No. 786,776. PATENTED APR. 4, 1905.

L. POTTHOFF.

ELECTROPLATING APPARATUS.

APPLICATION FILED DEC. 1, 1904.

3 SHEETS—SHEET 1.

Fig. 1

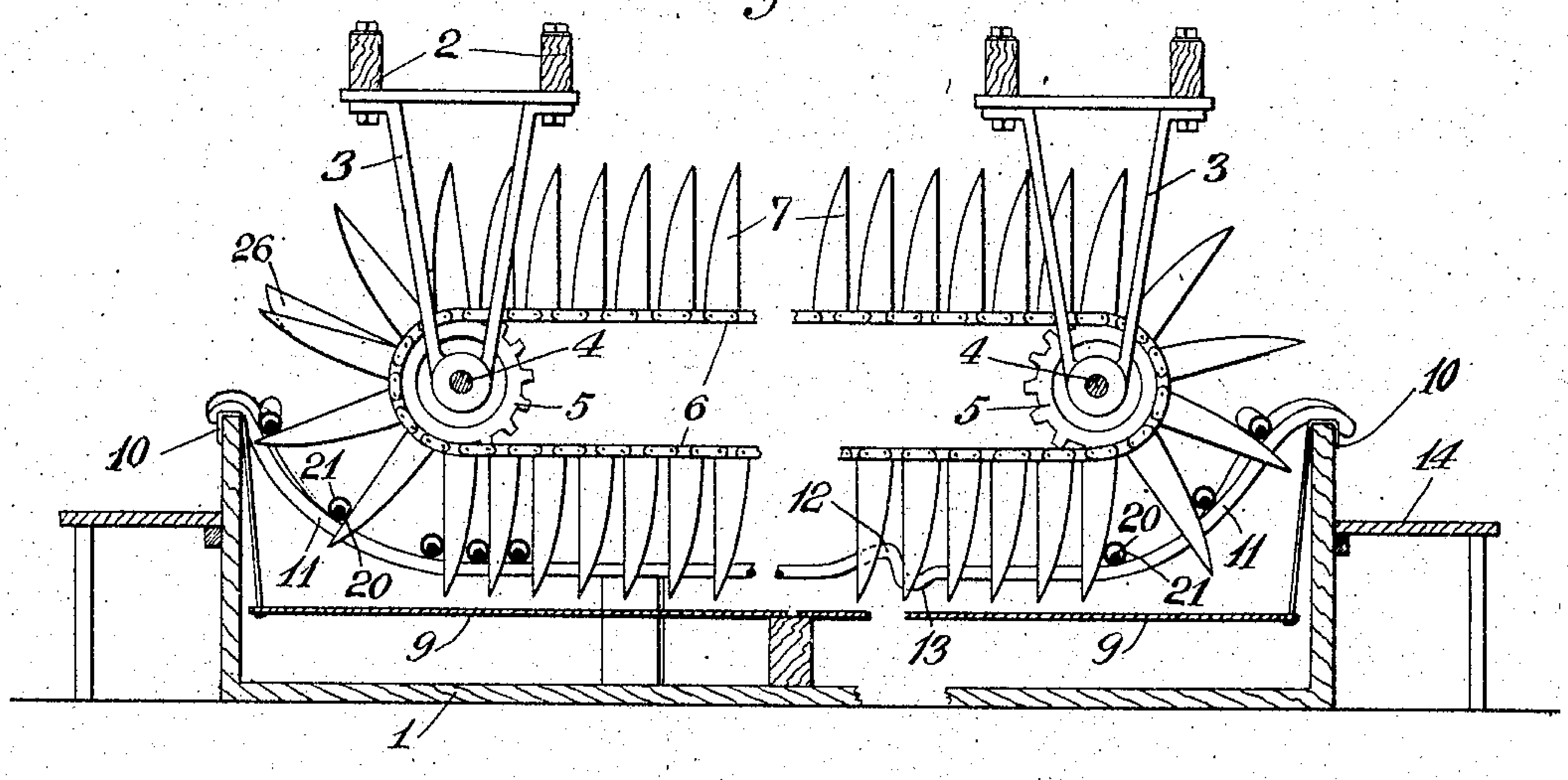


Fig. 2

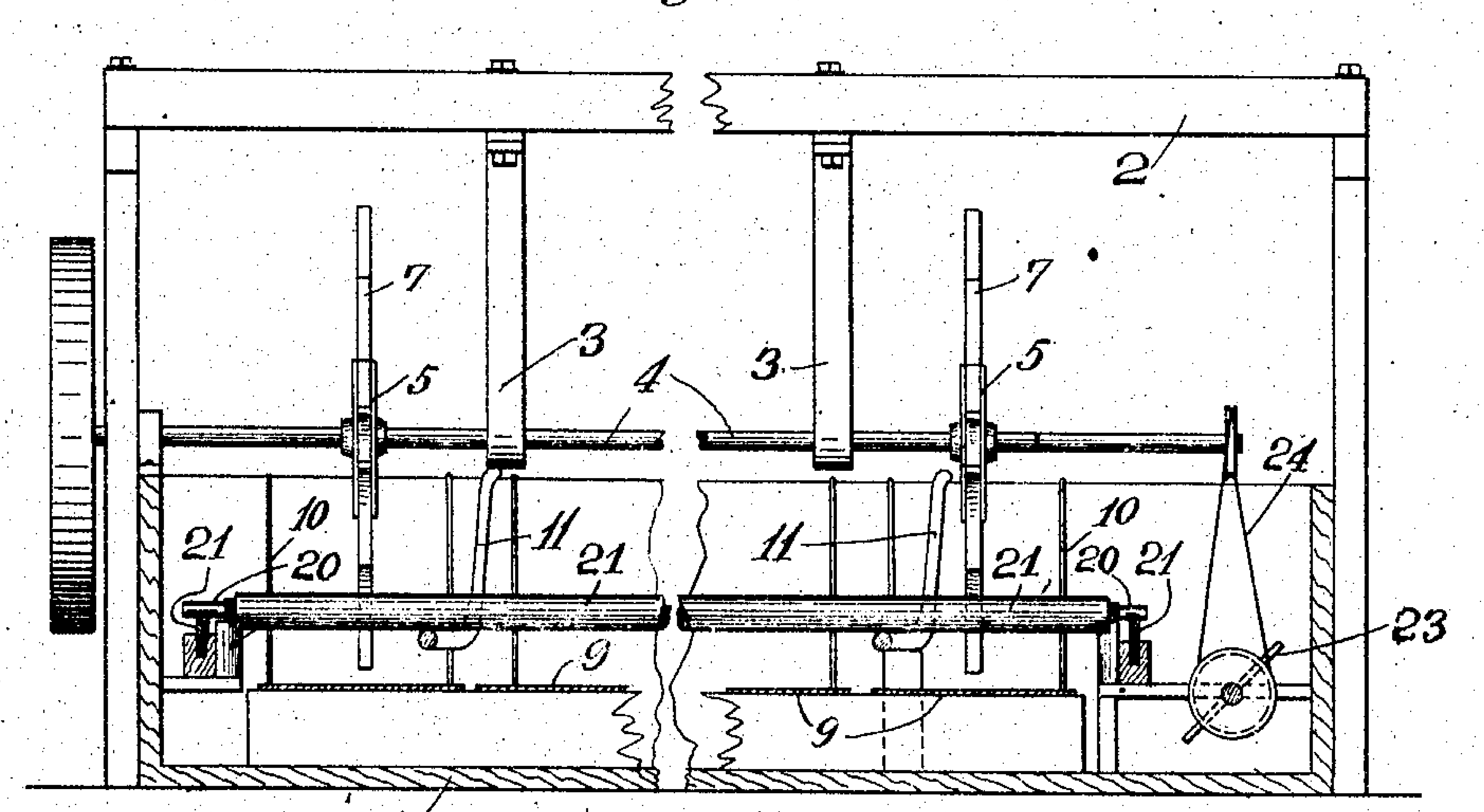


Fig. 8

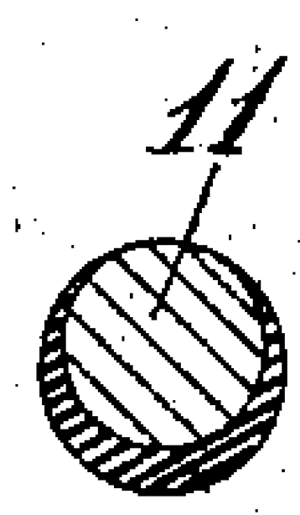


