(No Model.) 2 Sheets—Sheet 1.

W. M. MORGAN.

APPARATUS FOR ELEVATING AND EQUALIZING THE SUPPLY OF LIQUIDS.

No. 502,102. Patented July 25, 1893.

Fig. 3.

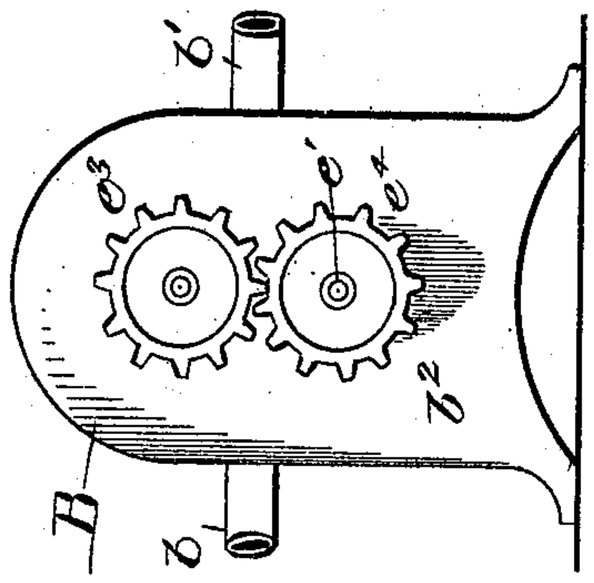


Fig. 1.

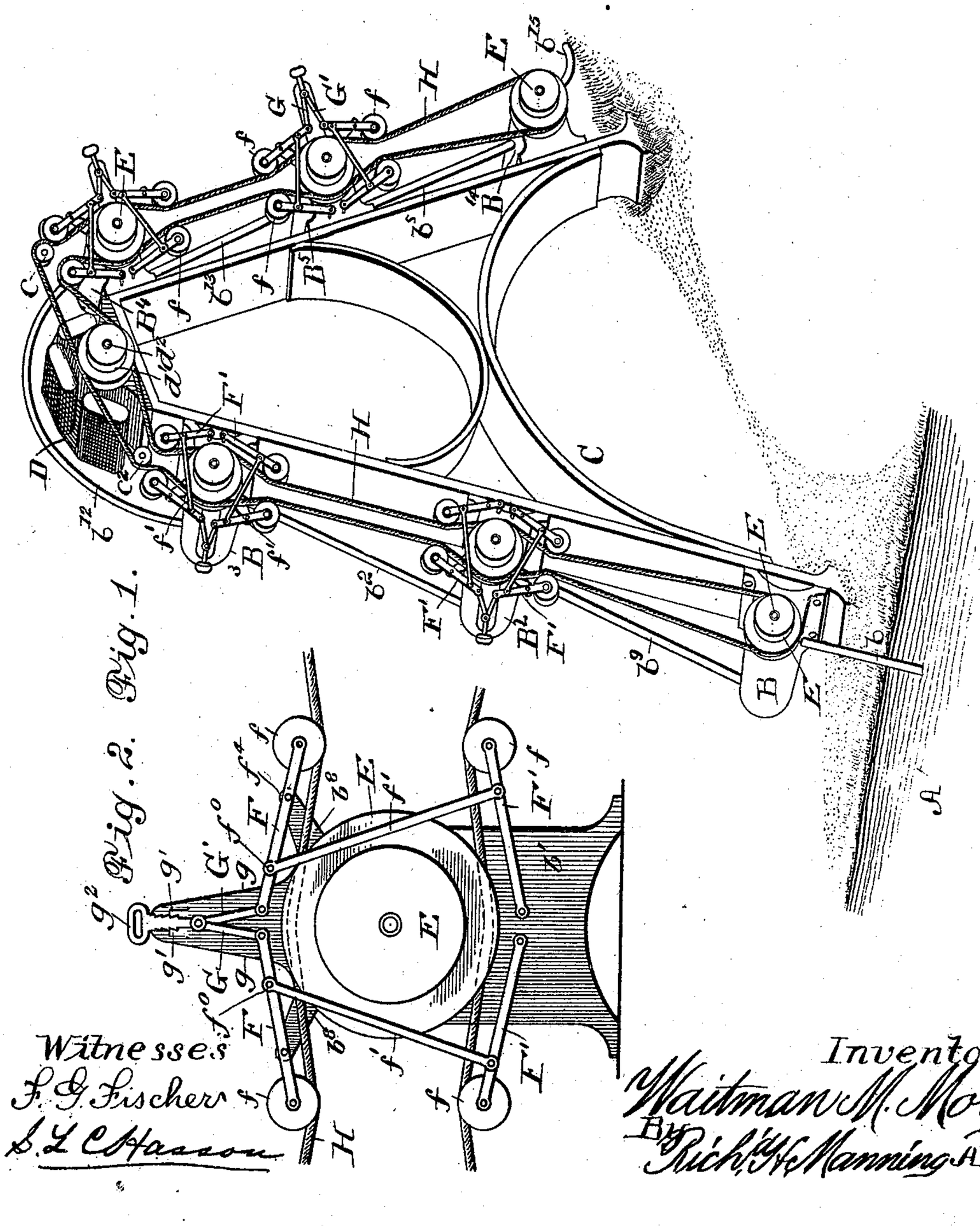
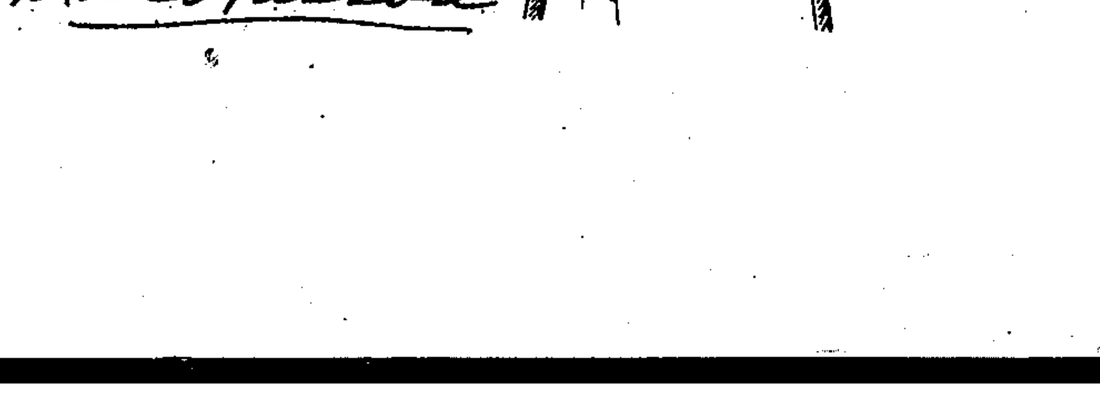


