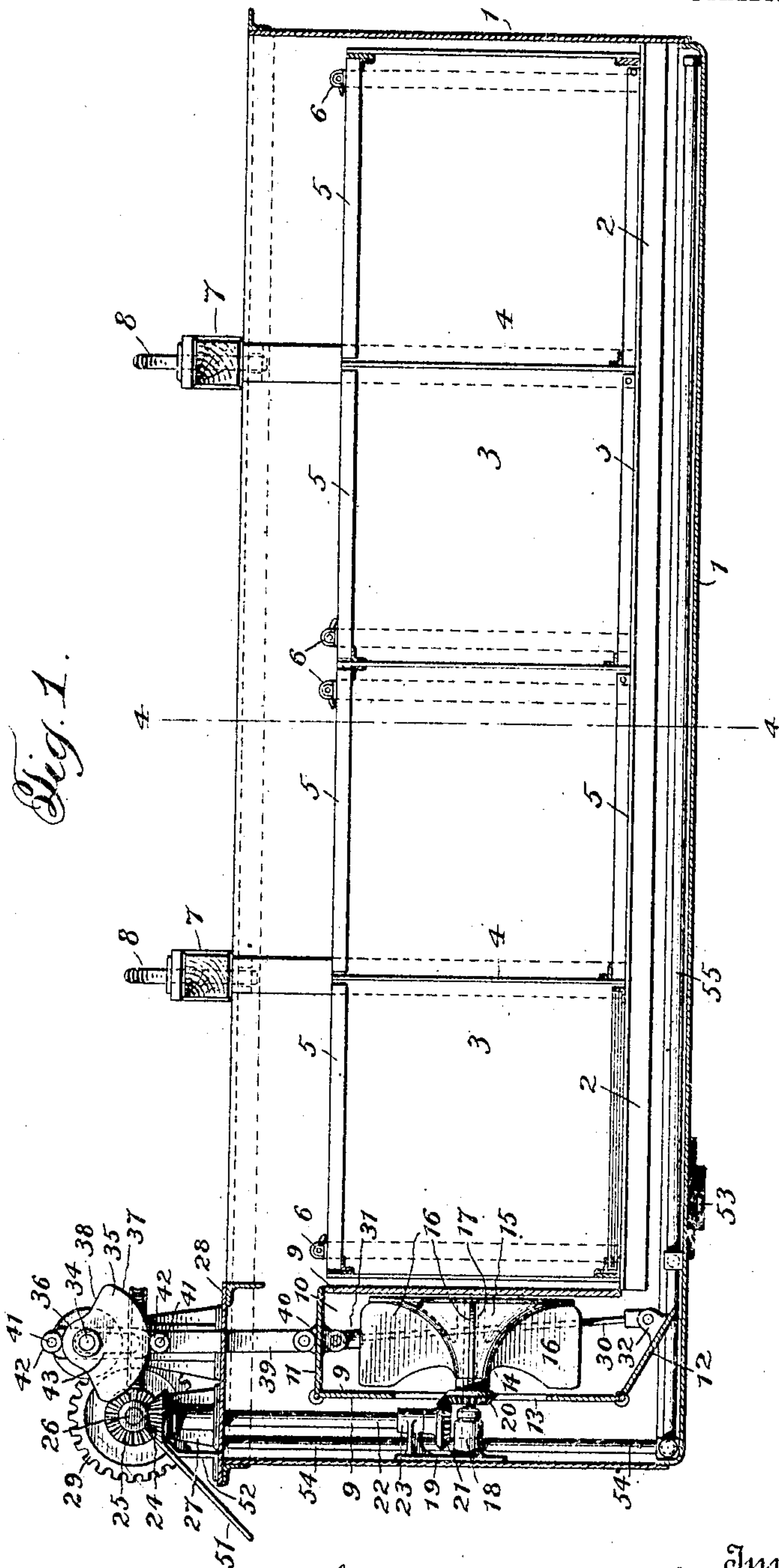


T. ALLSOP & W. W. SIBSON.  
CIRCULATING DYEING MACHINE.  
APPLICATION FILED SEPT. 10, 1908.

918,484.

Patented Apr. 13, 1909.

4 SHEETS—SHEET 1.



Witnesses:  
Jas. Hutchinson:  
N. E. Smith.

Inventors  
Thomas Allsop & Walter W. Sibson.  
By *[Signature]* Attorney:

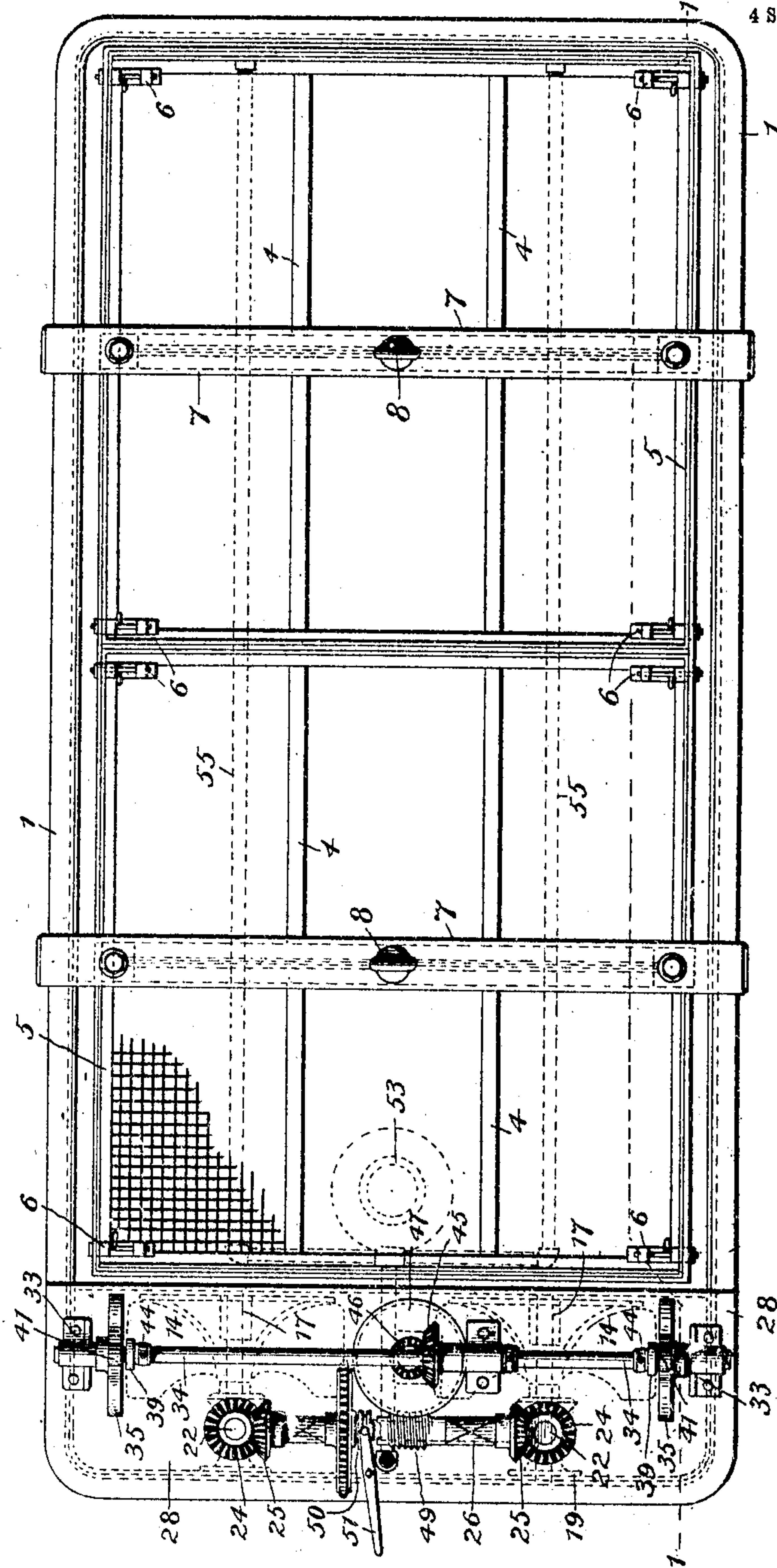
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4 SHEETS—SHEET 2.