Fig. 7

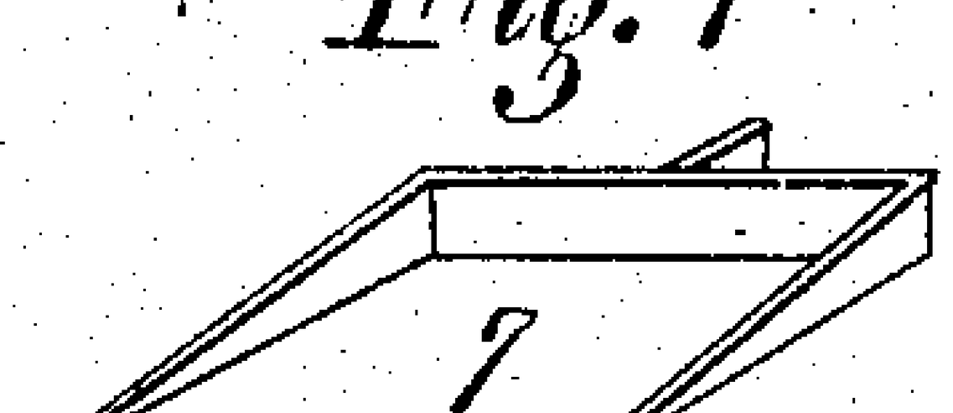
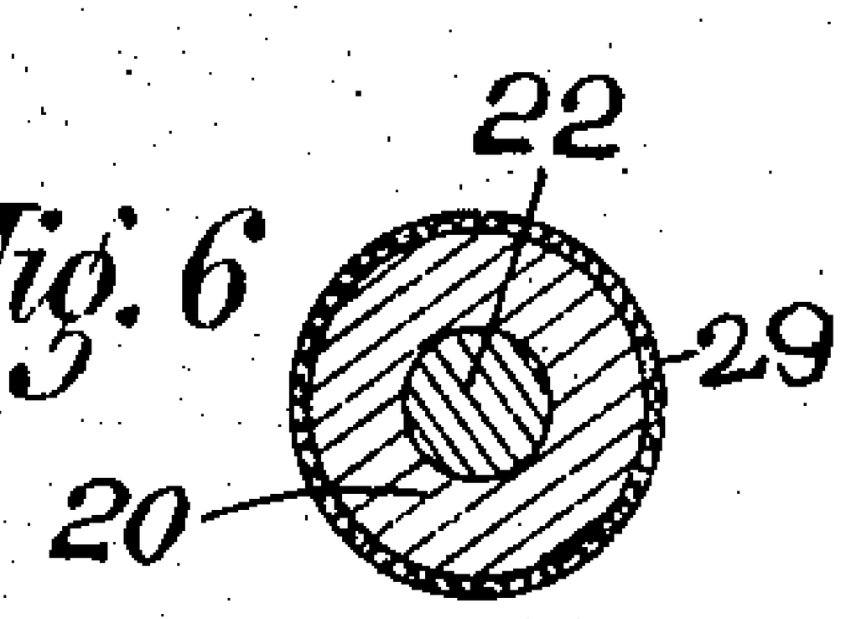


Fig. 6



Witnesses
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Louis Potthoff Inventor
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3 SHEETS—SHEET 2.

