

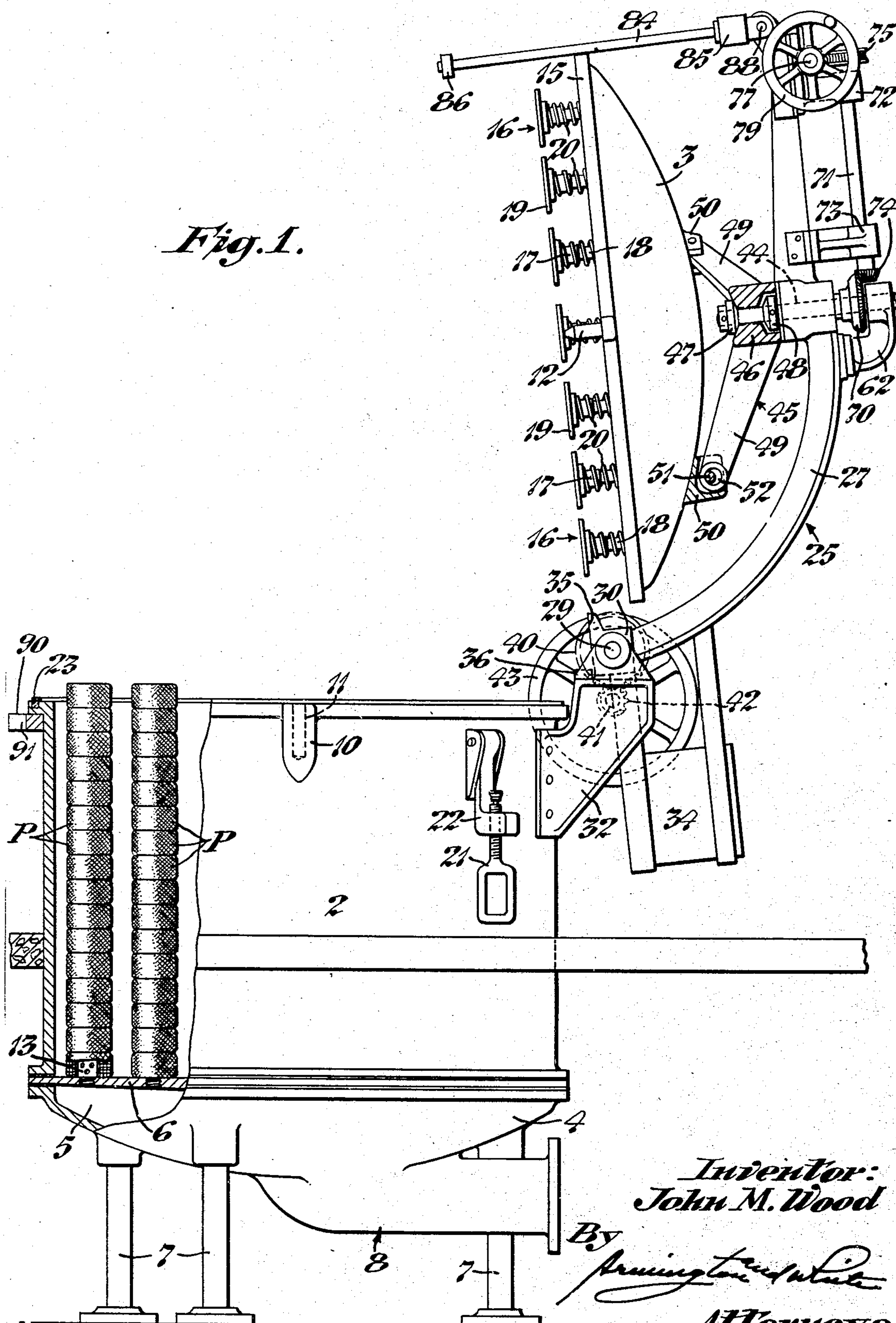
March 30, 1943.