Fig. 2.



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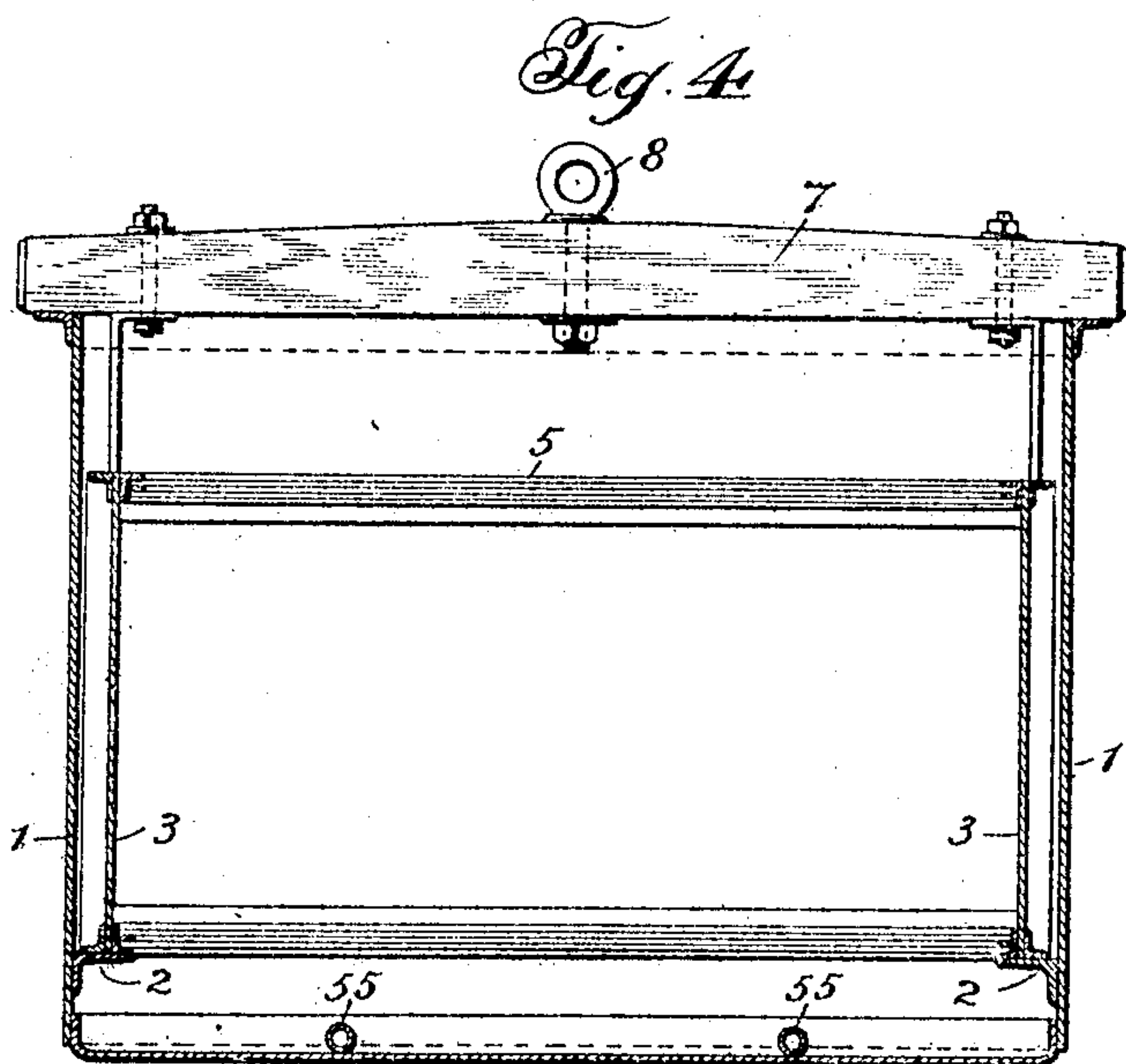
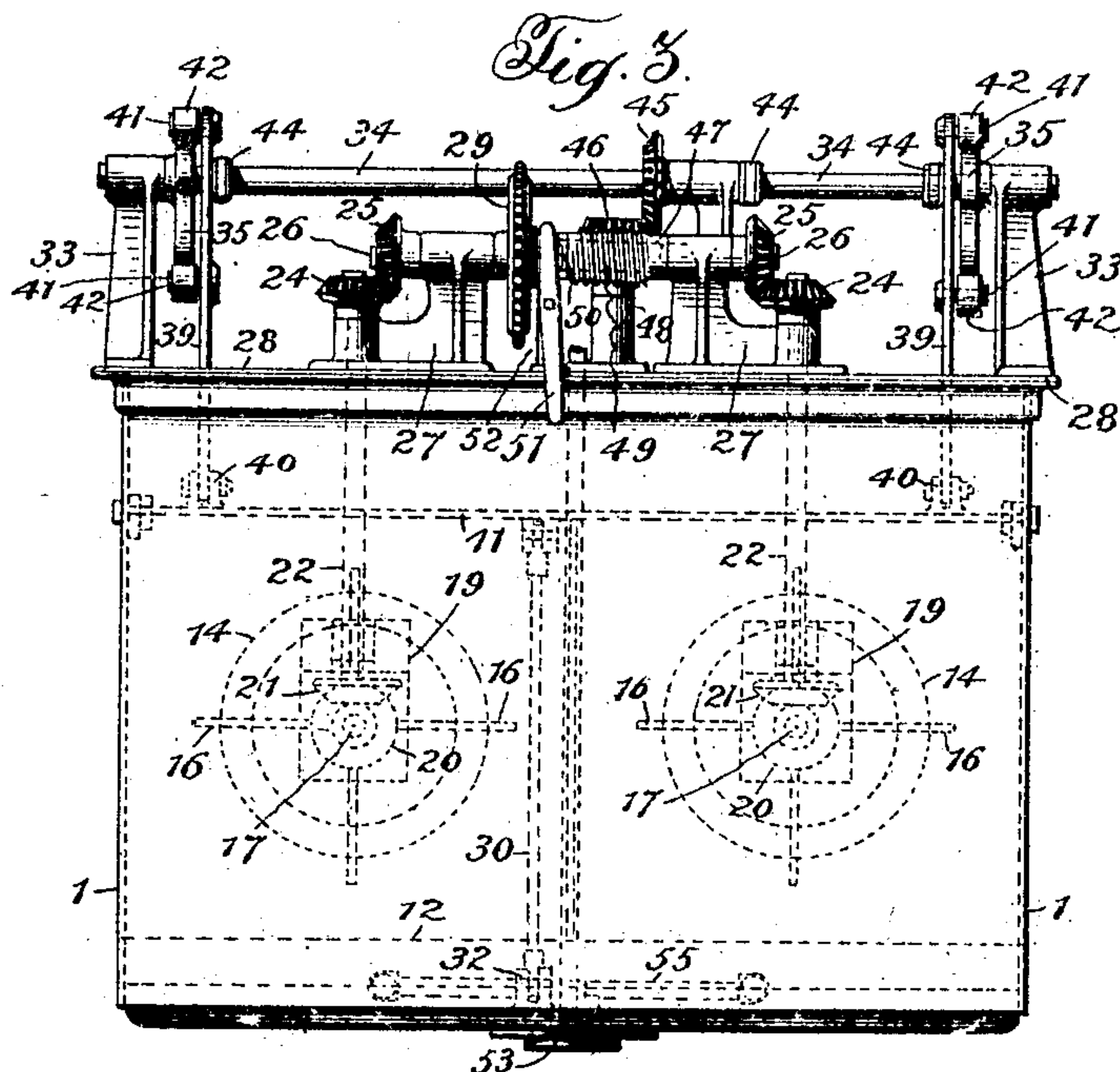
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4 SHEETS—SHEET 3.