Fig. 3

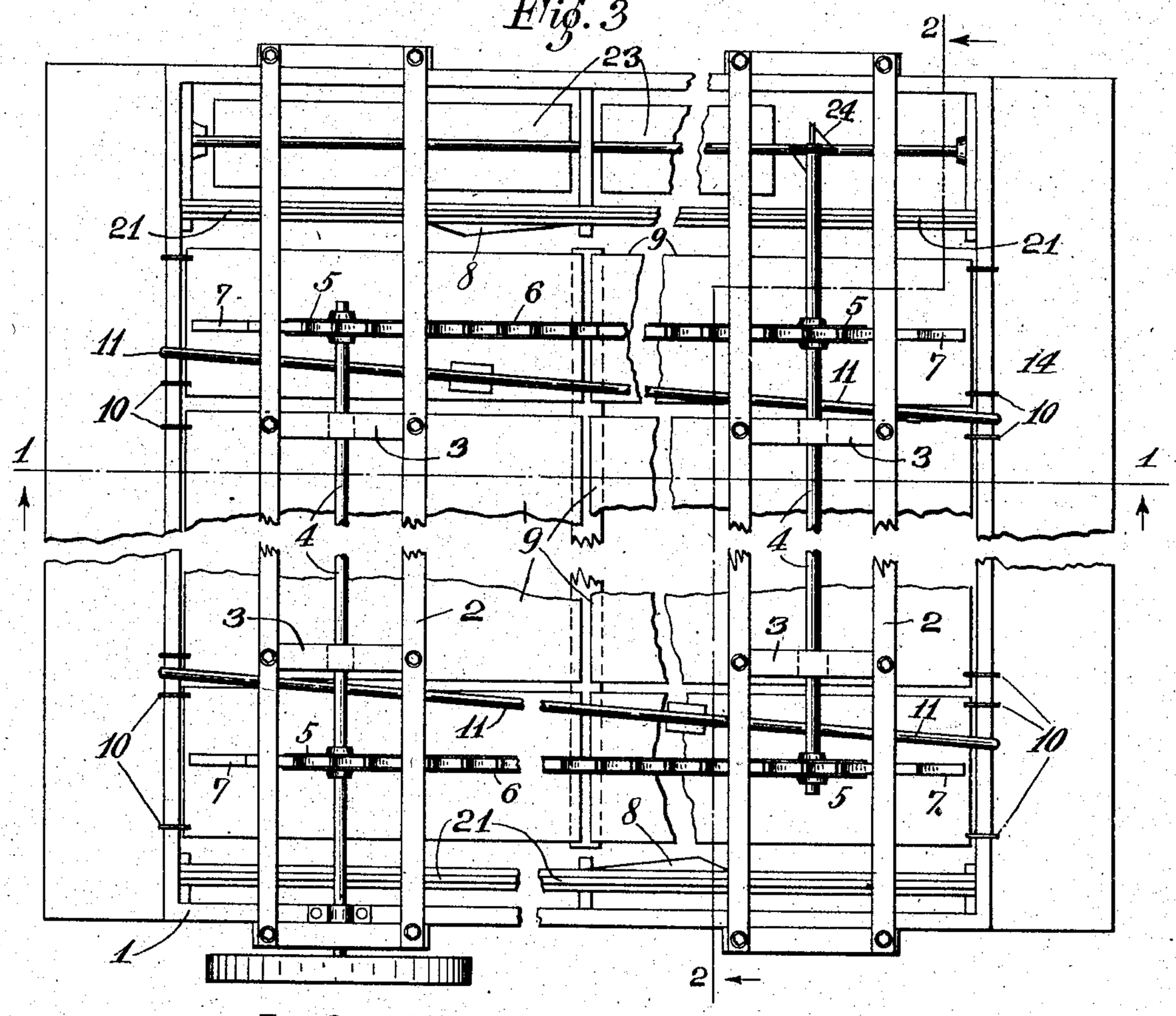