J. M. WOOD  
APPARATUS FOR DYEING, BLEACHING, AND LIKE  
TREATMENT OF TEXTILE MATERIALS  
Filed Aug. 5, 1941

2,314,962

3 Sheets-Sheet 1

*Fig. 1.*



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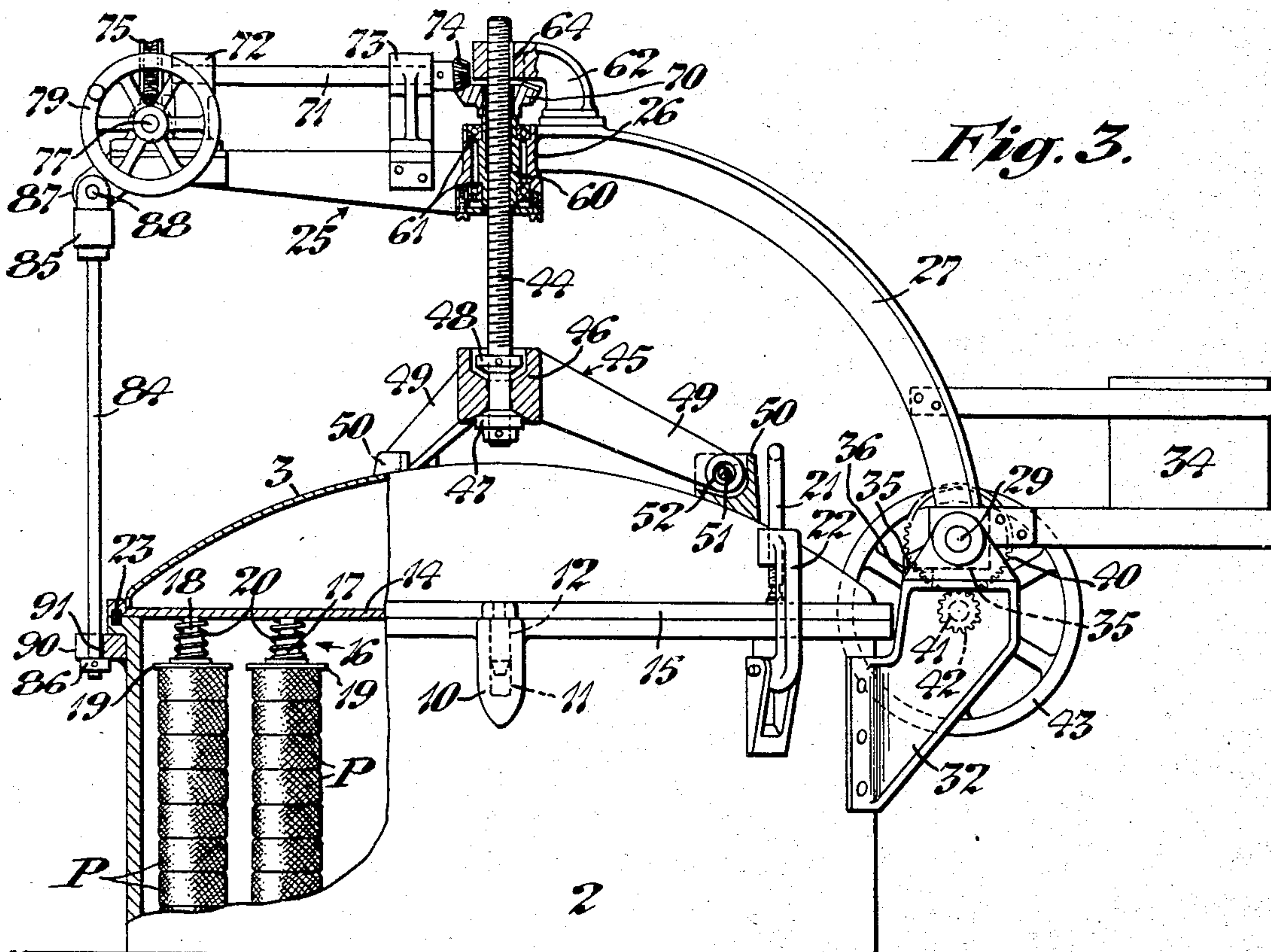


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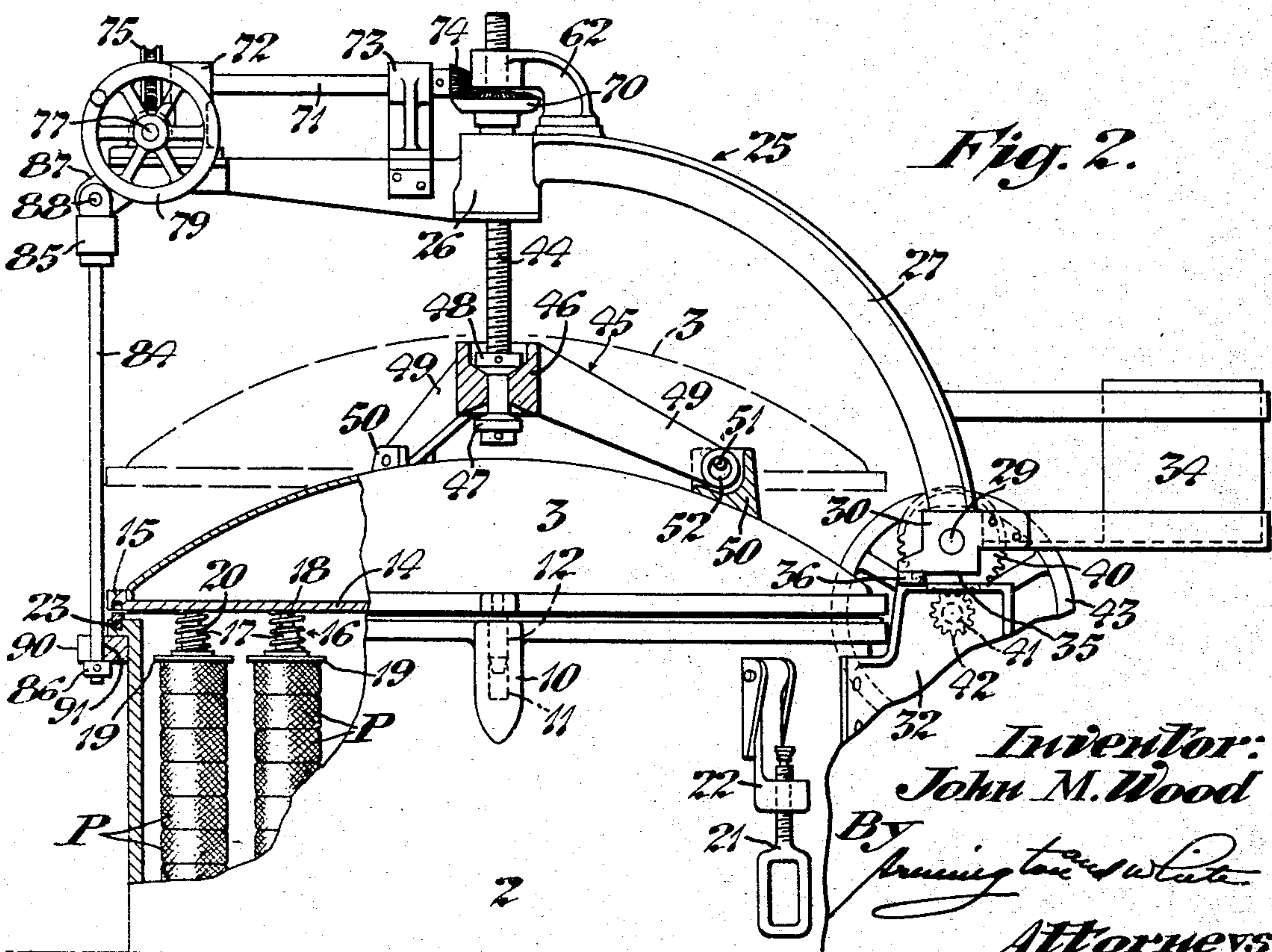
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3 Sheets-Sheet 2



