

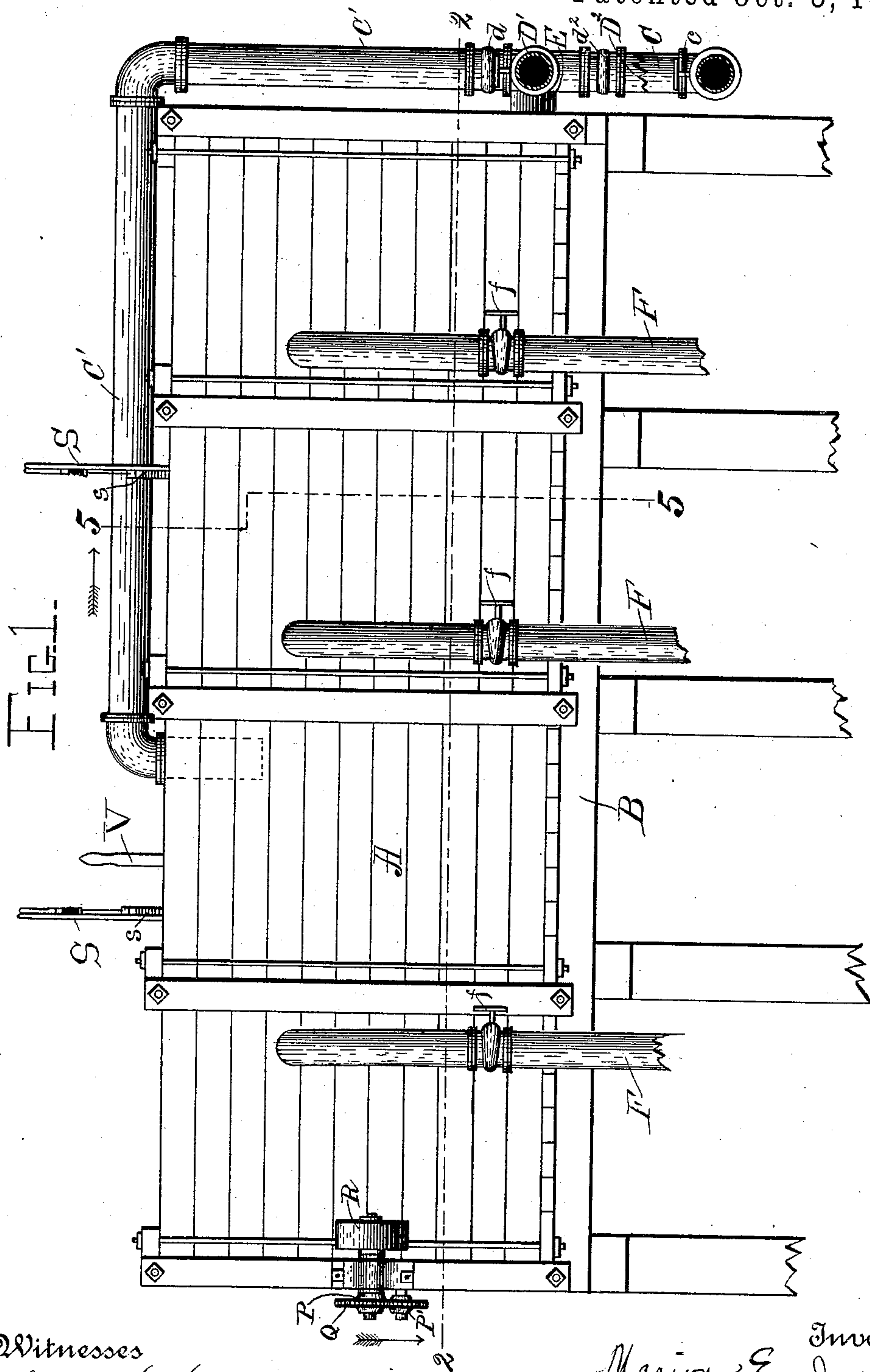
(No Model.)

M. E. JONES.  
FILTER.

6 Sheets—Sheet 1.

No. 591,279

Patented Oct. 5, 1897.



Witnesses  
John H. Holt.  
J. Stephen Givsta

Inventor  
Marion E. Jones,  
by Whitman & Wilkinson,  
Attorneys.

(No Model.)

