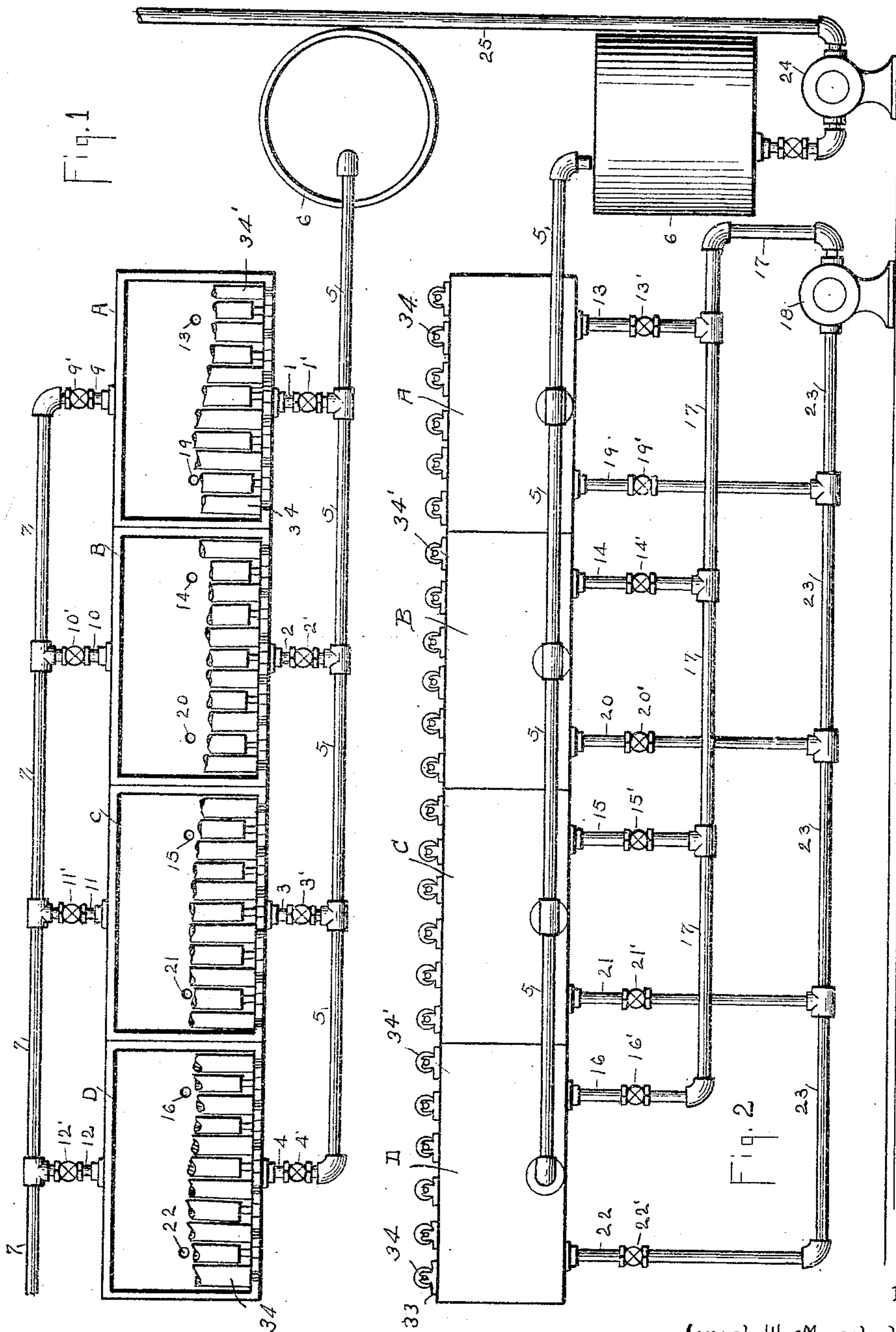


924,683.