*Fig. 3.*



*Fig. 2.*

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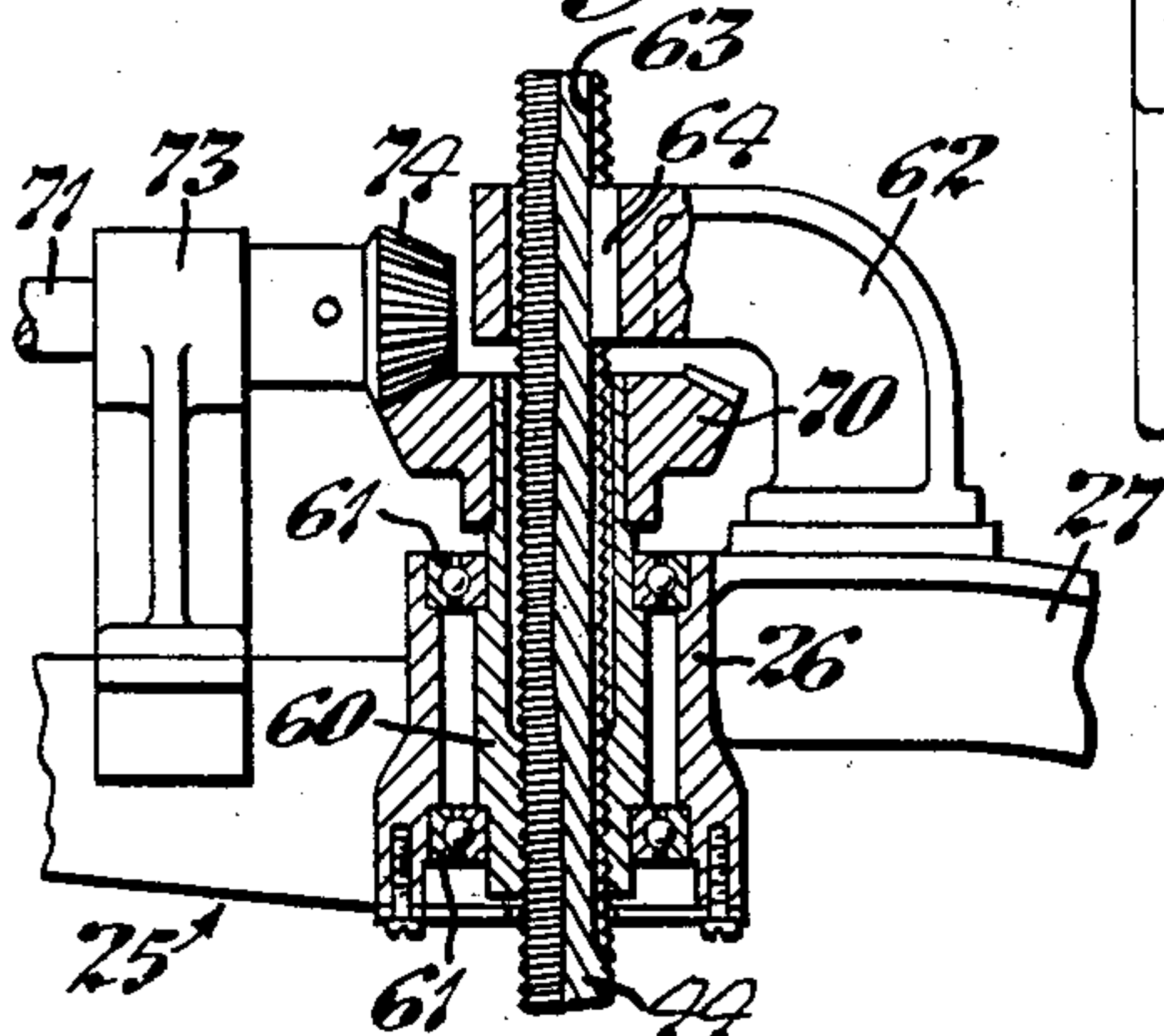