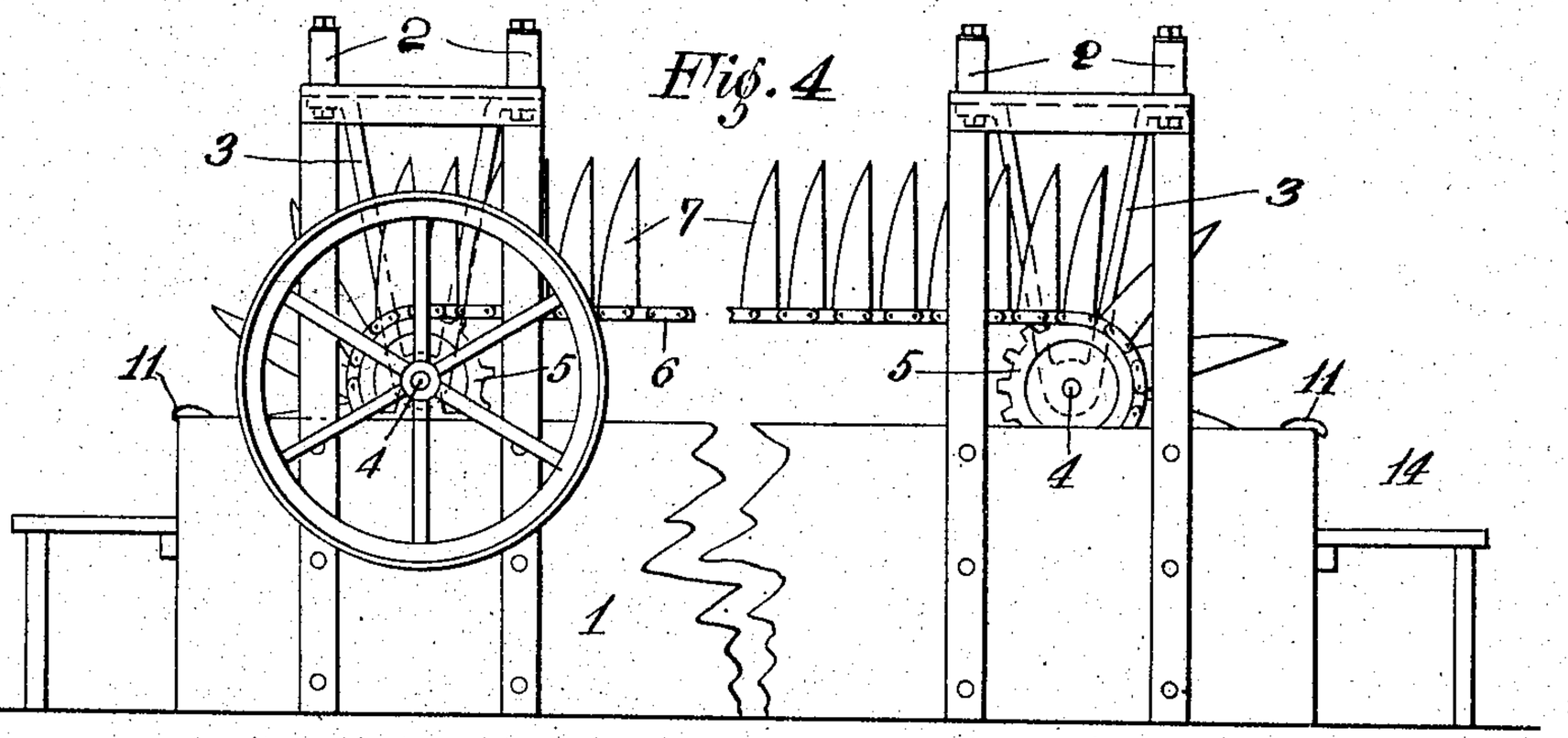