Witnesses:  
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4 SHEETS—SHEET 4.

Fig. 5.

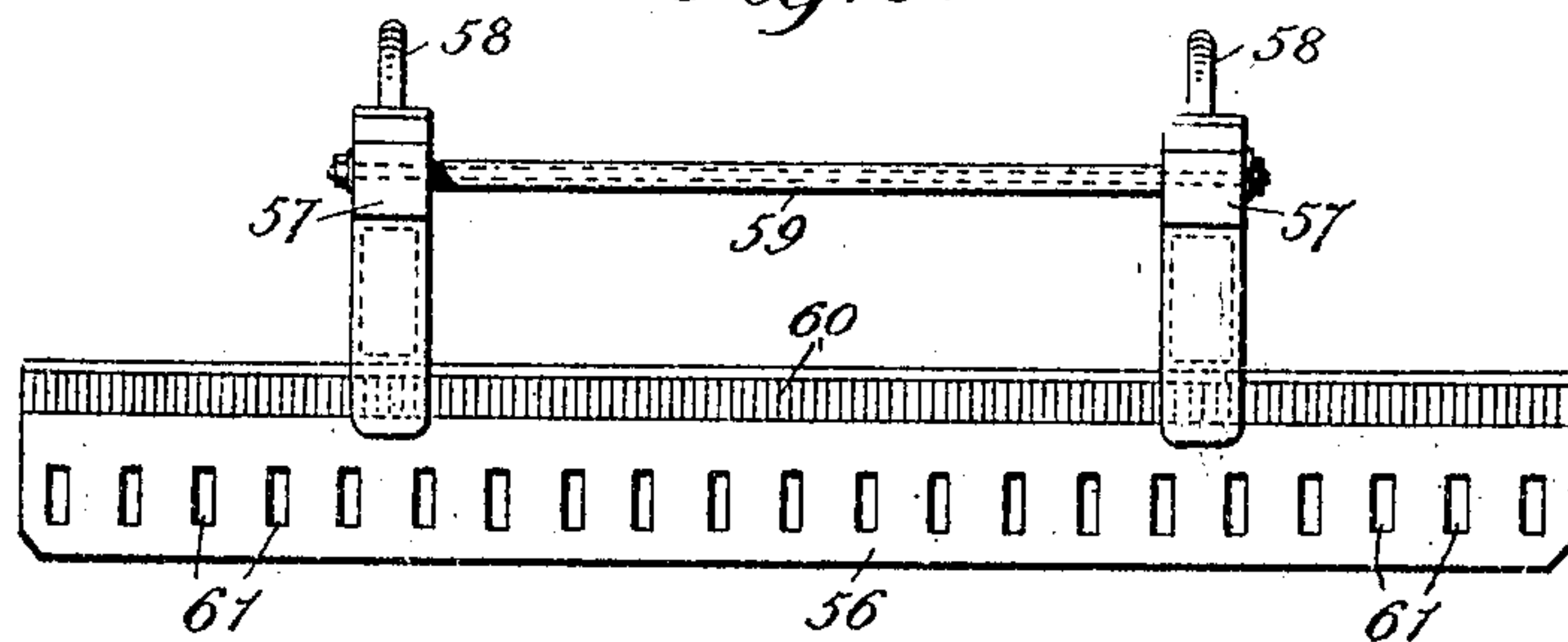


Fig. 6.