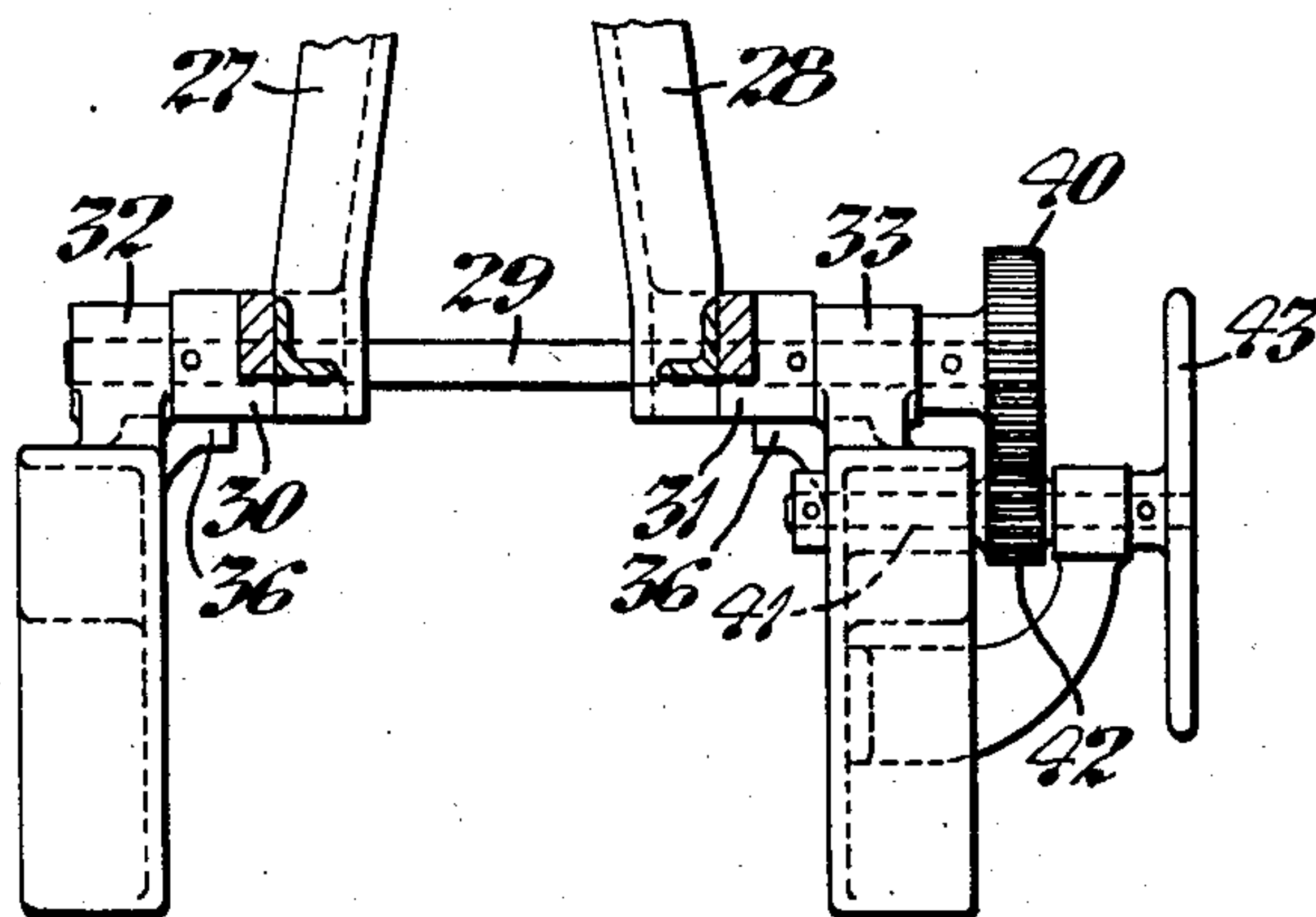
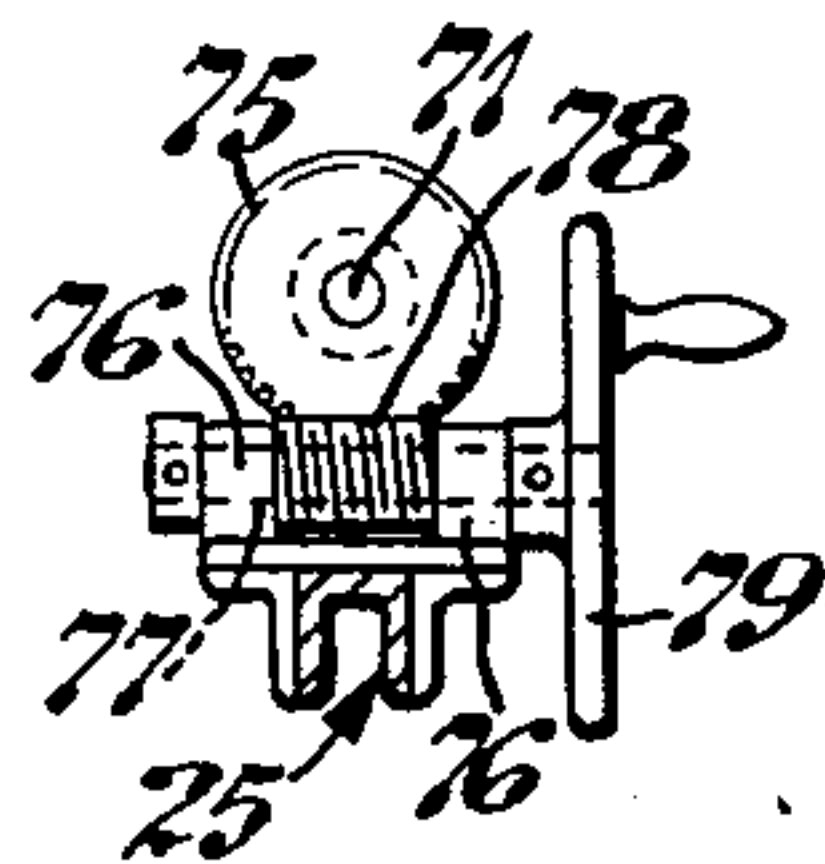
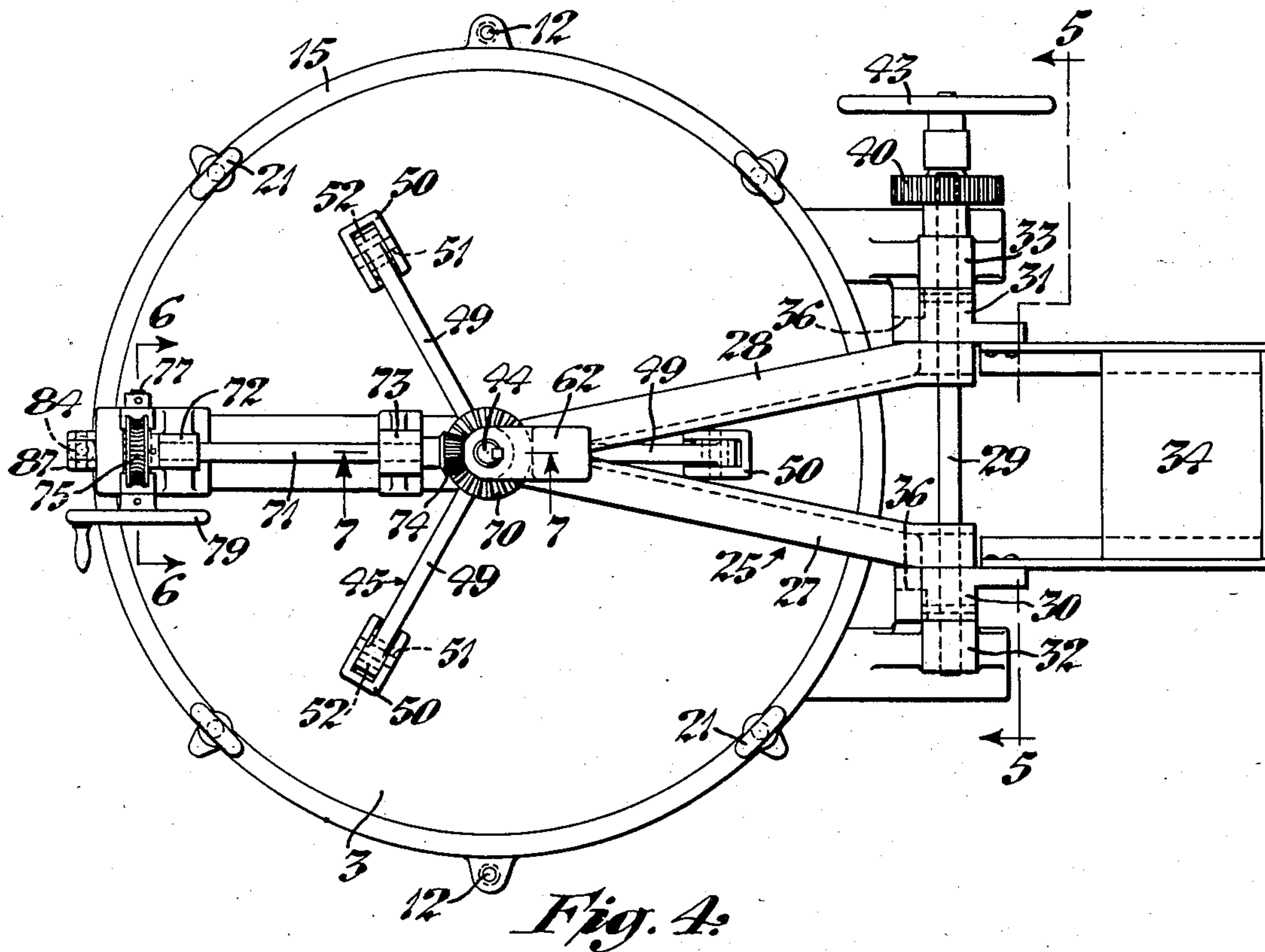