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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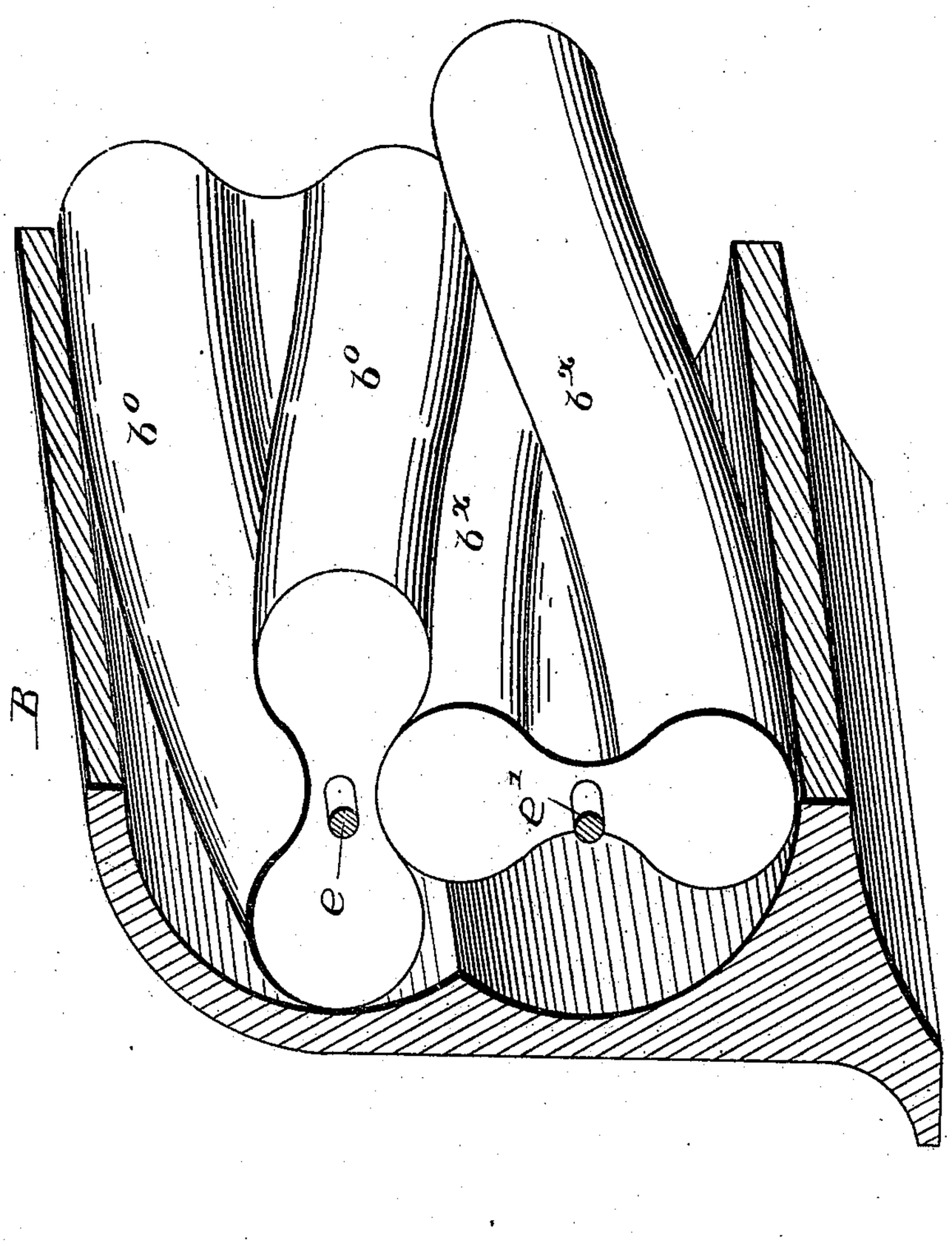
Fig. 4.