I. W. MARSHALL.
SHEET WASHING APPARATUS.
APPLICATION FILED OCT. 8, 1907.

Patented June 15, 1909.

4 SHEETS—SHEET 1.



Inventor

Israel W. Marshall.

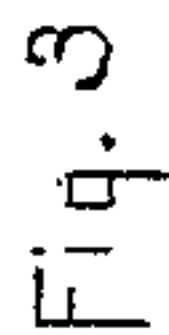
Witnesses

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4 SHEETS—SHEET 2.

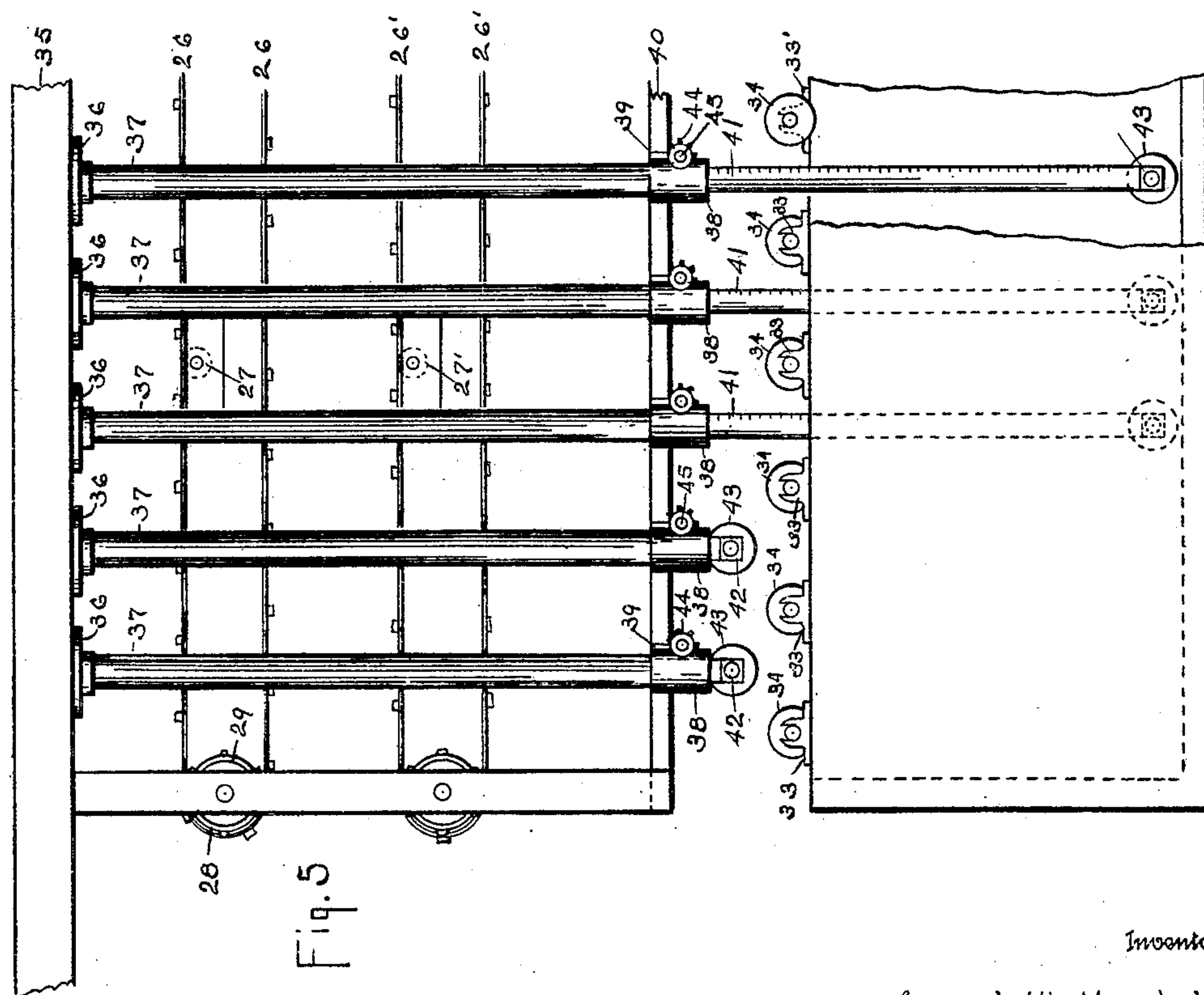
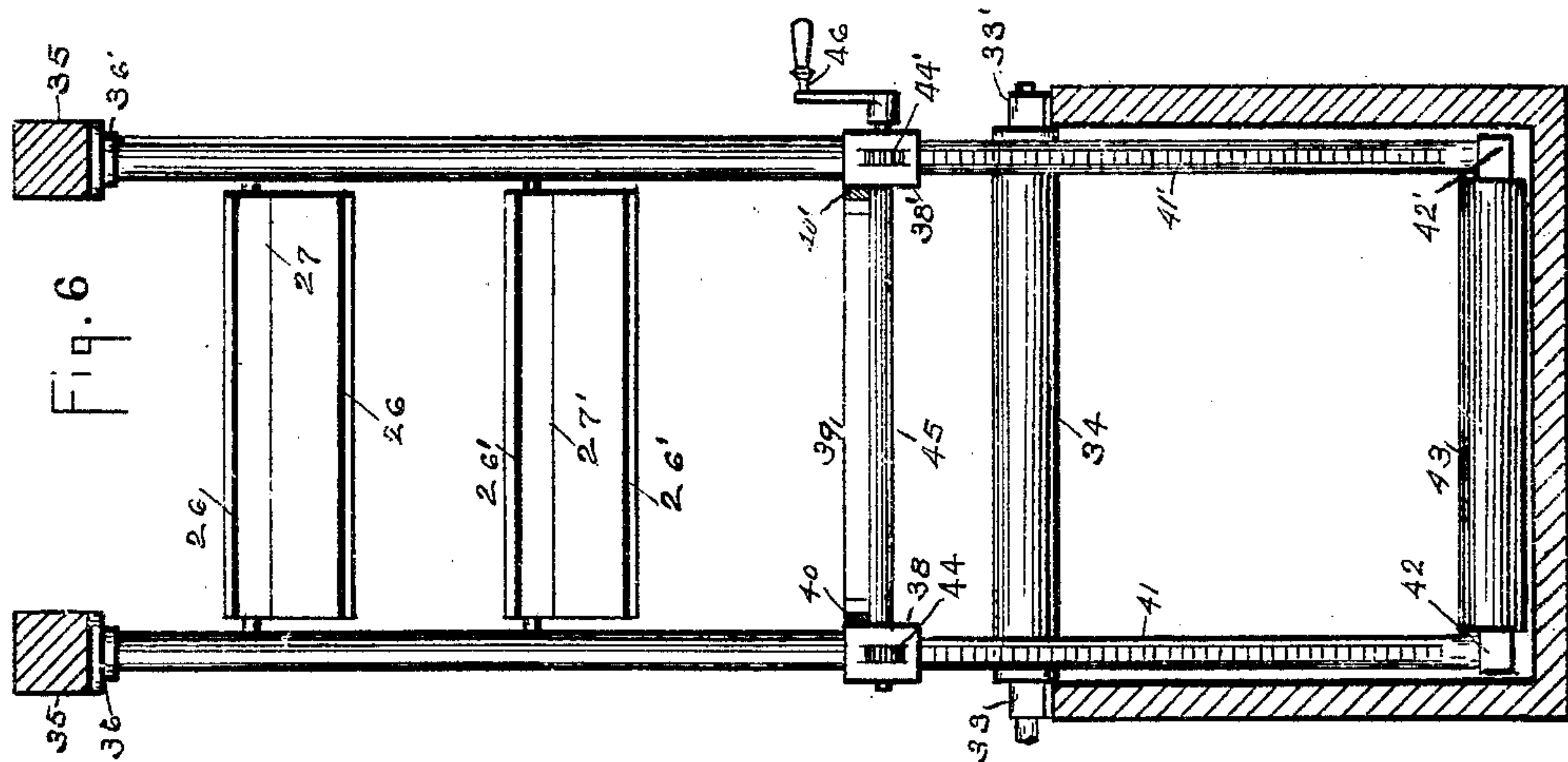


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4 SHEETS—SHEET 4.