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## UNITED STATES PATENT OFFICE

2,314,962

APPARATUS FOR DYEING, BLEACHING, AND  
LIKE TREATMENT OF TEXTILE MATERIALS

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Application August 5, 1941, Serial No. 405,510

7 Claims. (Cl. 68—189)

The present invention relates to improvements in apparatus for dyeing, bleaching, washing or otherwise similarly processing fibrous materials.

Commercial dyeing apparatus commonly used for package dyeing of yarn and similar textile materials is of heavy construction as comprising a large dyeing-vessel or kier having an open top and a removable cover for closing the kier. The cover is removed from the kier to open the latter to receive a batch of dye-cops inserted into the kier through its open top and the cover must then be replaced on the kier and clamped thereto to seal the joint. It is also the preferred practice to provide means on the cover for the further purpose of compressing the yarn in the large number of packages strung on hollow perforated holders supported vertically in the kier. Because of the great weight of the cover and its attached parts a traveling hoist with a tackle depending therefrom is usually employed for lifting the cover and moving it to one side of the kier. With such equipment considerable time and energy is required to open and close the kier, extra space in the dye-house is necessary for accommodating the cover and its handling apparatus and difficulty is sometimes experienced in properly positioning the cover on the kier to close the latter.

One of the objects of the present invention is to provide an apparatus for facilitating the removal of the cover from the kier and the accurate positioning of the cover on the kier to close the opening therein.

Another object is to provide an apparatus of the type indicated comprising a support or mounting for the cover pivoted at the side of the kier to adapt the cover to be swung away from the top of the kier.

Another object is to provide an apparatus of the type indicated which adapts the cover to be raised or lowered on its support or mounting and swung bodily with the support toward or away from the top of the kier.

Another object is to provide a mounting or support for the cover which is counterbalanced to adapt the cover to be easily and quickly manipulated to open or close the kier.

Another object is to provide manually operable gearing for swinging the cover-support on its pivotal mounting.

Another object is to provide manually operable gearing for raising or lowering the cover on its support or mounting.

Still another object of the invention is to provide an apparatus of the type indicated which

is of relatively simple and compact construction to adapt it for economical manufacture and one which is efficient for performing its intended functions.

Further objects of the invention are set forth in the following specification which describes a preferred form of the device, by way of example, as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a side elevational view of a dyeing-vessel or kier incorporating the novel features of the present invention and illustrating the cover-support as swinging on its pivot to displace the cover upwardly and laterally of the open top of the kier;

Fig. 2 is a view similar to Fig. 1 showing the cover-support swung to a position overlying the open top of the kier and the cover lowered with respect thereto to compress the yarn in the columns of packages in the kier and close the open top of the latter;

Fig. 3 is a view similar to Fig. 2 showing the cover clamped to the top of the kier;

Fig. 4 is a plan view of the kier showing the manually operable gearing for swinging the cover-support toward and away from the kier and for raising and lowering the cover relatively of its support;

Fig. 5 is a transverse sectional view on line 5—5 of Fig. 4 showing the manually rotatable pinion-gear for swinging the cover-support;

Fig. 6 is a transverse sectional view on line 6—6 of Fig. 4 showing the manually operable worm and worm-wheel for transmitting motion to raise or lower the cover with respect to its mounting or support;

Fig. 7 is a sectional view taken generally on line 7—7 of Fig. 4 showing in detail the construction of the transmission gearing for raising and lowering the cover relatively of its mounting or support;