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UNITED STATES PATENT OFFICE.

WAITMAN M. MORGAN, OF KANSAS CITY, MISSOURI.

APPARATUS FOR ELEVATING AND EQUALIZING THE SUPPLY OF LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 502,102, dated July 25, 1893.

Application filed August 3, 1891. Serial No. 401,570. (No model.)

To all whom it may concern:

Be it known that I, WAITMAN M. MORGAN, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented a certain new and Improved Apparatus for Elevating and Equalizing the Supply of Liquids; and I do hereby declare that the following is a full, clear, and exact description thereof, such as will enable others to make and use the same, reference being had to the accompanying drawings, forming a part of the specification.

The object of my invention is to elevate and maintain an equal pressure upon a column of liquid, at desired heights, without the intervention of reservoirs, and also distribute the column so raised in measured quantities.

In the drawings: Figure 1 is a view in perspective, showing an elevated structure with the motor operating the endless cable at its top, and also the series of apparatus upon both sides of the structure for raising and distributing the liquid; the liquid distributing and conducting pipes connected with the apparatus; the speed pulleys and the endless cable extending over the speed pulleys on each apparatus, and the pulley on the motor. Fig. 2 is a view of one end of one liquid conducting apparatus, showing the pulleys of different diameters on the journal of one end of the spiral flanges; also showing the separate portions of the endless cable and the cable depressing levers and rollers and the means for operating said levers on both side portions of the cable simultaneously. Fig. 3 is a view of the other end of the liquid actuating apparatus, as seen in rear of Fig. 2, showing the ends of the journals on the spiral flanges and the meshing gear on said journals, also showing positions of the induction and eduction pipes, connected with the liquid actuating apparatus. Fig. 4 is a longitudinal vertical sectional view in perspective of the liquid receiving case with the ends of the case broken away showing the ends of the rotary shafts and the meshing spiral flanges.

Similar letters of reference indicate corresponding parts in all the figures.

In carrying out my invention, let A represent a river or other source of liquid supply. In the river is immersed one end of the liquid conducting pipe *b*, the other end of which pipe is connected with the induction opening of the liquid actuating and measuring apparatus B.