Fig. 4



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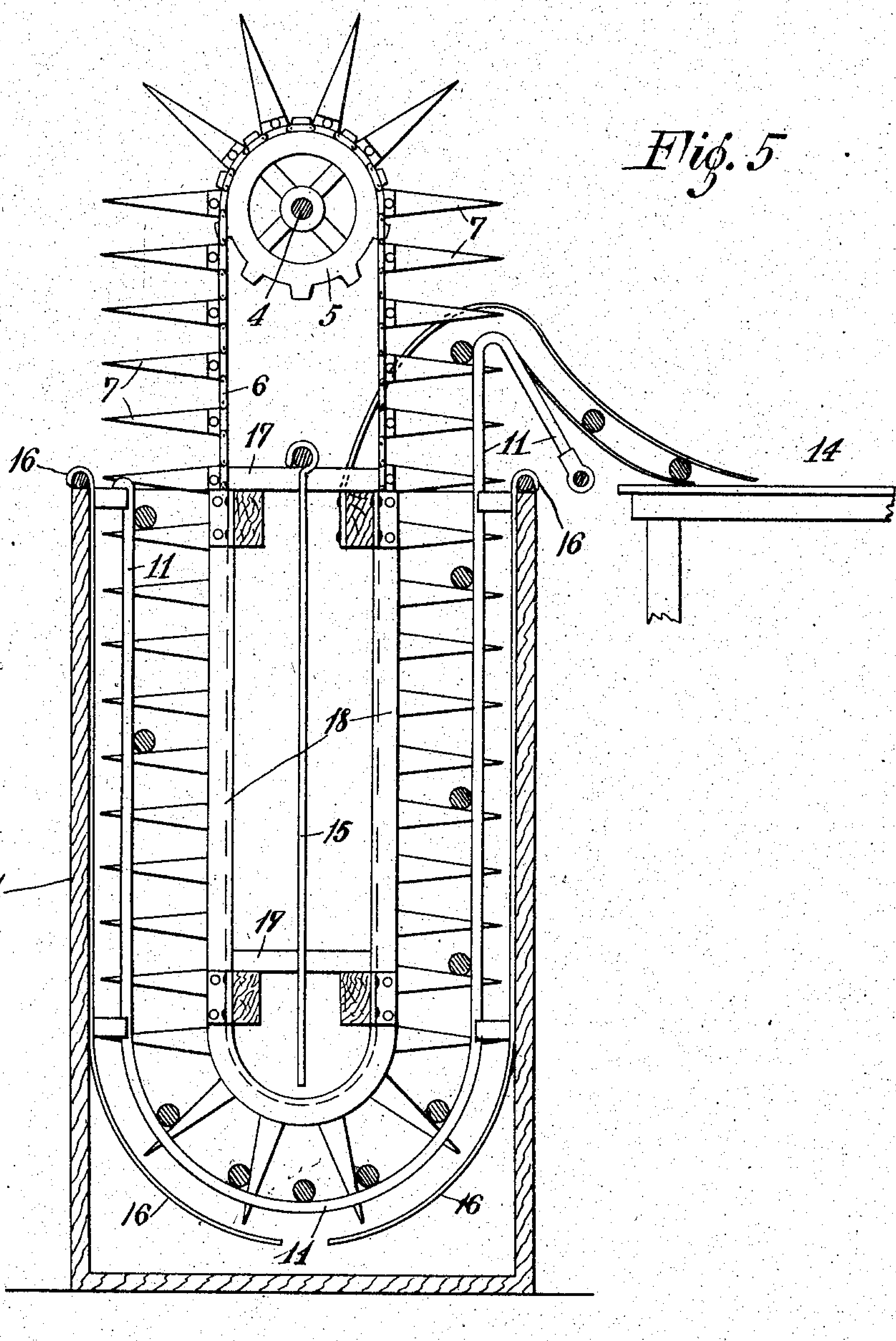
3 SHEETS—SHEET 3.