The kier to which the present invention is applied is generally similar to that illustrated and described in United States Letters Patent to William A. Traver for Apparatus for dyeing or otherwise processing fibrous materials, No. 1,743,254, issued January 14, 1930. Suffice it to state herein that such apparatus comprises a cylindrical dyeing-vessel or kier 2 having an open top and a removable cover 3. The bottom 4 of the kier is of concavo-convex shape, forming a lower compartment 5 separated from the upper or main chamber of the kier by a horizontal diaphragm or false-bottom 6, see Fig. 1. The kier 2 may be supported from legs or standards 7 and entering its lower



compartment 5 are suitable supply and exhaust pipes, indicated generally at 8, for the circulation of the dye-liquor or other fluid through the kier. Usually, a circulating pump, not herein shown, is employed to force the dye-liquor into the lower compartment 5 of the kier, whence it passes through openings in the diaphragm 6 to penetrate the yarn-packages in the upper chamber and is exhausted therefrom by means of an exhaust pipe communicating with the upper chamber in any suitable manner. The upper rim of the kier 2 is provided with a number of bosses 10 having vertical holes 11 therein for receiving dowel-pins 12 depending from the cover 3 to accurately aline the cover with the open top of the kier.

Although the kier 2 may be adapted for treating other kinds of textile material, as herein illustrated it is adapted to support columns of compressible yarn-packages or dye-cops P mounted in vertical arrangement therein. The dye-cops P may be arranged in columns in any suitable manner, such as by winding the yarn on compressible tubes of the form illustrated and described in United States Letters Patent to F. H. Daniell for a Cop tube, Re. 13,223, dated March 28, 1911, and mounting a series of such dye-cops on perforated standpipes 13 in the kier 2. The standpipes 13 are preferably screwed into holes in the diaphragm or false-bottom 6 for communication with the lower compartment 5, from which the treating liquor is circulated through the standpipes, dye-cops and kier, or in reverse order. Such a method of dyeing is widely known as the "Franklin" dyeing process.

The cover 3 as herein illustrated is of concavo-convex form with a flat bottom wall 14 of the proper dimensions to adapt it to close the open top of the kier 2 with its rim 15 overlying the upper flanged rim of the kier. Mounted on the bottom wall 14 of the cover 3 are a series of resiliently-operated devices 16, one for each column of packages P, adapted for engagement with the topmost packages of the columns in the kier to compress the masses of yarn on all of the standpipes 13. Each pressure means 16 comprises a sleeve 17 slidable on a pin 18 depending from the bottom wall 14 of the cover 3 with a plate or disk 19 at its lower end engageable with the topmost packages in the columns of dye-cops P. A coiled spring 20 is provided between the bottom wall 14 of the cover 3 and the disk 19 of each pressure means 16 to normally retain the latter in the extended position illustrated in Fig. 1. A series of bolts 21 are also provided in clamps 22 pivotally mounted on the side of the kier for engagement with the rim 15 of the cover 3 to clamp the latter to the top of the kier against the action of the spring-pressed pressure means 16, a suitable gasket 23 being provided between the kier and cover to seal the joint therebetween.

In accordance with the present invention the cover 3 is mounted on a pivoted crane-like support 25 to adapt it for movement therewith upwardly and laterally of the kier and also for vertical movement relative thereto to raise and lower the cover with respect to its mounting or support. The cover-support or mounting 25 as herein shown is in the form of a cantilever overlying the open top of the kier and having a hub 26 at the axial center of the kier with curved arms 27 and 28 extending rearwardly and downwardly from the hub, see Figs. 1 and 4. The cover-support 25 is pivotally mounted by means of hubs 30 and 31 at the ends of the curved arms 27 and 28

fastened to a rock-shaft 29 journaled in spaced bearing-brackets 32 and 33 attached to the side of the kier 2. The hubs 30 and 31 are pinned to the rock-shaft 29, and attached to rearwardly extending lugs on the hubs is a counterweight 34. One end of the rock-shaft 29 projects laterally beyond the bearing-bracket 33 and mounts a spur-gear 40 which is pinned or otherwise keyed thereto. A countershaft 41 journaled in the bearing-bracket 33 has keyed thereto a pinion-gear 42 which meshes with the spur-gear 40 and also a hand-wheel 43. Thus rotation of the hand-wheel 43 acting through the countershaft 41 and gears 42 and 40 serves to rotate the rock-shaft 29 to swing the cover-support 25 mounted thereon from the position illustrated in Fig. 1 to that illustrated in Fig. 2, the counterweight 34 balancing the weight of the support and cover 3 carried thereby to facilitate manual operation of the device. To limit the rocking movement of the cover-support 25 in either direction the hubs 30 and 31 of the latter are provided with flatted sides 35 engageable with the adjacent sides of rectangular lugs 36 projecting inwardly from the bearing brackets 32 and 33 along the sides of the hubs, see Figs. 1, 2 and 4.

The cover 3 is mounted on the cover-support 25 by means of a stem 44 depending from the hub 26 of the cover-support and connected to a spider-like frame 45 at its lower end, see Figs. 3 and 7. The lower end of the stem 44 extends through a central hub 46 on the spider 45 and has longitudinally-spaced collars or abutments 47 and 48 with beveled ends for engagement with beveled recesses in the opposite sides of the hub while permitting a limited relative movement between the spider and stem. The spider 45 has arms 49 extending radially from the hub 46 with their ends projecting into recessed bosses 50 on the top of the cover 3. The cover 3 is attached to the spider 45 by means of pins 51 extending across the recessed bosses 50 on the cover 3 and through eyes 52 at the ends of the arms 49. Preferably the eyes 52 at the ends of the arms 49 of the spider 45 are of greater diameter than the pins 51 whereby to provide for a slight movement of the cover 3 with respect to the spider 45.

The main portion of the stem 44 is provided with screw-threads in meshing engagement with an interiorly-threaded sleeve or nut 60 journaled in antifriction bearings 61 in the hub 26 of the cover-support 25, see Figs. 3 and 7. The stem 44 also extends through a bearing in a bracket 62 on the cover-support 25 and has a longitudinally extending keyway 63 in its side for receiving a key 64 on the bracket to prevent rotation of the stem, see Fig. 7. Rotation of the sleeve 60 with respect to the stem 44 will thus cause longitudinal movement of the stem with respect to the cover-support 25 to raise or lower the cover 3.