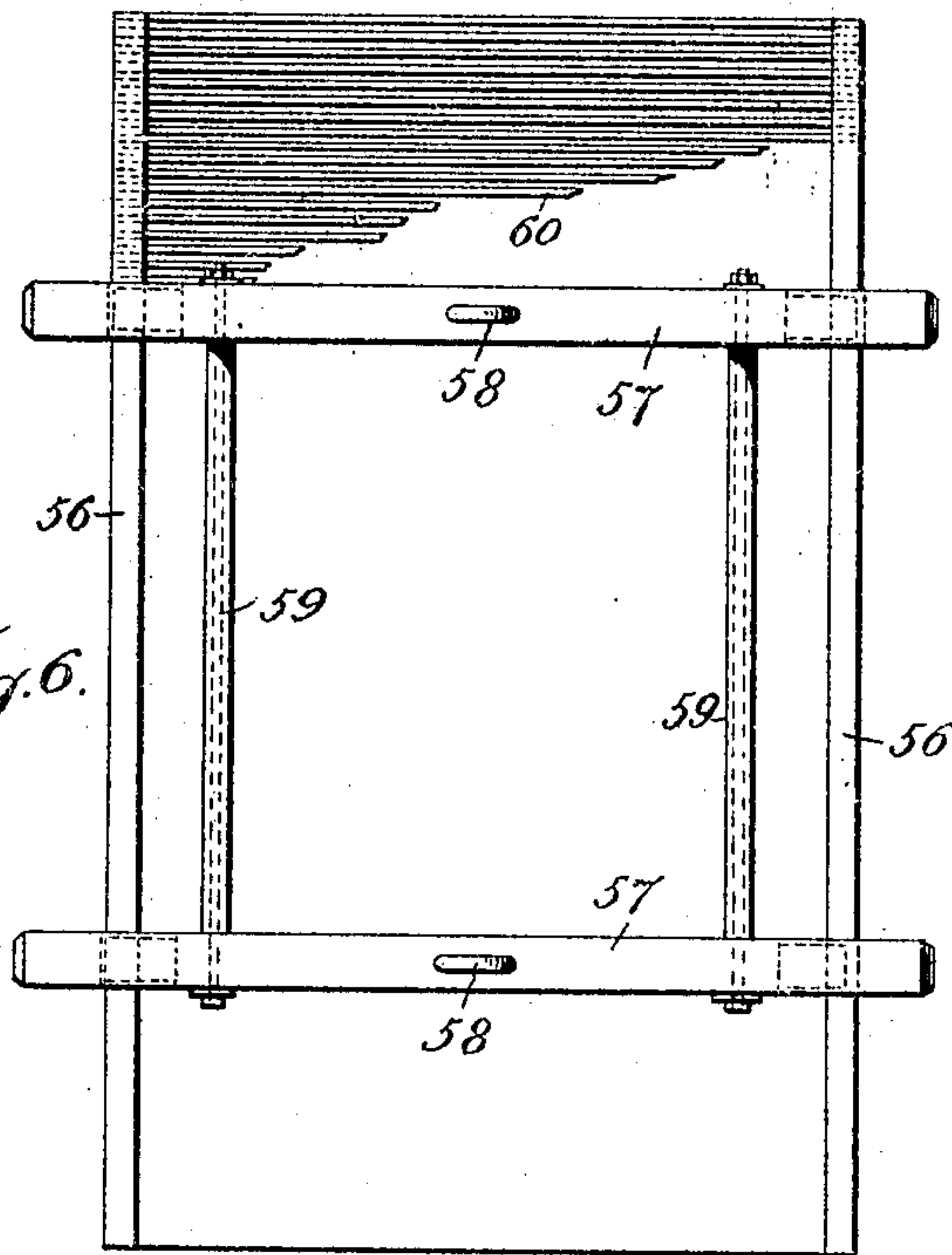
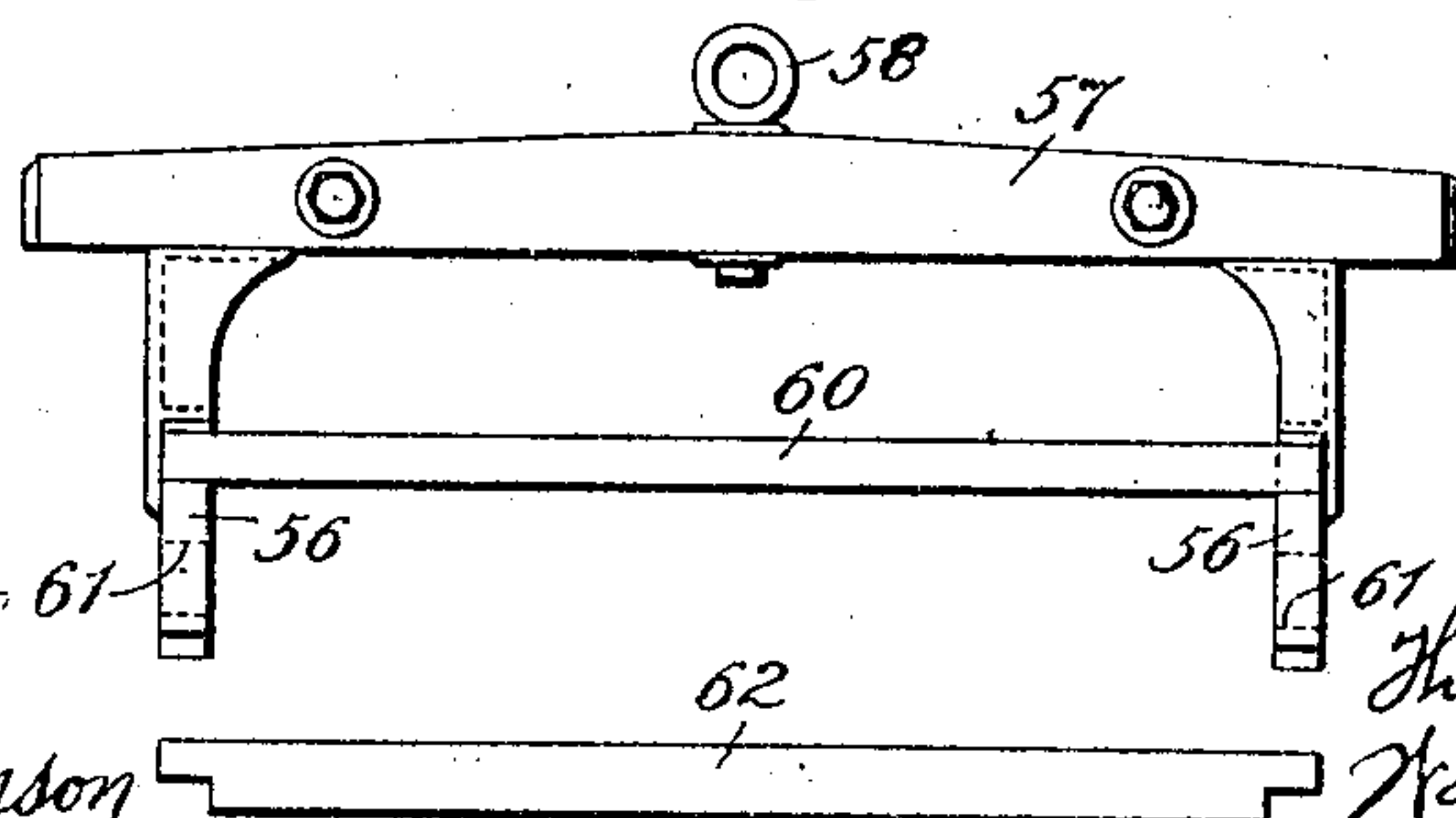