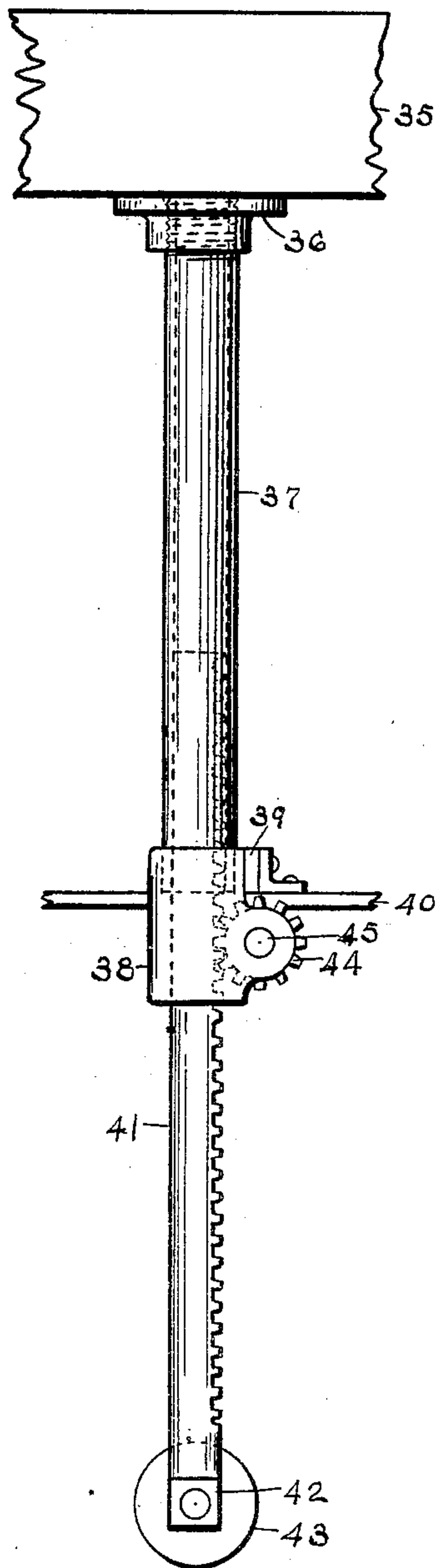


Fig. 7

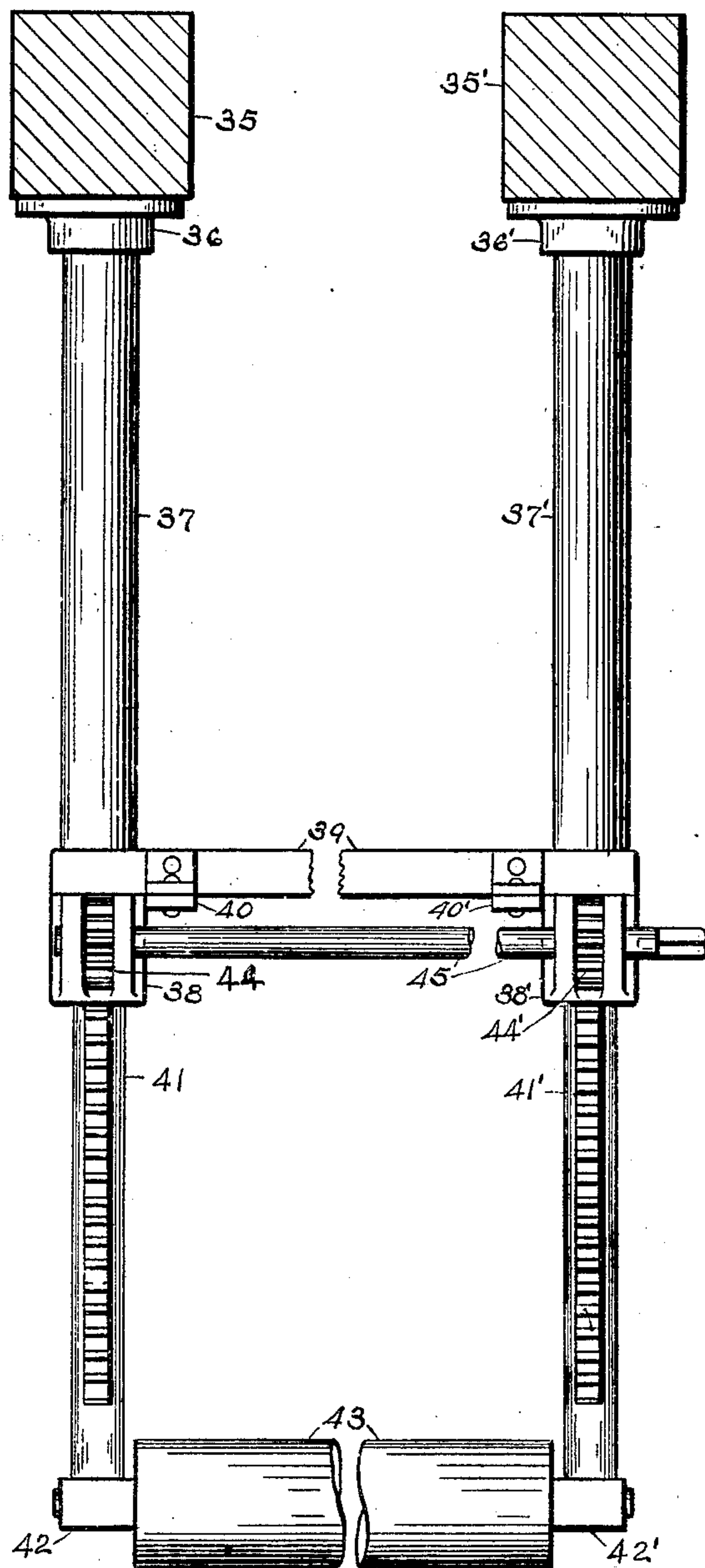


Fig. 8

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UNITED STATES PATENT OFFICE.

ISRAEL W. MARSHALL, OF YORKLYN, DELAWARE, ASSIGNOR OF ONE-HALF TO THOMAS E. MARSHALL, OF YORKLYN, DELAWARE.

SHEET-WASHING APPARATUS.

No. 924,683.

Specification of Letters Patent.

Patented June 15, 1909.

Application filed October 8, 1907. Serial No. 396,402.

To all whom it may concern:

Be it known that I, ISRAEL W. MARSHALL, a citizen of the United States, residing at Yorklyn, in the county of Newcastle and State of Delaware, have invented new and useful Improvements in Sheet-Washing Apparatus, of which the following is a specification.

This invention relates to improvements in devices and instrumentalities for washing, coating or saturating a continuous web or sheet of material passing therethrough, and is particularly applicable in so treating an unbroken web of fiber, being so used in my improved process of manufacture thereof.