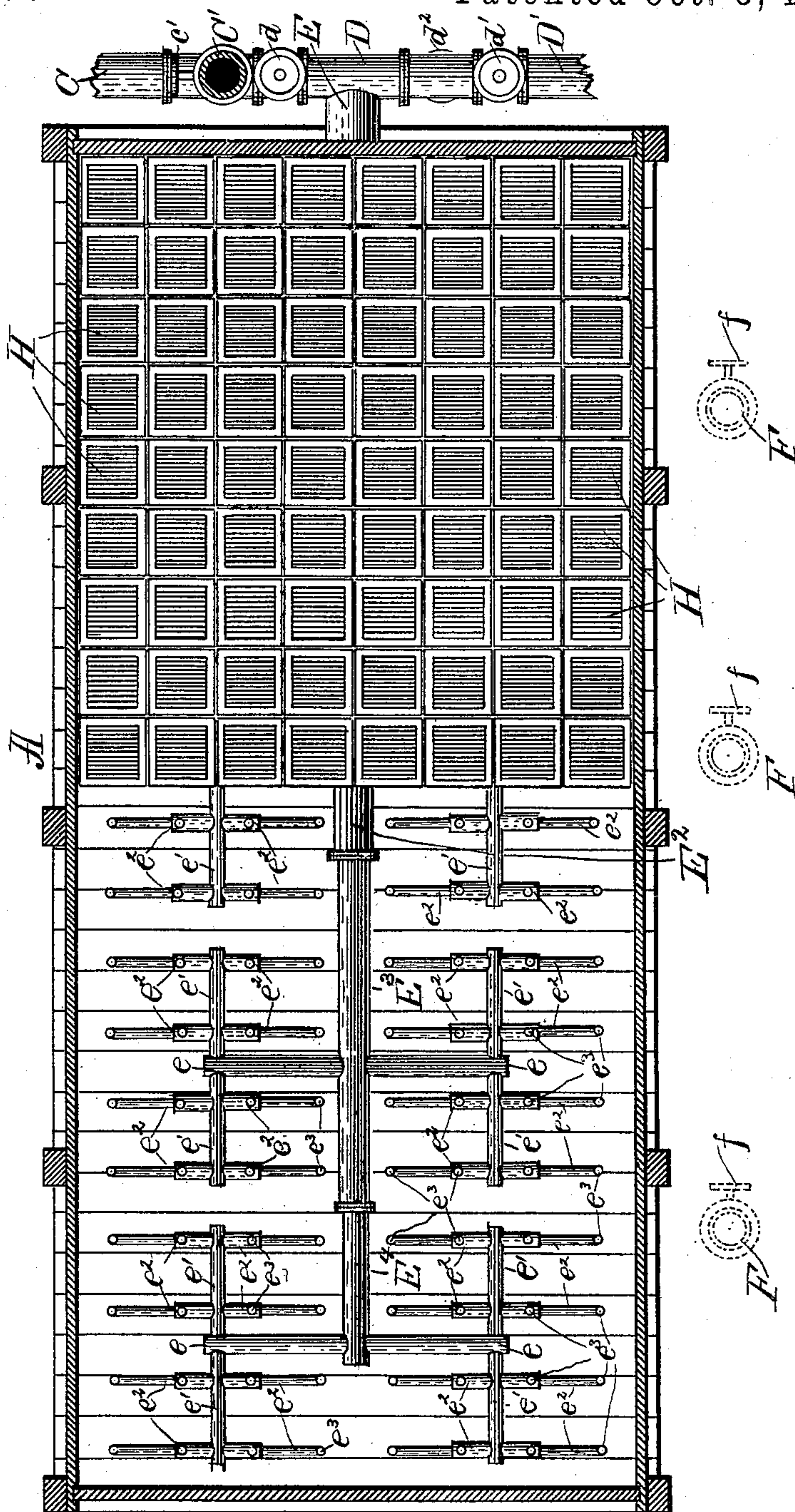
6 Sheets—Sheet 2.

M. E. JONES.  
FILTER.

No. 591,279.

Patented Oct. 5, 1897.

FIG. 2.



Witnesses

John H. Holt.

J. Stephen Ginst.

Inventor

Marion E. Jones,

by Whitman & Wilkinson,

Attorneys.