Fig. 7.



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# UNITED STATES PATENT OFFICE.

THOMAS ALLSOP AND WALTER W. SIBSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS  
TO THE PHILADELPHIA DRYING MACHINERY COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## CIRCULATING DYEING-MACHINE.

No. 918,484.

Specification of Letters Patent.

Patented April 13, 1909.

Application filed September 10, 1908. Serial No. 452,377.

*To all whom it may concern:*

Be it known that we, THOMAS ALLSOP and WALTER W. SIBSON, citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Circulating Dyeing-Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in dyeing machines, and more particularly relates to machines of the open-vat type.

The main and primary object of the present invention is the provision of a dyeing machine including in its construction simple and efficient means whereby the dye liquor may be freely circulated within the vat, thus accomplishing a much more uniform dyeing of the material or articles under treatment than by machines in which the dye liquor remains in a quiescent state.

Subordinate to the foregoing, the invention also aims to provide a machine of the character stated wherein provision is made for reversing periodically the direction of flow of the dye liquor in its circulation through the vat, and also, if so desired, whereby the liquor may constantly flow in but one direction, thus enabling the material to be subjected to the action of the dye liquor periodically in alternate directions or continuously in but one direction.

Furthermore, the present invention contemplates a dyeing machine the liquor-circulating mechanism of which is so constructed and arranged as to insure uniform distribution of the dye liquor as the same is caused to circulate within the machine.

Having these general objects in view, and others that will appear as the nature of the improvements is better understood, the invention consists substantially in the novel construction, combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the appended claims.

While the form of the invention herein shown and described is believed, at this time, to be a preferable adaptation thereof, it will of course, be understood that the invention is susceptible of various changes in the

form, proportion and minor details of construction, and the right is accordingly reserved to modify, change or vary the invention as falls within the spirit and scope thereof.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of a circulating dyeing machine constructed in accordance with and embodying the principles of the present invention, the line of the section being as indicated at 1—1, Fig. 2. Fig. 2 is a top plan view thereof. Fig. 3 is an end elevation of the machine, viewing the same at the end at which the dye-liquor-circulating mechanism is located. Fig. 4 is a transverse sectional view on the line 4—4, Fig. 1. Fig. 5 is a view illustrating another form of the removable cage, adapted especially for use in dyeing yarn in the skein. Fig. 6 is a top plan view of the construction illustrated in Fig. 5, portions being broken away. Fig. 7 is an end elevation thereof, one of the supporting poles being shown in detached relation to the frame.

Referring in detail to the drawings, the numeral 1 designates the vat of the herein-described machine, which vat may be of any approved construction, and arranged within said vat, and extending along the sides thereof, adjacent to the bottom of the vat, is a pair of supporting rails 2, these rails, preferably, being in the form of angle irons. The supporting rails 2 extend from one end of the vat throughout the major portion of the length of the latter, and are designed to sustain the weight of a removable cage 3, this cage being employed for the reception of the material or articles to be dyed. When hosiery and like articles are to be subjected to the dyeing operation, the cage 3 may be subdivided by suitable partitions 4 into a plurality of compartments, and thus it will be seen that articles of different character may be simultaneously subjected to the action of the dye-liquor, the partitions 4 maintaining the articles in separated relation. The compartments of the cage 3 are also provided with suitable closures, in the form of doors 5, and these doors are also provided with locking devices 6, preferably in the form of sliding bolts, whereby the doors may be held in closed position upon the body of the cage. A preferable construction of the cage 3 consists in a frame work of angle irons, which



frame work is covered by wire fabric of suitable mesh, a fragment only of said fabric being shown in Fig. 2, and, for purposes of clearness, being omitted wholly from the  
 5 other views, but it will be understood any other form of cage may be substituted so long as the material or articles therein can be readily reached by the dye-liquor. The cage  
 10 3 is also provided with transversely-extending beams 7, and these are provided with eye-bolts 8, or equivalent devices, through the medium of which the cage 3 may be deposited within and hoisted from the vat 1.