Among the several objects sought to be obtained by this invention are:—to provide means whereby a continuous sheet of fiber, as received from prior operation, may be effectually washed free from any traces of chemical solutions with which it may have been previously saturated, rinsed in its passage through the several tank units employed and delivered in condition to receive subsequent operations; to provide means combined with such devices adapted to cause the web to travel circuitously in and through the several tanks, exposing both sides of the material to the liquids therein, and for a relatively lengthy period of time, thus enabling the web to receive the full effect of its bath, being freed from previously absorbed solutions, not integrally incorporated; to so arrange the driving mechanism as to keep taut and at the same time prevent any danger of tearing, stretching or otherwise injuring the web in the manifold manipulations accorded it; to so arrange the several tanks that all the residue and chemical salts not completely synthetically incorporated may be retained and conserved for further use; to provide means whereby any tank may have its contents removed, either wholly or in part, and supplied from the contents of any other tank or with fresh liquid. These and minor other objects are attained by the novel devices and arrangement of parts hereinafter fully described and indicated by reference to the several accompanying drawings forming part of these specifications, and in which:—

Figure 1, is a plan view of the series of tanks, indicating the piping system. Fig. 2, is a side elevation of the same. Fig. 3, is a

plan view of the tanks indicating the arrangement of submerging rolls and their drive. Fig. 4, is a side elevation of the same. Fig. 5, is a partial view of a tank the rolls and their supports drawn to an enlarged scale. Fig. 6, is a transverse sectional view of the same. Fig. 7, is a side elevation of a single roll and its supporting means, drawn to a still larger scale, and, Fig. 8, is a transverse sectional view of a pair of the same.

Similar characters refer to similar parts throughout the several views.

In the drawings the several tanks, here shown as four in number, have been designated as A, B, C, and D, respectively; A, being the first tank to receive the web. All the several tanks are preferably rectangular in shape, of such dimensions as are compatible with their purposes and are adapted to rest upon the floor of the factory, in line with the series of machines through which the web has passed and others to which it may continue. These tanks are of wooden construction and may be lined suitably with copper or lead if preferred.

By referring to Fig. 1, it will be seen that each tank is supplied with a pipe entering at the bottom as at 1, 2, 3 and 4, having corresponding valves 1', 2', 3' and 4', communicating with the train pipe 5, in such manner that the contents of any tank can be transferred to the vat 6, into which pipe 5, leads. On the opposite side of the tanks is a similar pipe 7, leading from a supply of water or whatever liquid it is desired to use and which is connected with the tanks by the pipes 9, 10, 11, and 12, having valves 9', 10', 11' and 12', as indicated.

At the bottom of the tanks, extending below the floor are connected pipes 13, 14, 15 and 16, having valves 13', 14', 15' and 16', communicating with the train pipe 17, which leads to the inlet opening of the rotary pump 18. Also at the bottom of the tanks is a second set of pipes 19, 20, 21 and 22, provided with valves 19', 20', 21', and 22', communicating with the train pipes 23, which is connected to the discharge opening of the pump 18.

From the foregoing it is evident that any tank may be emptied into the vat 6, and from there the contents raised by the pump 24, through the pipe 25, to a condenser—not shown—where the solution may be evapo-

rated and the salts reclaimed. It will also be evident that the tank thus emptied may be refilled by means of the pipe 7, from a source of supply, or that the contents of any other
 5 tank may be transferred to it by properly operating the corresponding valves and causing the pump 18, to work.

The usual procedure is to daily withdraw the liquid from tank A, refilling from B, and
 10 so on, supplying tank D, with fresh liquid.

As the web is received from previous operations it is in a moist, heated condition necessitating cooling and airing before submerging; this is accomplished by passing the advancing web over the tanks on the endless
 15 carrier 26, comprising a pair of link belts having attached, at intervals between, wooden slats on which the web rests; this carrier is supported by a series of rollers 27, distributed along its course and is driven at the
 20 front end by the sprocket 28, at the ends of the roller 29, to which revolution is imparted by the sprocket 30, and chain 31, from the countershaft as indicated, while at the opposite, or receiving, end the carrier passes over
 25 the roller 32; immediately below the carrier 26, is arranged a duplicate carrier similarly driven, for the return passage of the web which, after the airing it has received, is
 30 turned down over the roller 32'.