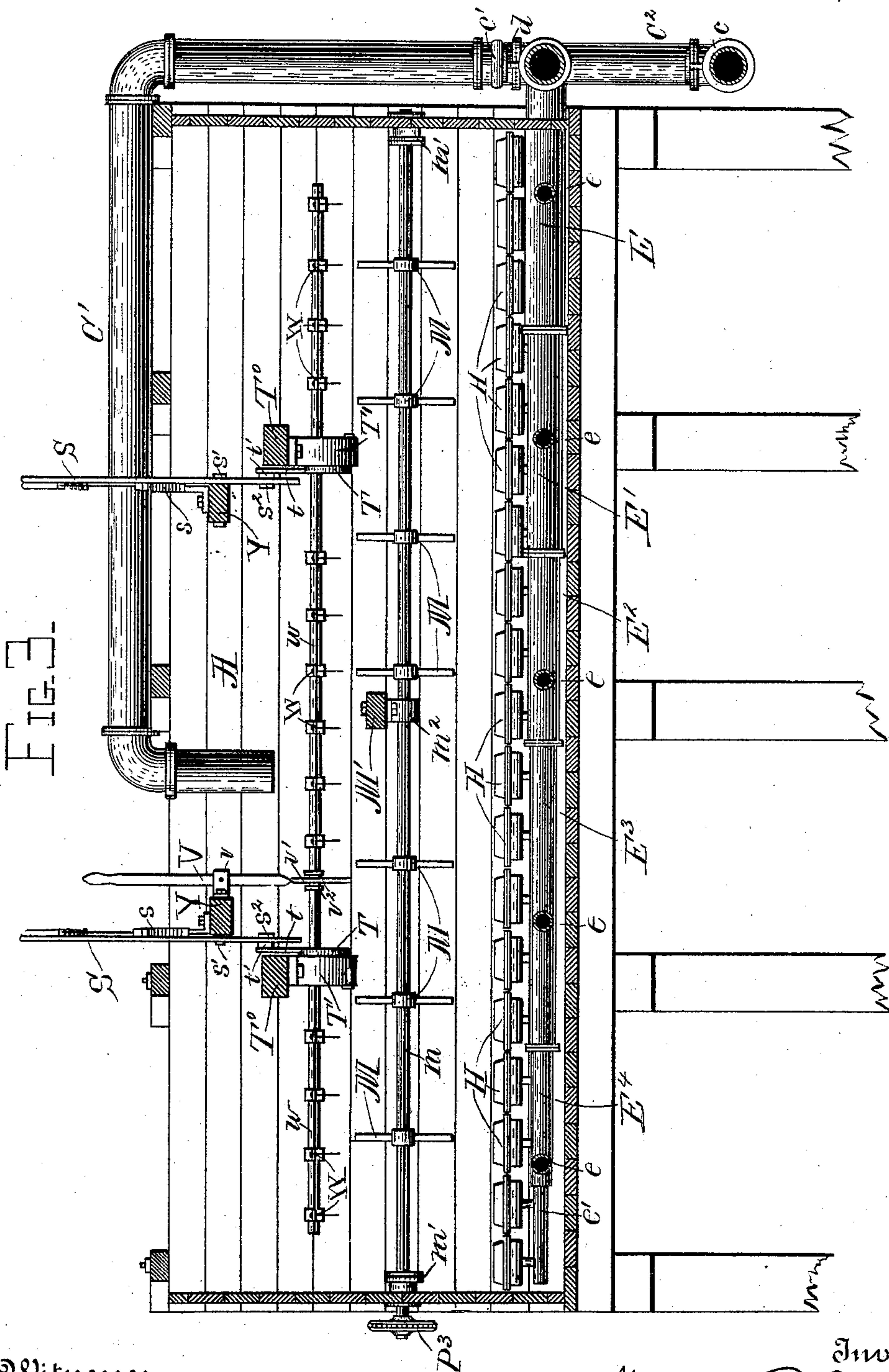
(No Model.)

6 Sheets—Sheet 3.

M. E. JONES.  
FILTER.

No. 591,279.

Patented Oct. 5, 1897.



Witnesses  
*John H. Hall*  
*J. Stephen Kincaid*

Inventor  
*Marion E. Jones*  
by *Whitman & Wilkinson*,  
Attorneys.

(No Model.)

6 Sheets—Sheet 4.

M. E. JONES.  
FILTER.

No. 591,279.

Patented Oct. 5, 1897.