In the construction of the apparatus I first make a water tight case of the proper length and width and with vertical ends, b', b^2. Through the end b' of the case and a short distance below the top of said case, is inserted one end of a rotating shaft *e*, which extends in a horizontal direction through the case and the other end extends through the other end b^2 of said case. A short distance below the shaft *e*, and through the end *b*, is inserted one end of a rotary shaft e' which is parallel with shaft *e*, and the other end extends through the end b' of said case. Upon shaft *e* are arranged the multiple threads or flanges b^o. The side of each one of the flanges is rigidly attached to and extends outwardly from the other side of shaft *e* a short distance and at an angle to each other and the extreme end of said flange is made to describe an outwardly curved line from one side of said flange to the other. The flange b^o is then made to describe a spiral in a slight degree extending from one of the shafts to the other, within the case of the apparatus. The other flanges, b^o are constructed in the same manner, and are also arranged to describe a spiral in a like degree. Upon the shaft e' are arranged the spiral flanges $b^\times$ which are made in precisely the same manner as upon shaft *e*, and are extended so far outwardly from the shaft *e*, as to mesh closely in position with the flanges b^o on the shaft *e*. The inner walls of the case opposite the meshing threads $b^\times$ b^o are made in the form of an ellipse described by the outer end of each of said flanges on each shaft *e* e', so that the flanges come nearly into contact with the said sides. In the side of the case near the end *b*, directly opposite the meshing flanges, b^o $b^\times$, is made induction opening b^3. A portion of the side of the case is extended a short distance beyond the end b', so as to provide a receiving inlet extending beyond the ends of the flanges, b^o $b^\times$ on shafts, *e*, e'. To said inlet opening is attached the induction pipe, *b*, previously described. The outer side of the inlet opening b^3 on the case is made concave. The eduction opening b^4 is made in the other side, and on the end b^2 of the case, the side of the case being ex-

tended a short distance beyond the said end in the same manner as that of the induction opening, and provided with similar concave portions. To the end of the shaft *e*, which extends through the end b^2 and outside of the case is rigidly secured the gear e^3. To the end of shaft *e'*, directly beneath the gear e^3, is attached a gear e^4 which meshes with the gear e^3. Upon the other end of shaft *e*, which extends beyond the outer side of the end *b'* of the case is attached a speed pulley, E and upon the same shaft outside of the pulley E, is rigidly secured a pulley E' E', which is smaller in diameter than pulley E.

Upon the top of the case in vertical line with the end *b'* are attached the standards *g*, *g*, which extend upwardly a short distance at an angle to the top of the case and are secured together at the upper ends to the upper ends and outer faces of the standards *g*, *g*, which extend outwardly from the same standards as far as that described by the pulleys E, E'. The lugs *g'*, *g'* are arranged a short distance apart and between said lugs is arranged a notched bar g^2 upon the upper end of which is the handle, g^3.

Upon the top of the case in line with the vertical end *b'* and extending outwardly a short distance at an angle to and upon the other side of one of the standards, is attached rigidly an arm b^8. Upon the outer side of the other standard *b*, is attached an arm, b^8, which is similar to the other arm described and extends outwardly in like manner. To the arms b^8 b^8, are pivotally attached at $f^\times$ the levers F F, the inner ends of which levers nearly meet and the other ends extend a short distance beyond the respective arms, b^8. Pivotally attached at its inner end to the end *b'* of the case beneath the pulleys E, E' is a lever F', which extends outwardly a distance corresponding to that of the lever F. A similar lever F', is pivotally attached at the inner end to the end *b'* of the case and extends outwardly in the opposite direction. To the inner end of one lever F is pivotally attached the lower end of the short bar G, and to the inner end of the other lever F, is pivotally attached the lower end of the short bar G', the other ends of which bars are pivoted together and also pivoted to the lower end of the notched bar g^2. To one of the levers F between its pivotal point f^0, and the bar *g*, is pivoted the upper end of a counter connecting bar *f'*, the lower end of which bar is pivotally connected with the lever F', beneath and near the outer end of said lever. To the other lever *f* is attached a lever *f'* which is similar to and connected with the lever F' beneath in like manner. Upon the other end of each lever F F F' F' is pivotally attached a cable depressing sheave *f*, for the purpose of elevating the liquid from the source of supply A, to any desired height. Let the scaffolding C, represent an elevation of which *c* is the top. At the foot of the elevation is placed the apparatus B, with the induction pipe *b*, extending into the liquid A. Upon the side of the elevation at the proper distance from the apparatus B, is placed and secured in position another apparatus, B^2, constructed in precisely the same manner as the apparatus B. To the apparatus B, and to the eduction opening of said apparatus is connected one end of a liquid conducting pipe, b^9, the other end of which pipe is connected with the eduction opening of the apparatus B^2. The proper distance above the apparatus B^2 which is similar to the apparatus B^3 is secured in position an apparatus B^3 which is similar to the apparatus B. To the eduction opening of the apparatus B^2 is connected one end of a liquid conducting pipe b^{10}, the other end of which pipe is connected with the induction opening of the apparatus B^3 B^3. At the summit *c*, is placed a stationary motor D.