As before premised, the present invention  
 15 aims to provide a dyeing machine in which the dye-liquor may be freely circulated, and to the accomplishment of this end the vat 1 has located in one of its ends a pair of transversely-extending partitions 9. These par-  
 20 titions extend across the entire width of the vat 1, and are spaced from each other to provide a compartment 10, but it will be observed that the upper and lower edges of the partitions 9 terminate at points removed  
 25 from the tops and bottoms of the sides of the vat 1, so that spaces remain at the top and bottom of the compartment 10, whereby the dye-liquor may readily pass over and under said compartment. The upper and  
 30 lower ends of the compartment 10 are closed by valves 11 and 12, and these valves are in the form of doors that are pivoted at their outer edges, or those edges that are contiguous to the adjacent end of the vat 1, to the  
 35 upper and lower edges of the outer partition 9. Thus it will be seen that as the valves 11 and 12 swing open and shut the free edges thereof are directed toward the central portion of the vat 1. The purpose of the valves  
 40 11 and 12 is to control the direction of circulation of the dye-liquor, and the relative movement of these valves is such that when one is closed the other is opened. Thus it will be seen, as clearly illustrated in Fig. 1,  
 45 the valve 11 is in closed position, while the valve 12 is open, and hence the dye-liquor will circulate through the compartment 10 and be discharged at the bottom thereof, while this discharge will occur at the top of  
 50 the compartment 10 when the valve 11 is open, and the valve 12 is closed. By reason of this, as will readily be understood, the discharge of the dye-liquor from the compartment 10 can be directed either to the top or  
 55 to the bottom of the cage 3.

In order that the dye-liquor may freely enter the compartment 10 the outer partition 9 is provided with an opening or openings 13, the outer partition 9 being sufficiently re-  
 60 moved from the end of the tank adjacent thereto to provide a circulating passage or space of substantial size, and the dye-liquor entering this space readily passes into the compartment 10 through said opening or  
 65 openings 13.

That the dye-liquor may be agitated to the required extent for effecting its circulation, propeller wheels 14 are arranged in the compartment 10. In small machines a single wheel will be sufficient, but in the  
 70 larger sized machines a plurality of these wheels will be necessary, and, as illustrated in the accompanying drawings, two of these wheels are shown in the present machine. The wheels 14 are arranged opposite the  
 75 openings 13, and as said wheels rotate they suck the dye-liquor through said openings into the compartment 10. Each of the wheels 14 comprises a conical web, or body portion, 15, from which radiate a series of  
 80 blades or vanes 16, and the apex of the conical web 15 is arranged adjacent to the opening 13 so that as the liquor is drawn in through said opening the same will follow the contour of the conical web, and be de-  
 85 flected outwardly from the hub of the wheel and discharged at the outer edges of the blades or vanes 16. The wheels 14 are mounted upon shafts 17 that are carried by bearings 18 formed in bearing brackets 19,  
 90 and these brackets are connected to the end of the vat 1. Each of the wheels 14 is driven by a bevel gear 20 that meshes with a corresponding gear 21 carried by the lower end of a vertically disposed shaft 22, and  
 95 the lower end of the shaft 22 is journaled in a vertically disposed bearing 23 that is carried by the bracket 19. At the top of each of the shafts 22 is a horizontally-disposed gear wheel 24, and said gear wheels  
 100 24 mesh with corresponding gears 25 carried by a driving shaft 26 that is journaled in suitable bearing brackets 27. The gears 24 and 25 are bevel gears, and it will be observed that the gearing thus described for  
 105 each of the shafts 22 is such that these shafts are caused to rotate in unison with the driving shaft 26. The gears 25, however, being arranged at opposite ends of the shaft 26, it will be seen that the wheels 14  
 110 will rotate in opposite directions, and by reason of this the direction of rotation of one of the wheels will be toward the right, while that of the other wheel will be toward the left. This insures uniform distribution of  
 115 the dye-liquor as the latter is projected from the compartment 10 and down the length of the vat 1, and precludes movement of the dye-liquor in a direction diagonally of the vat, so that the dye-liquor will follow a  
 120 straight course from the compartment 10 over and through the cage 3, whereby the liquor will freely flow to all parts of the cage 3 for action upon the contents thereof.

The brackets 27 are carried by a sup-  
 125 porting plate 28 that extends transversely of the vat 1 at a point immediately above the compartment 10, said plate 28 being pierced with suitable openings for the pas-  
 sage of the shafts 22.



While any suitable form of driving means may be employed for the shaft 26, a sprocket wheel 29 is preferably adopted, this wheel receiving its motion from any suitable  
5 source.

As also before premised, the present invention has in view the provision of a machine embodying means for reversing periodically and automatically the direction of  
10 flow of the dye-liquor, as the latter circulates in the vat. The rotation of the propeller wheels 14 being constantly in one direction, in the operation of the machine, the periodical reversal of the flow of the  
15 liquid is accomplished by the opening and closing of the valves 11 and 12, and that these might move in unison a connecting rod 30 extends between the valves 11 and 12, the ends of this rod being pivoted be-  
20 tween a pair of attaching lugs 31 carried by the valve 11, and also between similar lugs 32 carried by the valve 12. The employment of the connecting rod 30 causes a positive movement between the valves 11  
25 and 12, and provides for the alternate opening and closing thereof as previously described.

Mounted in bearing standards 33, that are carried by the supporting plate 28, is a cam-  
30 shaft 34, this shaft extending transversely of the vat, and this shaft is provided adjacent to each of its ends with a cam 35. Each of these cams is provided with concentric holding faces 36 and 37, said faces being con-  
35 nected by inclines 38, and associated with said cams 35 are links 39, the lower ends of said links being pivoted between attaching lugs 40 carried at the upper side of the valve 11. The upper end of each of the links 39 is  
40 provided with a pair of studs 41, and upon each of the latter is journaled a bearing roll 42, the rolls 42 of each of the links 39 being arranged at opposite sides of the contiguous cam 35, and working upon the face of the  
45 latter. It will thus be seen that in the rotation of the cams 35 the links 39 are caused to rise and fall, thus opening and closing the valve 11, and operating in connection there-  
50 with the valve 12. That this vertical movement of the links 39 may be permitted, the upper end of each of the latter is provided with an elongated slot 43, said slots receiving the shaft 34, and thus permitting free  
55 movement of the links upon said shaft, and said links 39 also pass through suitable openings pierced in the supporting plate 28. In order that the links 39 may be held in proper working relation to the cams 35 locking col-  
60 lars 44 are adjustably held upon the shaft 34, and maintain the links 39 in close proximity to the cams 35.