The sleeve 60 is rotated by manually-operable reduction gearing comprising a bevel-gear 70 fast on the reduced end of the sleeve which projects upwardly beyond the antifriction bearings 61. A shaft 71 journaled in bearing brackets 72 and 73 on the cover-support 25 has a pinion-gear 74 fast on one end and arranged in meshing engagement with the bevel-gear 70 on the sleeve 60. A worm-wheel 75 fast on the opposite end of the shaft 71 abuts the bearing 72, see Figs. 1 to 3. Journaled in suitable bearings 76 at the outer end of the cover-support 25 is a shaft 77 having a worm 78 fast thereon and arranged in meshing engagement with the worm-wheel 75, a hand-



wheel 79 at the opposite end of the shaft serving to rotate the worm, see Fig. 6. Rotation of the hand-wheel 79 will thus be transmitted through the worm 78 and worm-wheel 75, shaft 71, and bevel-gears 74 and 70 to rotate the sleeve 60 whereby to raise or lower the cover 3 on its support 25 with respect to the kier 2.

At the outer free end of the cantilever or support 25 is a tie-rod 84 having a clevis 85 at its upper end and a collar or enlargement 86 adjacent its lower end. The clevis 85 at the upper end of the tie-rod 84 embraces a lug 87 projecting from the end of the cover-support 25 and is pivotally connected thereto by means of a pin 88 extending through the clevis and lug. The collar or enlargement 86 at the lower end of the tie-rod 84 is adapted for engagement with the bottom of a bifurcated abutment 90 projecting from the side of the kier 2. The bifurcated abutment 90 provides a slot 91 of a width substantially equal to the diameter of the tie-rod 84 to adapt the lower end of the latter to be swung thereinto to position the collar 86 beneath the abutment on the kier. With the outer end of the cover-support 25 detachably anchored to the kier 2 by means of the tie-rod 84 a rigid structure is provided for opposing the thrust required to compress the vertical columns of textile packages P by forcing the cover 3 downward against the open top of the kier 2. One form of apparatus incorporating the novel features of the present invention having been described in detail, the mode of operation of the apparatus is explained as follows.

With the cover-support 25 and cover 3 carried thereby in the open position illustrated in Fig. 1 the dye-cops P or package of textile material to be treated are inserted into the kier through its open top. When dye-cops P are to be treated they are strung in vertical arrangement on the perforated standpipes 13 in the kier 2 until all of the columns have been loaded with stacks of the packages. The stacks of dye-cops P when so mounted on the perforated standpipes 13 in the kier 2 extend upwardly above the top of the kier, see Fig. 1.

To close the kier 2 the hand-wheel 43 is turned manually to rotate the gears 42 and 40 which rotate the rock-shaft 29 and thereby swings the cover-support 25 from the upright position illustrated in Fig. 1 to a position overlying the top of the kier 2 as illustrated in Fig. 2. As the counterweight 34 balances the weight of the cover-support 25, cover 3 and parts carried thereby little effort is required to swing the support from its upright to its lower position, or vice versa. When the cover-support 25 has been swung to the position illustrated in Fig. 2 the tie-rod 84 is swung about its pivotal connection 88 with the support to position its lower end in the slot 91 in the abutment 90 and engage the collar 86 with the under side of the abutment.

The cover 3 is then lowered from the position indicated by dash lines to the position illustrated in full lines in Fig. 2 by turning the hand-wheel 79 to rotate the shaft 77, see Fig. 6. Rotation of the hand-wheel 79 and shaft 77 is transmitted through the reduction gearing comprising the worm 78 and worm-wheel 75, shaft 71, and bevel-gears 74 and 70 to rotate the sleeve 60. Due to the engagement of the screw-threads on the periphery of the stem 44 with the interior threads on the sleeve 60, see Fig. 7, rotation of the sleeve is translated into a longitudinal movement of the stem to lower the cover 3; the engagement of the key 64 on the bracket 62 with the keyway 63

in the side of the stem preventing rotation of the latter with the sleeve. During the lowering of the cover 3 the ends of the dowel-pins 12 are caused to enter the holes 11 in the bosses 10 on the kier 2 to properly align the cover with the top of the kier.

As the cover 3 is lowered toward the open top of the kier 2 the pressure devices 16 carried by the cover engage the upper ends of the columns of dye-cops in the kier 2. Further lowering of the cover 3 will cause the masses of yarn in the dye-cops P to be compressed longitudinally thereof until all of the yarn in the several columns is brought under substantially uniform compression. That is to say, continued turning of the hand-wheel 79 and reduction gearing operated thereby causes the upper collar or abutment 48 on the stem 44 to engage the hub 46 of the spider frame 45 to depress the cover 3 connected thereto to complete the compression of the yarn in the packages P with the springs 20 yielding between the disks 19 and cover when necessary. During the lowering of the cover 3 to compress the yarn in the dye-cops P the tie-rod 84 braces the outer free end of the cantilever-support 25 to provide the necessary resistance to the force of reaction.

After the cover 3 is lowered and depressed to the position illustrated in full lines in Fig. 2 the pivoted clamps 22 are raised to engage the screws 21 with the rim 15 of the cover 3 and the screws screwed down to tightly clamp the cover to the top of the kier, see Fig. 3. As the cover 3 is being clamped in position on the kier 2 it may adjust itself with respect to the spider 45, the spacing of the collars 47 and 48 on the stem 44 and the enlarged eyes 52 at the ends of the arms 49 of the spider allowing for relative movement between the parts. The apparatus is then in condition for dyeing or any similar treating operation by circulating the treating fluid through the batch of yarn or other material on the perforated standpipes 13.