Fig. 5



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No. 786,776. Patented April 4, 1905.

UNITED STATES PATENT OFFICE.

LOUIS POTTHOFF, OF FLUSHING, NEW YORK.

ELECTROPLATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 786,776, dated April 4, 1905.

Application filed December 1, 1904. Serial No. 234,986.

To all whom it may concern:

Be it known that I, LOUIS POTTHOFF, a citizen of the United States, residing at Flushing, in the county of Queens and State of New York, have invented certain new and useful Improvements in Electroplating Apparatus, of which the following is a full, clear, and exact specification.

This invention relates to electroplating apparatus, and has for its objects to provide an apparatus for continuously and economically galvanizing articles—such as bars, pipes, &c.—in large quantities.

According to this invention I propose to construct an apparatus in which the articles to be galvanized can be fed through the solution and out at the other end, means being also provided for automatically changing the point of contact between the work and the cathode-terminal in order that all parts of the work may be covered.

A further feature of the invention resides in the provision of means whereby tubes and other hollow articles may be galvanized inside as well as outside in the same operation.

The invention also comprises other features of novelty and advantage, as means for circulating the electrolyte, improved means for leading the current in and out, together with various details of construction, all of which will be more fully pointed out and described with reference to the form thereof shown in the accompanying drawings, in which—

Figure 1 is a longitudinal section on the line 1 1 of Fig. 3, showing a horizontal tank broken in the middle. Fig. 2 is a section on the line 2 2 of Fig. 3. Fig. 3 is a plan view. Fig. 4 is an end view. Fig. 5 is a sectional view of a modified form of the invention. Fig. 6 is a view of my improved inside anode. Fig. 7 is a view of a modified form of pin; and Fig. 8 is a section of one of the cathode-terminals, showing the insulation partially removed.

Referring now to the drawings, 1 represents a suitable tank or receptacle having mounted thereon the framework 2, carrying hangers 3, in which are shafts 4 4. Mounted on the shafts 4 are sprocket-wheels 5 5, around which run chains or belts 6 6. Mounted at intervals on the chains are pins 7, which engage the work and move it through the solution. The pins 7 may be made of wood or other non-conducting material and so shaped as to cause round work, such as tubes, to roll when engaged by them. It will be obvious that instead of one long chain extending the length of the tank a plurality of chains may be used to avoid the objection due to sagging of a long chain, this arrangement also serving to change the points of contact between the pins and the work on account of their different alinement. The pin shown in Fig. 7 is straight-edged on both sides instead of straight on one side and curved on the other and has two separated prongs, so that in cases where the work is short a single chain may be used instead of two chains. The pins are made readily detachable, so that one may be substituted for another. In order to change the points of contact between the pins and the work, I provide fixed cams or inclines 8, against which the work will strike and be moved thereby transversely, so as to contact with both the pins and the cathode-terminals at different points.

9 9 represent the anodes, which are composed of the metal to be deposited and disposed so that the current may pass from them through the solution to the work and thence out through the conductor-bars 11, which are covered with insulation, except where the work contacts. The anodes may be supported by hooks 10, which are connected with supply-mains. As shown in Fig. 3, these cathode-terminals 11 form a track or guide which is inclined to the chains 6, so that as the work is moved along by the pins the points of contact with the cathode-terminal continually change, thus permitting entire covering of the work with deposited metal. The work is fed in at the left of Fig. 1 and is supported by the pins 7 against the guide-bars 11 until it gets to the horizontal portion and is thereafter merely moved along by the pins, being supported by the bars. Round work is rolled along by the pins as the chain moves; but work of angular shape will slide, and in order to insure that all the contacts with the bars 11 will not be on one side I may provide one or more inclines and depressions 12 13 in the cathode, which will cause the work to turn

over as it is moved along by the pins. At the opposite end the work is fed out onto a table or other receptacle 14. It will be understood that the bars 11 are to be connected with negative mains. The discharge end of one bar is higher than that of the other, so that the electrolyte will be automatically discharged from the work before it falls on the table.