FIG. 4.

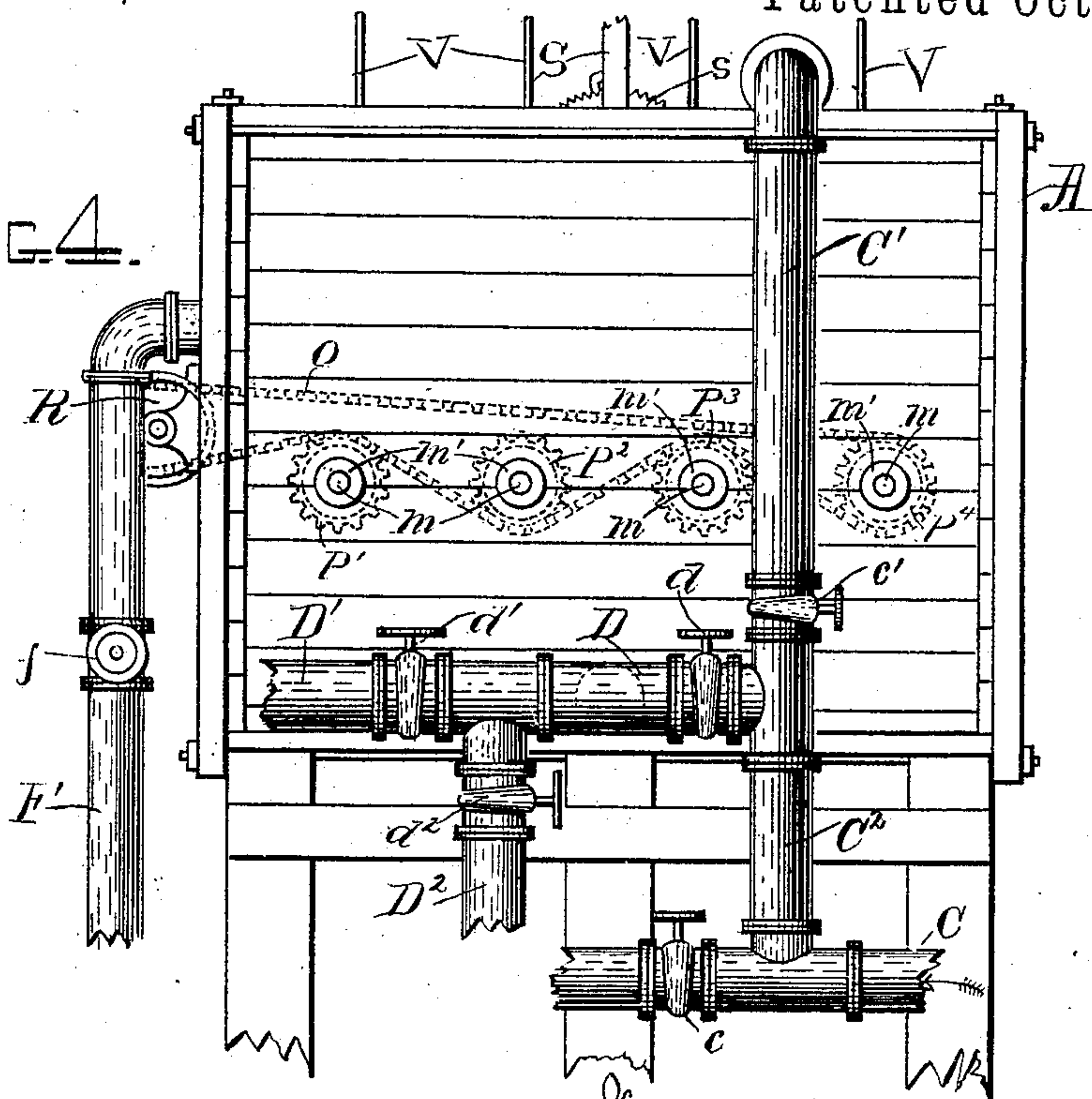