The upper face of the tank is provided with a series of rolls 34, which are journaled in bearings 33, 33', fixed upon the upper side edges of the tank. One roll 34', at the forward
 35 end of the tank is a driven roll, but, the other rolls are idler rolls and merely act as anti-friction rolls over which the web passes. As before stated, the most forward roll 34', of each tank is a driven roll which acts to
 40 draw the web through the tank. For the reason that the web may be retarded in its course, that it tends to shrink and that therefore, the speed at which it is drawn through the tank must be constantly varied,
 45 as well as for other reasons, I drive the roll 34', by the peculiar flexible intermittent chain drive described and claimed in my application for patent, Serial No. 396,401, filed
 50 October 8, 1907. This form of gearing permits the driving roll 34', to check or even reverse its action upon any retardation of the web.

At some distance above the tanks and parallel thereto are arranged suitable supports
 55 as 35 and 35', having flanges 36 and 36', securely attached and in which are rigidly contained the vertical tubes 37 and 37'; these tubes provide means for sustaining the rollers 27, cross bars being appropriately secured to them in which their ends freely
 60 revolve.

At the lower end of the tubes 37 and 37', are secured sleeves 38 and 38', provided with seats for the connecting cross bars 39,
 65 extending from side to side and to which are

secured the longitudinal bars 40 and 41', in such manner as to form a rigid frame, bracing the entire superstructure.

Vertically operable bars 41 and 41', having at their lower extremities bearings 42
 70 and 42', for the submerging rollers 43, are adapted to pass freely through the sleeves 38 and 38', and be received within the tubes 37 and 37', in a telescopic manner; the bars 41 and 41', may be raised, by reason of the rack
 75 teeth cut in their sides, the same being engaged by the spur gears 44 and 44', contained in recesses formed in the sleeves 38 and 38', said gears being mounted on shafts 45, extending between each pair of sleeves and in
 80 which bearings are formed for them; these shafts are extended beyond the bearings on one side and squared or otherwise fitted to receive the operating crank or wrench 46. Thus it will be seen that the submerging
 85 rollers 43, may be raised above the surface of the tank and rollers 34, or lowered to their limit, just above the bottom of the tank, at will and independently of each other; it is also noticeable that the rollers 43, are positioned
 90 midway between the rollers 34, and are of such length as to clear the sides of the tank in their descent therein.

As the bars 40 and 41' may extend well into the tubes 37 and 37', even when lowered,
 95 they are rigidly guided thereby and require no supplementary guiding devices within the tank.

The web after passing downward over the roller 32, is carried across the top of the tank
 100 to the forwardmost roll 34', of that particular tank. The front edge of the web is then held in any convenient manner. One of the vertical movable rollers 43, preferably the roller nearest to the driven roll 34', is caused
 105 to descend into the tank by turning the spur gear 44. This it will be evident draws into the tank a certain portion of the web, drawing it downward between the two rollers 34, on each side of the downwardly descending
 110 roller. The next adjacent vertical movable roller is then forced downward immersing in its turn a certain length of web. In this manner, the several rollers of the series of rollers over the tank being used, are forced
 115 downward. The downwardly descending rollers move at a speed one-half of that at which the web is being delivered from the roller 32, and thus as fast as the web is being
 120 delivered at one end of the tank, it is being taken up. Thus no wrinkles or folds are allowed to form in it, and the material is kept perfectly straight and at the proper tension. It will thus be seen that the tank A, which is
 125 the first tank, becomes completely filled with webbing and that the webbing afterward is similarly immersed in the succeeding tanks, B, C and D. The greater portion of the matter to be removed from the web, is removed
 130 in the first tank and this removal is perfected

in the tanks following. The particular product for the manufacture of which I have designed this machine, is of such a character that it would be impossible to force down all
 5 of the vertically moving rolls of a tank at one time without tearing the web of fabric, hence I have provided means whereby the individual vertically descending rolls may be individually operated, and operated at a speed
 10 sufficient to take up the fabric as fast as it is delivered. This operation is only possible with a construction wherein the vertically descending rolls are independent of each other, and are separately operable. In order
 15 that the greatest care may be taken in depressing the rolls so as not to tear the web, I prefer to control the descent of these rolls by hand in the manner shown.