In the form of the invention shown in Fig. 5 the chains or belts instead of running horizontally run vertically, and thus necessarily the pins 7 carry the weight of the work, the weight on one side balancing that on the other. The arrangement of anodes 15 16 is somewhat different, as is the construction of the framework 17. In this form the bars 11 are vertically inclined relatively to the chains, and thus cause the points of contact to be changed as the work moves along. In order to secure rigidity, one set of sprockets is dispensed with and the chain runs in one or more channels 18. In this form the edges of the pins should be inclined on both sides, so that the work will tend to rest against the bars 11, and thus form a better contact. It will be seen that the contact between the pins and the work will be automatically changed in going from the down side to the up side, because in going down the work rests on the pin by gravity, while in going up it must be lifted by the succeeding pin, which will engage the opposite side. This can be seen from an inspection of Fig. 5. The discharge-table 14 can be similarly arranged.

In order to deposit on the interior of tubes, it is necessary to pass an anode 20 through the tube 27 without having it contact therewith. I have found that if an anode be covered with a meshed fabric 29, such as burlap or cocoa-matting, as shown in Fig. 6, the passage of metal therethrough is not retarded and burning due to contact between the anode and the work prevented. As the inside anode is gradually dissolved, the wrapping becomes more loose, thus permitting free movement of the anode inside of the wrapping as the work moves along.

If desired, the current may be conducted to the inside anode from the outside anode through the solution without using the track 21. As long as the inside anode and the tube are of different polarities no deposit will be made on the inside anode by any positive current which it may receive from any positive conductor, and this condition will be maintained as long as the voltage is not so high as to cause the current to jump across from the inside anode 20 to the tube through the wrapping. The thickness of the wrapping must therefore be proportioned according to the voltage which is to be used. Under some circumstances it will be desirable to use a high voltage and thick wrapping without the track and in other cases to use a low voltage and thin wrapping in connection with the track 21, connected with the positive mains.

It will be obvious that the use of the inside anode is not restricted to round work, as work of other shapes may be equally well galvanized, and it will also be seen that partial tubes—such as angles, &c.—may be galvanized on both sides by using appropriately-shaped anodes.

22 is a stiffening-rod, composed, preferably, of wood, which passes through the inside anode 20 and prevents its breaking when a considerable amount has been dissolved off. For instance, where anodes of zinc are used this stiffening-rod becomes quite essential, because of the brittleness of zinc.

23 represents rotary paddles or propellers which may be driven from the shaft 4 by a belt 24 to force the electrolyte to circulate through tubular work as it is moved along.

In galvanizing small pipes it has been found that air sometimes becomes trapped in the tube and the meshes of the fabric, especially if the tube is carried into the electrolyte horizontally, which permits the electrolyte to rush in at both ends simultaneously. By feeding one end of the tube in before the other the contained air can escape from the end not immersed, and thus prevent the trapping of air within the tube. This I may accomplish by making the straight backs of the pins higher on one chain than on the other, as at 26, so as to incline the tube, and also by setting the pins of one chain slightly in advance of the other, the sprockets being provided with set-screws for this purpose. It will be seen that the tube can be fed in in an inclined position and yet be carried through the tank in a straight line, because the tube comes in on the back edges of the pins and is fed along by the front edges. By setting the pins of one chain in advance of those of the other the electrolyte will be permitted to run out of the tubes before they are discharged, or, as before stated, one bar can be made higher than the other at each end.

It will be seen that I have provided an electroplating apparatus in which large quantities of work may be continuously and economically plated and that the points of contact between the work and its supporting and transferring means will be automatically changed, so that an even and complete coating will be obtained.

Modifications and changes in the parts herein shown may be made without departing from the scope of the invention, and I do not restrict myself to the exact form which I have shown and described.

Having thus described my invention, I declare that what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with means for moving material through an electroplating solution, of a conductor connected with said material, and means for automatically changing the point of connection between the material and the conductor, substantially as described.

2. The combination with means for moving material through an electroplating solution, of a fixed conductor connected with said material, and means for automatically changing the point of connection between the material and the conductor, as the work moves along, substantially as described.