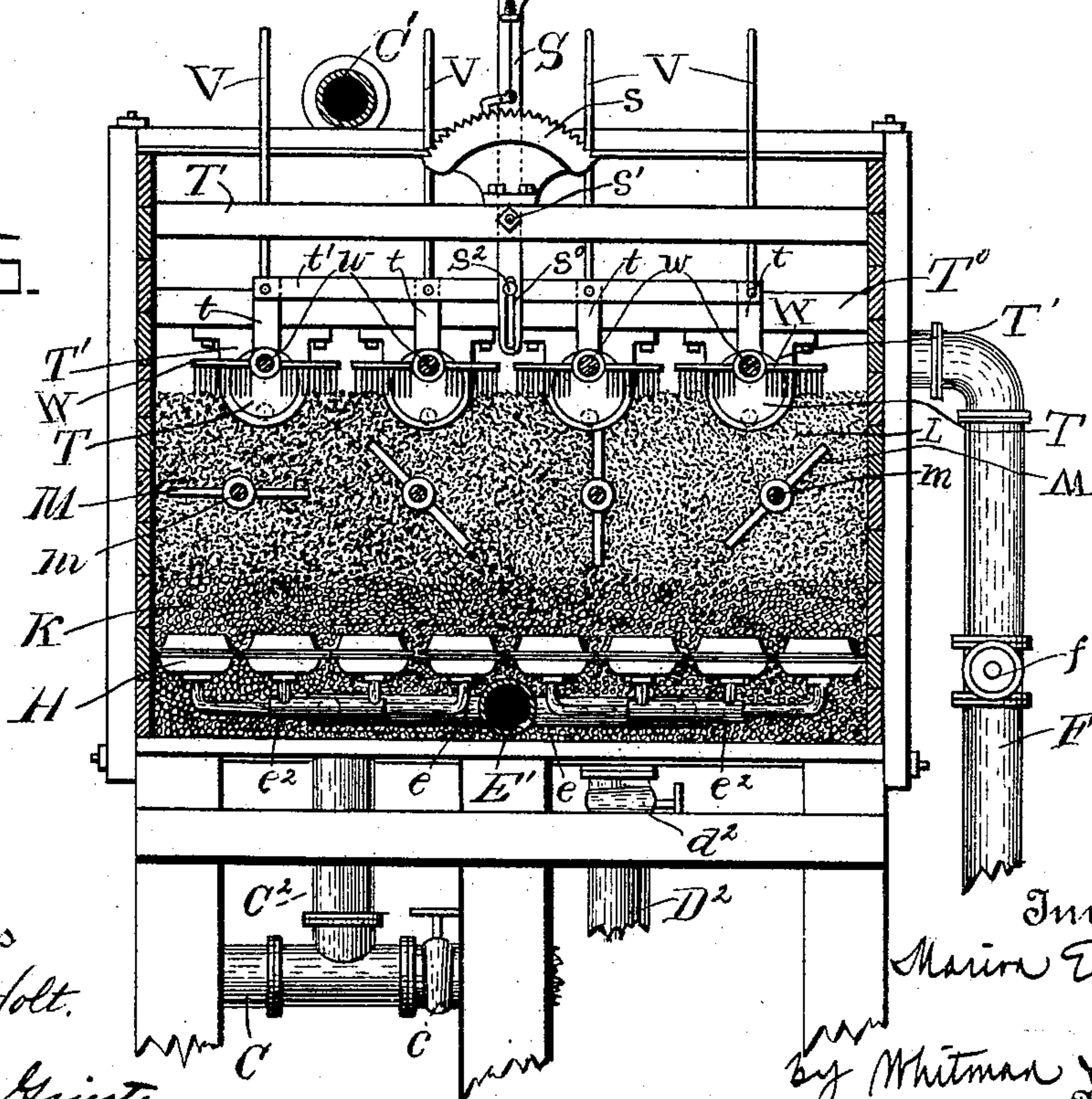