A peculiar feature noticeable in the process
 20 of washing the web is the degree of shrinkage that takes place, amounting on an average to ten per cent. in width and length and necessitating the use of a novel drive which automatically compensates for the shrinkage
 25 in the web by a series of intermittent disengagements of the driving means, proportional to, and directly caused by, the shrinking of the web as it occurs. This disengagement of the roll 34', from the driving means
 30 permits the roll to rotate reversely if necessary. As this roll is the only roll used for driving the web or drawing it through the tank, and as the other rolls 34 and 43, are idlers, the web is not subjected to any tension
 35 which would tend to drag it apart or otherwise weaken it. The particular intermittent drive by which the rolls are left free, if there is any strain upon the web, as before
 40 stated, forms the subject of another application Serial No. 396,401. This mechanism being fully described in this application, need not be here gone into in detail, it
 45 being sufficient to say that the shaft of each roll 34, extends beyond its bearings upon the driving side and is provided with a sprocket
 50 wheel 47, which is engaged by the slack sprocket chain 48. This chain is driven by a sprocket 49, on a shaft 50, to which the afore-said intermittent variable motion is trans-

mitted.
 While I have mentioned and described a specific use for my invention it is by no means restricted in its application, but has a wide range of adaptability to other purposes
 55 in which it is desired to treat a continuous web or sheet of fabric to coatings of other material, as paints, varnishes, adhesives, waterproofing compounds and the like, and which may be applied in a heated condition
 60 as well as cold if preferred.

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

1. In a washing apparatus of the class de-

scribed, a tank, a series of endless carriers 65 arranged above the tank delivering the material to be washed at one end of said tank, a series of fixed rolls rotating freely in bearings on said tank, a driven roll at one end of
 70 said tank and a series of submergible rolls arranged above and alternately with said fixed rolls, and mechanism whereby said submergible rolls may be vertically moved into and out of the tank, each independently
 75 of the other.

2. In a washing apparatus of the class described, a tank, a series of endless carriers arranged above the tank delivering the material to be washed at one end of said tank,
 80 a series of fixed rolls rotated freely in bearings on said tank, a driven roll at one end of said tank having means whereby it may be rotated at a variable speed, and a series of submergible rolls arranged above and alternately with said fixed rolls, and mechanism
 85 whereby said submergible rolls may be vertically moved into and out of the tank, each independently of the other.

3. In a washing apparatus of the class described, a series of tanks, a series of endless
 90 carriers arranged above the tanks delivering the material to be washed at one end of the first of said series of tanks, a series of fixed rolls located above each tank and rotating freely, each tank having upon it at its forward
 95 end a driven roll, means whereby the said driven roll may be rotated at variable speeds, and a series of submergible rolls arranged above the series of tanks and alternately positioned with reference to said fixed
 100 rolls, and mechanism whereby said submergible rolls may be vertically moved into or out of the tanks, each roll independently of any other roll of the series.

4. In a washing apparatus of the class described, a tank, a series of fixed rolls journaled above and transversely of the tank, a series of submergible rolls arranged above
 105 and alternately to each of said fixed rolls, each being vertically movable independent of the other, a driven roll mounted at the forward end of said tank, a driven shaft, a flexible driving connection between the two,
 110 a wheel located intermediately of said shafts, said intermediate wheel having normally rotative engagement with said connection but being adapted to lose its rotative engagement therewith when retarded, said intermediate wheel being connected with the
 115 said driven roll upon the forward end of the tank.
 120

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

ISRAEL W. MARSHALL.

Witnesses:

WARREN E. WILLIS,
 CHAS. E. POTTS.