a containing vessel, a shaft in and movable relatively to said vessel, an inner and an outer set of stirring-plates carried by and arranged around and substantially parallel to said shaft, the adjacent plates of the inner and outer sets converging toward each other from their front to their rear edges, and stirring-blades secured to the rear edges of said plates and arranged in a spiral line around the shaft, the corresponding blades of the outer and inner sets being twisted in opposite directions, as set forth.

11. A mixing and dissolving apparatus, comprising a containing vessel of ceramic material having a recess molded in its bottom, a cover having a journal-box therein in line with said recess, a metal shaft carrying stirrers, within said vessel, said shaft journaled in and entirely supported by said box, and a bushing of ceramic material secured on the lower end of said shaft and revolubly arranged in said recess, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

LINUS PORTER BURROWS.

Witnesses:

EUGENE A. BYRNES,  
JOSEPH W. BUELL.