Upon the driving shaft of the motor D are the sheaves *d'* d^2, which are similar to the sheaves on the pulleys E, E', on the apparatus B, and are in the same line of direction. Upon each end of the motor D, and connected with the scaffold B are pulleys c^2. Upon the other side of the elevation, or structure, near the motor D, is placed an apparatus B^4. To the eduction opening of said apparatus is connected one end of a liquid conducting pipe b^{12}, which is curved in the arc of a circle and the other end connected with the induction opening of the apparatus B^4. Below the apparatus B^4 is located in position an apparatus B^5. To the respective induction and eduction openings of the adjacent apparatus B^4 B^5 is connected a conduction pipe b^{13}, in the same manner as between the apparatus B B^2. Below the apparatus B^5 is an apparatus B^6, to the respective induction and eduction openings of which is connected in the same manner as the pipe b^{13}, pipe b^{13} b^{14}. To the eduction opening of the apparatus B^6 is connected one end of a distributing pipe, b^{15}. Over the speed pulley E, on the apparatus B, is extended one end of a wire cable H, the other end of which is extended over the corresponding pulley on the respective apparatus B^2 and beneath the rollers *f*, *f*, on the lever arms F, F, thence over the speed pulleys on the apparatus B^3 and beneath the depressing rollers *f*, *f*, and thence over the pulley c^2, thence over the sheave on the motor D, thence over the pulley c^2 on the opposite side of the motor, thence over the speed pulleys on the apparatus B^4, B^5, and thence beneath the respective rollers *f*, *f*, on each apparatus, thence over the sheave on the apparatus B^6, thence beneath said sheave and the sheaves on the apparatus B^5 B^4, and over the rollers on the arms F, F, thereon, thence beneath the sheave on motor D, thence over the rollers on the arms F, F, of the apparatus B^3 B^2 and thence to the apparatus B, and the two ends connected together in the usual manner, forming an endless cable. When the motor D is set in motion the movement is communicated to each sheave of each apparatus simultaneously.

The handle g^3 on each apparatus is raised in an upward direction which depresses the rollers on the arms F, F, and elevates the rollers on the arms F, F, and the cable is thereby grasped by the sheaves and motion communicated to the spiral flanges, b^o, $b^\times$. The liquid which is drawn through the induction pipe b enters at one end of the apparatus B past the concave portion, b^3. The rotation of the flanges b^o $b^\times$ are in opposite directions and as the outer edges of the flanges b^o $b^\times$ meet the inner side of the case above and below the induction opening, a suction is formed thereby and the liquid enters and is carried around by the rotation of the other flanges, between the sides of the case and the spiral movement of the flanges causes the liquid to move gradually toward the eduction opening, b' at which point the action of the flanges is directed from the sides of the case toward the eduction opening, and the liquid is forced out of the apparatus and an equal quantity of the liquid is thereby secured and discharged from the apparatus within a given time. The back flow of the liquid is checked at a point nearly equally distant from both ends of the spiral flanges, at which point the flanges meet without presenting an opening which will communicate with either the induction or the eduction openings, and the liquid held temporarily in the apparatus is forced out at the next turn of the meshing flanges. In this manner I am enabled to dispense with valvular pumps, and retain the liquid where it has entered the induction opening and the apparatus from back flow. In the distribution of liquids from any height to the foot of the elevation, the force of the liquid is equalized throughout each elevation pipe, thus enabling the power of the liquid to be controlled in proportion to the strength of the liquid connecting pipes. Through the medium of the speed pulleys, the speed of the fluid-actuating flanges is increased or decreased, and the liquid regulated throughout the liquid supply system.

Having fully described my invention, what I now claim as new, and desire to secure by Letters Patent, is—

In a system of liquid elevation through ascending and descending pipes the combination with a series of liquid inclosing cases having suitable induction and eduction openings at opposite sides and ends and arranged in ascending and descending planes and sections of liquid conducting pipes connected with the respective induction and eduction openings of adjacent cases in said series of cases and also upon both ascending and descending planes of power driven shafts in each case having meshing spiral flanges all operating simultaneously as and for the purpose described.

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Witnesses:
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