After the dyeing or similar operation is completed the cover 3 may be raised with respect to its support 25 by rotating the hand-wheel 79 in a direction opposite from that first explained to cause it to act through the reduction gearing to draw the stem 44 upwardly and lift the cover 3 connected thereto. As the counterweight 34 will either balance or slightly overbalance the weight of the support 25 and cover 3 it will prevent any tendency of the whole structure to move toward the kier 2 during the raising of the cover. When the cover 3 has been raised to the position indicated by dash-lines in Fig. 2 the collar 86 at the end of the tie-rod 84 is released from engagement with the abutment 90 on the kier 2 and the hand-wheel 43 rotated to swing the cover-support 25 from the position illustrated in Fig. 2 back to its upright position illustrated in Fig. 1. This movement of the support 25 carries the cover 3 connected thereto upwardly and laterally of the kier 2 to open the latter. The processed dye-cops P or other material treated may then be removed through the open top of the kier and a new batch inserted therein.

It will be observed from the foregoing specification that the present invention provides an improved apparatus for easily and quickly opening or closing the kier and insures the proper positioning of the cover on the kier. It will also be observed that the counterbalanced cover-support and reduction gearing facilitate the manual operation of opening and closing the kier, and



the reduction gearing further provides for compressing the yarn in the columns on the perforated standpipes in the kier.

While one form of kier is herein illustrated and described it is to be understood that the invention may be applied to other types of kiers and that modifications may be made in the construction and arrangement of the improved apparatus without departing from the spirit or scope of the invention. For example, the standpipes may have yieldable telescopic extensions directly engageable by the cover to compress the yarn masses in the columns instead of the pressure means on the cover as illustrated in the drawings. The kier may also be of different shape and so constructed as to adapt it for use with other kinds of material, the counterweight may be made to balance, underbalance or overbalance the cover-support and cover, and different forms of reduction gearing may be substituted for those herein shown and described. Therefore without limiting myself in this respect, I claim:

1. In an apparatus of the type indicated, a kier having an open top, said kier being adapted to support columns of compressible textile packages in vertical arrangement therein, a cover for compressing the textile packages in the columns and closing the open top of the kier, a support for the cover pivotally mounted for swinging movement, means comprising reduction gearing for swinging the cover-support on its pivot to move the cover bodily toward or away from the open top of the kier, and means on the cover-support for lowering the cover relative to its support to compress the textile packages in the columns in the kier.

2. In an apparatus of the type indicated, a kier having an open top, said kier being adapted to support columns of compressible textile packages in vertical arrangement therein, a cover for compressing the textile packages in the columns and closing the open top of the kier, a support for the cover pivotally mounted for swinging movement, means comprising reduction gearing for swinging the cover-support on its pivot to position the cover above the top of the kier, means for lowering the cover relative to its support, and pressure means on the cover engageable with the upper ends of the columns of textile packages to compress the latter during the lowering of the cover onto the open top of the kier.

3. In an apparatus of the type indicated, a kier having an open top, said kier being adapted to support columns of compressible textile packages in vertical arrangement therein, a cover for compressing the columns of textile packages and closing the open top of the kier, a support for the cover pivotally mounted for swinging movement, means for mounting the cover on its support to permit relative movement therebetween, means comprising reduction gearing for swinging the cover-support to position the cover above the top of the kier, means comprising reduction gearing for lowering the cover relative to its support to compress the textile packages in the kier, and means on the kier for clamping the cover thereto, said means for mounting the cover on its support permitting relative movement therebetween during the clamping of the cover to the kier.

4. In an apparatus of the type indicated, a kier having an open top, said kier being adapted to support columns of textile packages in vertical arrangement therein, a cover for compressing the textile packages in the columns and closing the open top of the kier, a support for the cover pivotally mounted at the side of the kier for swinging movement with respect thereto, a screw-threaded stem depending from the cover-support, means at the lower end of the stem for mounting the cover thereon, means for swinging the cover-support on its pivotal mounting to move the cover toward or away from the open top of the kier, a nut mounted to rotate on the cover-support and having internal threads engaging the screw-threads on the stem, means for rotating the nut to lower the stem and thereby the cover mounted thereon to compress the textile packages in the kier, and means for clamping the cover to the top of the kier.

5. In an apparatus of the type indicated, a kier having an open top, a cover for closing the top of the kier, a support for the cover pivotally mounted at the side of the kier for swinging movement with respect thereto, a screw-threaded stem extending through the cover-support and mounting the cover at its lower end, a counterweight on the cover-support at the opposite side of its pivot from the cover, manually-operable gearing for swinging the cover-support to move the cover bodily toward or away from the open top of the kier, a nut on the cover-support in meshing engagement with the screw-threads on the stem, and gearing for rotating the nut to raise or lower the stem and thereby the cover mounted thereon.

6. In an apparatus of the type indicated, a kier having an open top, a cover for closing the open top of the kier, a cantilever pivotally mounted at the side of the kier for swinging movement with respect thereto, a screw-threaded stem extending downwardly from the cantilever and mounting the cover at its lower end, a counterweight on the cover-support at the opposite side of the pivot from the cover, gearing for swinging the cover-support to move the cover bodily toward or away from the open top of the kier, a tie-rod at the end of the cantilever for connecting it to the kier, a nut on the cover-support having screw-threads in meshing engagement with the screw-threads on the stem, gearing for rotating the nut to raise or lower the stem and cover mounted thereon, and means for clamping the cover to the kier.

7. In an apparatus of the type indicated, a kier having an open top, said kier being adapted to support columns of compressible textile packages in vertical arrangement therein, a cover for compressing the textile packages in the columns and closing the open top of the kier, a support for the cover pivotally mounted for swinging movement, means comprising reduction gearing for swinging the cover-support on its pivot to move the cover bodily toward or away from the open top of the kier, means on the cover-support for lowering the cover with respect thereto, and pressure means acting between the cover and tops of the columns of packages for compressing the yarn masses in the columns.

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