3. The combination with a conveyer for moving material through an electroplating solution, of a conductor connected with said material, and means for automatically changing the point of connection between the material and the conductor, substantially as described.

4. The combination with a conductor, of means for moving material through an electroplating solution in contact with said conductor, and means for automatically changing the point of connection between the material and the conductor as the work moves along, substantially as described.

5. The combination with a fixed conductor, of means for moving material through an electroplating solution in contact with said conductor, and means for automatically changing the point of contact between the material and said moving means, substantially as described.

6. The combination with a traveling belt adapted to move material through an electroplating solution, of a fixed conductor with which the material contacts as it is moved along, substantially as described.

7. The combination with means for supporting the material to be treated, of a conductor adapted to contact with said material, an anode, and means for moving the material in a direction inclined to that of the conductor, substantially as described.

8. The combination of a tank, a traveling belt, means attached to said belt for moving material through the tank, a conductor inclined to the direction of movement of said belt, and contacting with the material, and an anode, substantially as described.

9. The combination of a tank, a traveling belt having pins adapted to move the material being treated, a conductor in contact with the material while being moved, and an anode, substantially as described.

10. The combination of a tank, a traveling belt having pins adapted to move material through the tank, and means for electrically depositing metal on said material while being moved by said pins, substantially as described.

11. The combination with means for moving elongated material through a tank, of a relatively fixed conductor adapted to contact therewith, an anode adapted to be carried with the work, and means for separating said anode from the work, substantially as described.

12. An anode for electroplating apparatus comprising a bar or rod composed of the metal to be deposited, means for reinforcing said bar, and a porous wrapping around said bar, substantially as described.

13. The combination with means for moving elongated material through a tank, of a relatively fixed conductor adapted to contact therewith, an anode adapted to be carried with the work, means for separating said anode from the work, and means with which the anode contacts as it moves along to supply current thereto, substantially as described.

14. The combination with means for moving elongated material through a tank, of an anode adapted to be carried therewith, and relatively fixed means for supplying current to said anode, substantially as described.

15. The combination with means for moving elongated material through a tank, of a relatively fixed conductor adapted to contact therewith, an anode adapted to be moved with the material, means for separating the anode from the material, and means for circulating the electrolyte longitudinally of the work, substantially as described.

16. In an electroplating apparatus, a soluble anode composed of the metal to be deposited and having a loose porous wrapping of a thickness proportional to the voltage to be used, substantially as described.

17. The combination with means for electroplating elongated material, and means for transferring it through a solution while being electroplated, of means for automatically inclining the work before it is discharged from the tank, substantially as described.

18. The combination in an electroplating-tank, of means for feeding tubular work into the solution in position whereby to expel the air, substantially as described.

19. The combination in an electroplating-tank, of means for feeding tubular work out of the solution in a position whereby to discharge the electrolyte, substantially as described.

20. The combination in an electroplating-tank, of means for feeding the work into the solution in an inclined position, means for moving it through the solution, and means for feeding the work out in an inclined position, substantially as described.

21. The combination in an electroplating-tank, of means for feeding the work into the solution in an inclined position, means for moving it through the solution, and a cathode-conductor independent of the feeding mechanism with which the work contacts as it moves through the solution, substantially as described.

22. The combination with means for moving material through an electroplating solution, and an anode, of a relatively fixed conductor with which the material contacts as it is moved along, substantially as described.

23. The combination with means for moving material through an electroplating solution, of a relatively fixed conductor with which the material contacts as it is moved along, an anode

moving with the material, and means for supplying current to the anode, substantially as described.

24. The combination with means for moving material through an electroplating solution, of a relatively fixed conductor with which the material contacts as it is moved along, an anode moving with the material, and means for automatically discharging the material, substantially as described.

25. The combination with means for moving material through an electroplating solution, of a conductor with which the material contacts as it is moved along, an anode moving with the material, and means for automatically discharging the material, substantially as described.

26. The combination with means for moving material through an electroplating solution, of a conductor connected with said material and formed in such a manner as to change the point of contact with the work when the latter is moved relatively thereto, substantially as described.

27. The combination with means for moving material through an electroplating solution, of supporting means therefor, a cathode-conductor connected with the material, and means for automatically changing the points of contact of the work with the moving and supporting means and the cathode-conductor, substantially as described.

28. The combination with a traveling belt, of means supporting the material to be treated, means attached to said belt for moving the material, and means automatically shifting the position of the material relatively to the supporting means, substantially as described.

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

LOUIS POTTHOFF.

Witnesses:

JULIAN S. WOOSTER,

GEORGE N. KERR.