FIG. 5.



Witnesses  
John H. Holt.  
J. Stephen Krieta.

Inventor  
Maurice E. Jones,  
by Whitman & Wilkinson,  
Attorneys.



(No Model.)

6 Sheets—Sheet 5.

M. E. JONES.  
FILTER.

No. 591,279.

Patented Oct. 5, 1897.

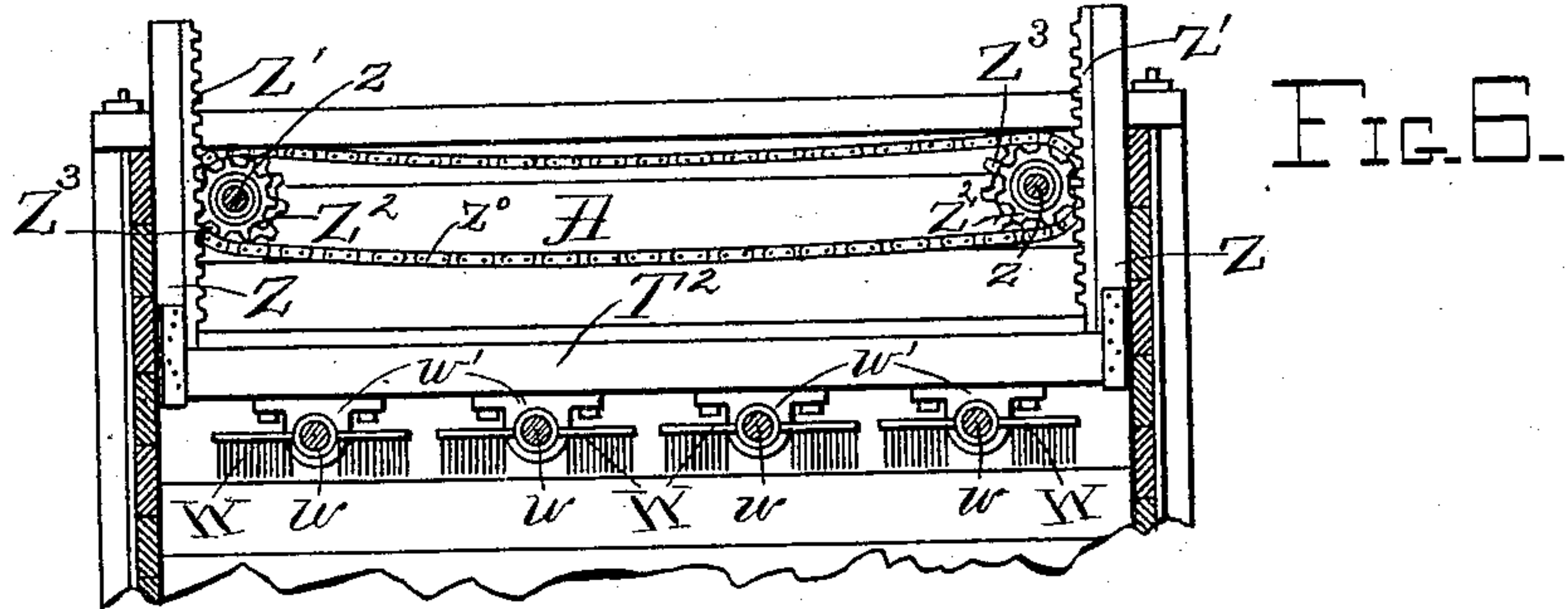


FIG. 6.