The cam-shaft 34 derives its movement from the driving shaft 26, and in order that this may be effected a bevel gear wheel 45 is  
65 mounted upon the shaft 34 at a point sub-

stantially midway its ends, which gear wheel meshes with a horizontally-disposed bevel gear wheel 46 associated with a worm wheel 47, said worm wheel 47 and gear wheel 46  
70 being journaled upon a supporting standard 48. The worm wheel 47 meshes with a worm 49 that is carried by the driving shaft 26. This worm, however, is loosely mounted upon the shaft 26, and for coupling the  
75 worm into engagement with said shaft a slidable clutch collar 50 is mounted upon said shaft, in proximity to the worm 49, said clutch collar being controlled by a shifting  
80 lever 51 that is pivotally connected to a support 52. Through the medium of the shift-  
ing lever 51, it will be clearly seen that the operation of the cam shaft 34 is manually controlled, and may be coupled with the  
driving shaft 26 at the desire of the operator.

In the operation of the herein described  
85 machine the vat 1 is, of course, provided from any suitable source with the requisite dye-liquor. The cage 3 having been charged with the articles or materials to be dyed,  
90 said cage is deposited within the vat 1, and rests upon the supporting rails 2. The driving shaft 26 being now set in operation, through the medium of the wheel 29 and its  
95 connected gearing, motion is transmitted from said shaft 26 to the propeller wheels 14, and these wheels thereupon agitate the dye-liquor, and set up circulation of the latter within the vat 1. As before stated, the  
100 wheels 14 have constant movement in one direction, there being no reversal of movement of the wheels 14, and consequently the dye-liquor is continuously drawn into the compartment 10 through the openings 13. Assuming that the cam-shaft 34 is not con-  
105 nected to the shaft 26, and assuming the position of the valves 11 and 12 to be that disclosed in Fig. 1 of the drawings, it will be seen that the dye-liquor will be discharged from the compartment 10 through the lower  
110 end thereof, and forced to the underside of the cage 3, whereupon it rises through said cage, acting upon the contents of the latter, and emerging from the top of the cage, whence the dye-liquor is drawn over the top  
115 of the cage 3 and the compartment 10, the upper end of the latter being closed by the valve 11, and by reason of the latter position of the valve 11, it will be seen that the dye-liquor passes back to the space between the  
120 end of the vat and the outer partition 9, when it again enters the compartment 10 through the openings 13. This provides for a continuous circulation of the dye-liquor in but one direction. If, however, it be de-  
125 sired to periodically reverse the direction of circulation of the dye-liquor, the worm 49 is clutched into engagement with the driving shaft 26, through the medium of the collar 50, and this connects the cam shaft 34 with  
the driving shaft 26. The cam-shaft 34  
130



thereupon commences to operate, and carries with it the cams 35, and as the faces of these cams move between the rolls 42, the inclines 38 of the cams impart to the links 39 alternate rises and falls. In the movement of the cams 35, however, the concentric holding faces 36 and 37 impart to the links 39 periods of rest or dwells at the limit of their movements in each direction, and by reason of this the valves 11 and 12 remain for a determinate period in their opened and closed positions. Hence, it will be seen that when the valve 12 is open, the circulation of the dye-liquor will be in the course above specifically described, but as soon as the cams 35 have raised the links 39, thus opening the valve 11, and closing the valve 12, discharge of the liquor from the bottom of the compartment 10 will immediately cease, and this discharge will occur at the top of said compartment, so that the dye-liquor will be projected over the cage 3 at its top, passing down through the contents of the cage, emerging from the bottom of the latter, and moving over said bottom, and the bottom of the compartment 10, which is now closed by the valve 12, and rising to the openings 13, through which openings the liquor is again drawn to the compartment 10 by the wheels 14. As the cams 35 continue to operate, the valves 11 and 12 are alternately opened and closed. It will be understood, however, that the shifting of the position of the valves 11 and 12, and the period during which these valves remain open and closed, will be of sufficient duration to freely permit the dye-liquor acting upon the contents of the cage 3.

After the contents of the cage 3 have been subjected the required time to the action of the dye-liquor, the cage is removed, and for the purpose of removing the cage 3 from the vat 1, and placing the same therein, any suitable hoisting apparatus may be employed.

The vat 1 is provided with an opening 53 through which the dye-liquor may be introduced and removed, if so desired, and arranged within said vat is a feed pipe 54 having distributing branches 55 that extend longitudinally of the vat, through which steam may be introduced to the vat 1 for heating the dye-liquor, if this be found necessary.

In Figs. 5, 6 and 7 is disclosed a form of the cage adapted for use when it is desired to dye yarn in the skein. This is, in reality, a rack, the same comprising parallel side bars 56 connected by transversely-extending beams 57 having eye-bolts 58, or equivalent devices, by which the rack may be placed within and removed from the vat, and said beams 57 are braced by longitudinal stays 59. The rack has a screen 60 (shown broken away in Fig. 6) arranged adjacent to the upper edges of the bars 56. Each of the

side bars 56 is provided with a plurality of openings 61, the openings of one bar being arranged opposite to those of the other bar, and said openings receive a plurality of removable supporting poles 62 from which the skeins of yarn to be dyed are suspended. When the flow of the dye-liquor is in a downward direction the poles 62 limit the movement of the skeins, the latter being pressed against the poles, and in the reverse direction the skeins are raised from the poles, but limited in their upward movement by the screen 60, the dye-liquor freely circulating about and through the skeins in both directions. It will thus be seen that the hereindescribed machine is capable of use for dyeing articles, such as hosiery, etc., and also for dyeing material in bulk, such as yarn in the skein.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent is:

1. In a machine of the class described, a vat, a compartment arranged therein, means arranged in said compartment for circulating the dye-liquor, valves associated with said compartment for changing the direction of the flow of the dye-liquor in its circulation, means for actuating said circulating means, and connections between said actuating means and said valves, whereby to impart alternate flow to the dye-liquor in reverse directions or in but one direction.

2. In a machine of the class described, a vat, a compartment arranged therein, means arranged in said compartment for circulating the dye-liquor, valves associated with said compartment for changing the direction of the flow of the dye-liquor in its circulation, means for opening and closing said valves in alternation with each other, means for actuating said circulating means, and connections between said actuating means and the means for opening and closing said valves, whereby to impart alternate flow to the dye-liquor in reverse directions or in but one direction.

3. In a machine of the class described, a vat, a compartment arranged therein, a propeller wheel mounted in said compartment for circulating the dye-liquor, valves arranged at the top and bottom of said compartment for changing the direction of the flow of the dye-liquor in its circulation, and means for actuating said valves.