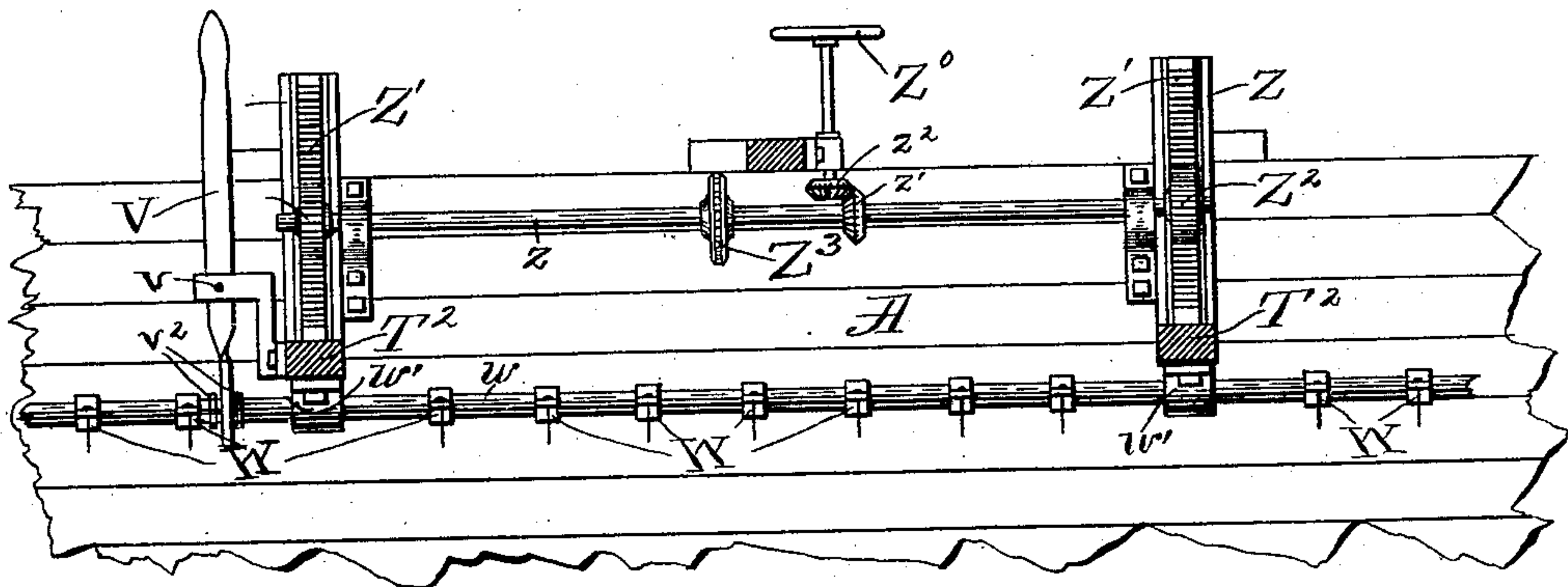


FIG. 7.