4. In a machine of the class described, a vat, a compartment arranged therein, a propeller wheel mounted in said compartment for circulating the dye-liquor, valves arranged at the top and bottom of said compartment for changing the direction of the flow of the dye-liquor in its circulation, and means for periodically opening and closing said valves.

5. In a machine of the class described, a



vat, a compartment arranged therein, a propeller wheel mounted in said compartment for circulating the dye-liquor, valves arranged at the top and bottom of said compartment for changing the direction of the flow of the dye-liquor in its circulation, and means for periodically opening and closing said valves in alternation with each other.

6. In a machine of the class described, a vat, a compartment arranged therein, a propeller wheel mounted in said compartment for circulating the dye-liquor, valves associated with said compartment and movable alternately into open and closed position for changing the direction of the flow of the dye-liquor in its circulation, means for connecting said valves for operation in unison, and means for automatically actuating said valves.

7. In a machine of the class described, a vat, a compartment arranged therein, a propeller wheel mounted in said compartment for circulating the dye-liquor, means for driving said propeller wheel, valves associated with said compartment for changing the direction of the flow of the dye-liquor in its circulation, means for automatically actuating said valves, and means for connecting the valve-actuating means for operation in unison with the driving means for said propeller wheel.

8. In a machine of the class described, a vat, a compartment arranged therein, a propeller wheel mounted in said compartment for circulating the dye-liquor, means for driving said propeller wheel, valves arranged at the top and bottom of said compartment for changing the direction of the flow of the dye-liquor in its circulation, means for actuating said valves, and means for connecting the valve-actuating means for operation in unison with the driving means for said propeller wheel.

9. In a machine of the class described, a vat, a compartment arranged therein, a propeller wheel mounted in said compartment for circulating the dye-liquor, means for driving said propeller wheel, valves arranged at the top and bottom of said compartment for changing the direction of the flow of the dye-liquor in its circulation, means for periodically opening and closing said valves in alternation with each other, and means for connecting the valve-actuating means for operation in unison with the driving means for said propeller wheel.

10. In a machine of the class described, a vat, means within the vat for circulating the dye-liquor therein, means associated with said circulating means for reversing the direction of the flow of the dye-liquor in its circulation, means for driving said circulating means, and connections between said driving means and the means for reversing the direction of the

flow of the dye-liquor, whereby to impart alternate flow to the dye-liquor in reverse directions or in but one direction.

11. In a machine of the class described, a vat, means within the vat for circulating the dye-liquor therein, means associated with said circulating means for reversing the direction of the flow of the dye-liquor in its circulation, means for driving said circulating means, a cam shaft for actuating the means for reversing the direction of the flow of the dye-liquor, and connections between said driving means and said cam shaft, whereby to impart alternate flow to the dye-liquor in reverse directions or in but one direction.

12. In a machine of the class described, a vat, means within the vat for circulating the dye-liquor therein, means associated with said circulating means for reversing the direction of the flow of the dye-liquor in its circulation, means for driving said circulating means, a cam shaft for actuating the means for reversing the direction of the flow of the dye-liquor, and a clutch connection between said driving means and said cam shaft, whereby to impart alternate flow to the dye-liquor in reverse directions or in but one direction.

13. In a machine of the class described, a vat, a compartment arranged therein, means arranged in said compartment for circulating the dye-liquor, means for driving said circulating means, valves associated with said compartment for controlling the direction of the flow of the dye-liquor in its circulation, a shaft, a cam carried by said shaft, a link connecting said cam and said valves and actuated by said cam, and connections between said shaft and said driving means, whereby said valves are caused to operate or remain at rest, and thereby impart either alternate flow to the dye-liquor in reverse directions or in but one direction.

14. In a machine of the class described, a vat, a compartment arranged therein, means arranged in said compartment for circulating the dye-liquor, a shaft for driving said circulating means, valves associated with said compartment for controlling the direction of the flow of the dye-liquor in its circulation, a second shaft, a cam carried by said second shaft, a link connecting said cam and said valves and actuated by said cam, gearing interposed between said driving and cam shafts, and a clutch included in said gearing for causing said valves to operate or to remain at rest, and thereby impart either alternate flow to the dye-liquor in reverse directions or in but one direction.

15. In a machine of the class described, a vat, a compartment arranged therein, means arranged in said compartment for circulating the dye-liquor, a shaft for driving said circu-



lating means, valves associated with said compartment for controlling the direction of the flow of the dye-liquor in its circulation, a second shaft, a cam carried by said second shaft, a link connecting said cam and said valves and actuated by said cam, a worm wheel geared to said cam shaft, a worm carried by said driving shaft and engaged with said worm wheel, and a clutch also carried by said driving shaft and cooperating with said worm for causing said valves to operate or to remain at rest, and thereby impart either alternate flow to the dye-liquor in reverse directions or in but one direction.

16. In a machine of the class described, a vat, a compartment arranged therein, means arranged in said compartment for circulating the dye-liquor, a shaft for driving said circulating means, valves arranged at the top and bottom of said compartment and hingedly connected thereto for controlling the direction of the flow of the dye-liquor in its circulation, said valves being connected to operate in unison, a second shaft, a plurality of cams carried by said second shaft, a plurality of links connecting said cams and the valve at the top of said compartment and actuated by said cams, and connections between said cam shaft and the driving shaft, whereby said valves are caused to operate or remain at rest, and thereby impart either alternate flow

to the dye-liquor in reverse directions or in but one direction.

17. In a machine of the class described, a vat, a compartment arranged therein, means arranged in said compartment for circulating the dye-liquor, a shaft for driving said circulating means, valves arranged at the top and bottom of said compartment and hingedly connected thereto for controlling the direction of the flow of the dye-liquor in its circulation, said valves being connected to operate in unison, a second shaft, a plurality of cams carried by said second shaft, a plurality of links connecting said cams and the valve at the top of said compartment and actuated by said cams, a worm wheel geared to said cam shaft, a worm carried by said driving shaft and engaged with said worm wheel, and a clutch also carried by said driving shaft and cooperating with said worm for causing said valves to operate or to remain at rest, and thereby impart either alternate flow to the dye-liquor in reverse directions or in but one direction.

In testimony whereof we affix our signatures, in the presence of two witnesses.

THOMAS ALLSOP.  
WALTER W. SIBSON.

Witnesses:

RALPH M. ERWIN,  
HENRY P. HARPER.