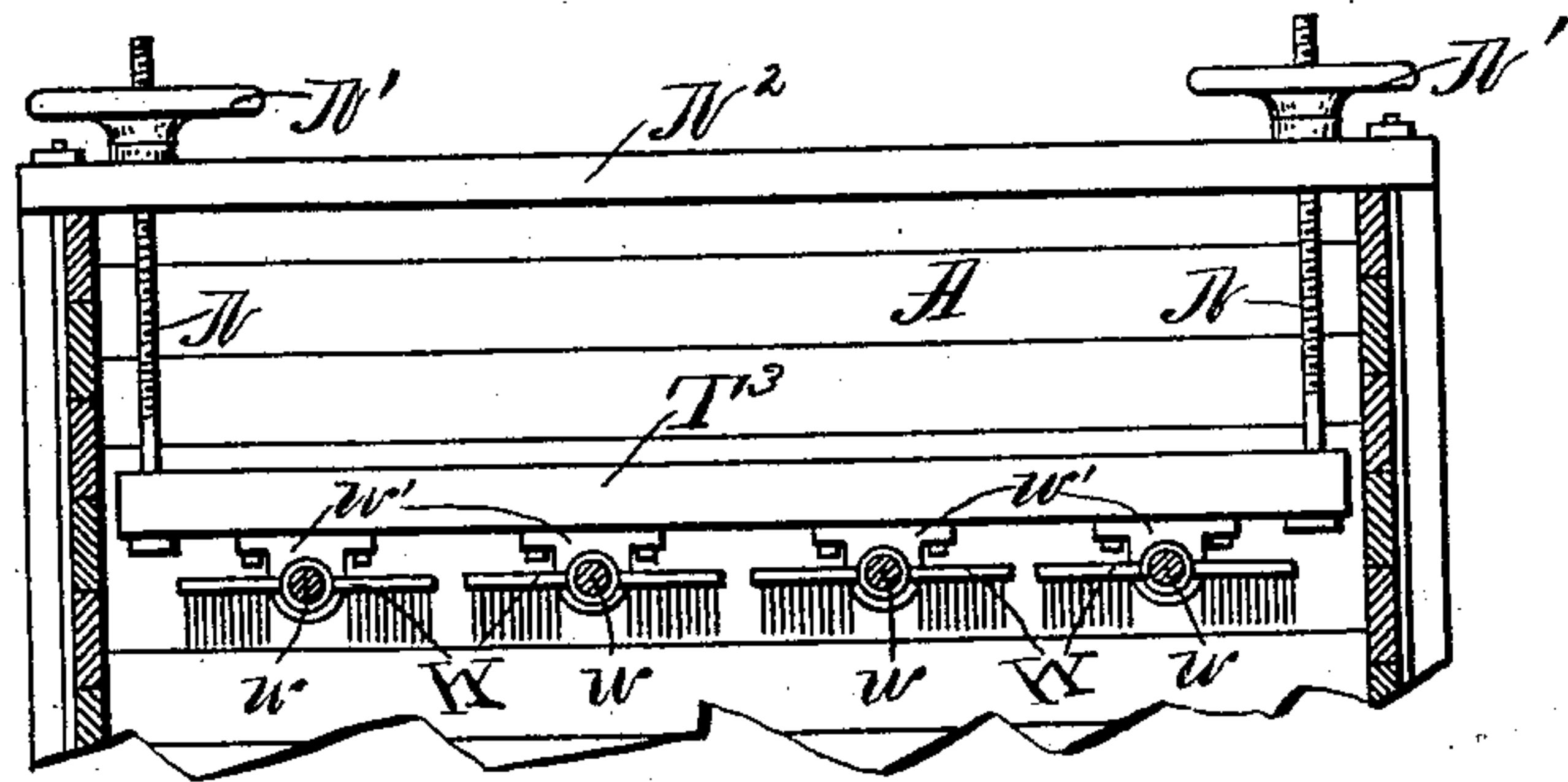


FIG. 8.

Witnesses  
John H. Holt.  
J. Stephen Kinsten.

Inventor  
Marion E. Jones,  
by Whitman & Wilkinson,  
Attorneys

(No Model.)

6 Sheets—Sheet 6.

M. E. JONES.  
FILTER.

No. 591,279.

Patented Oct. 5, 1897.

FIG. 9.

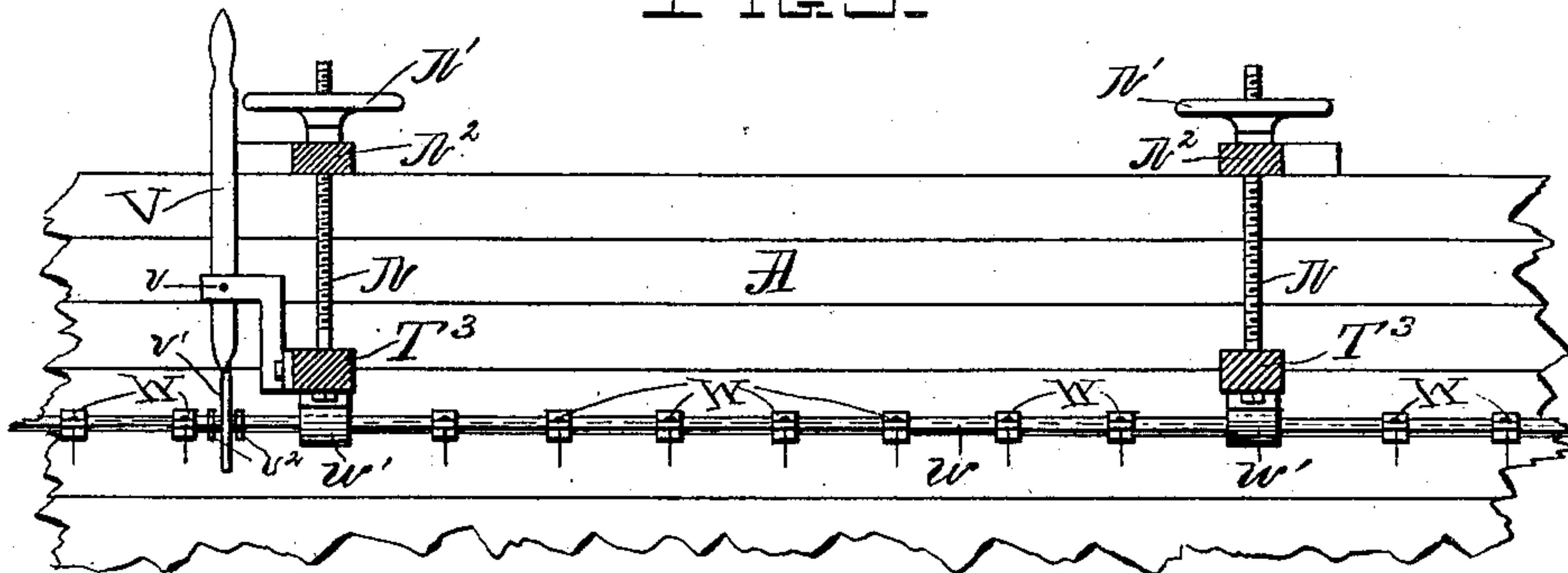


FIG. 10.

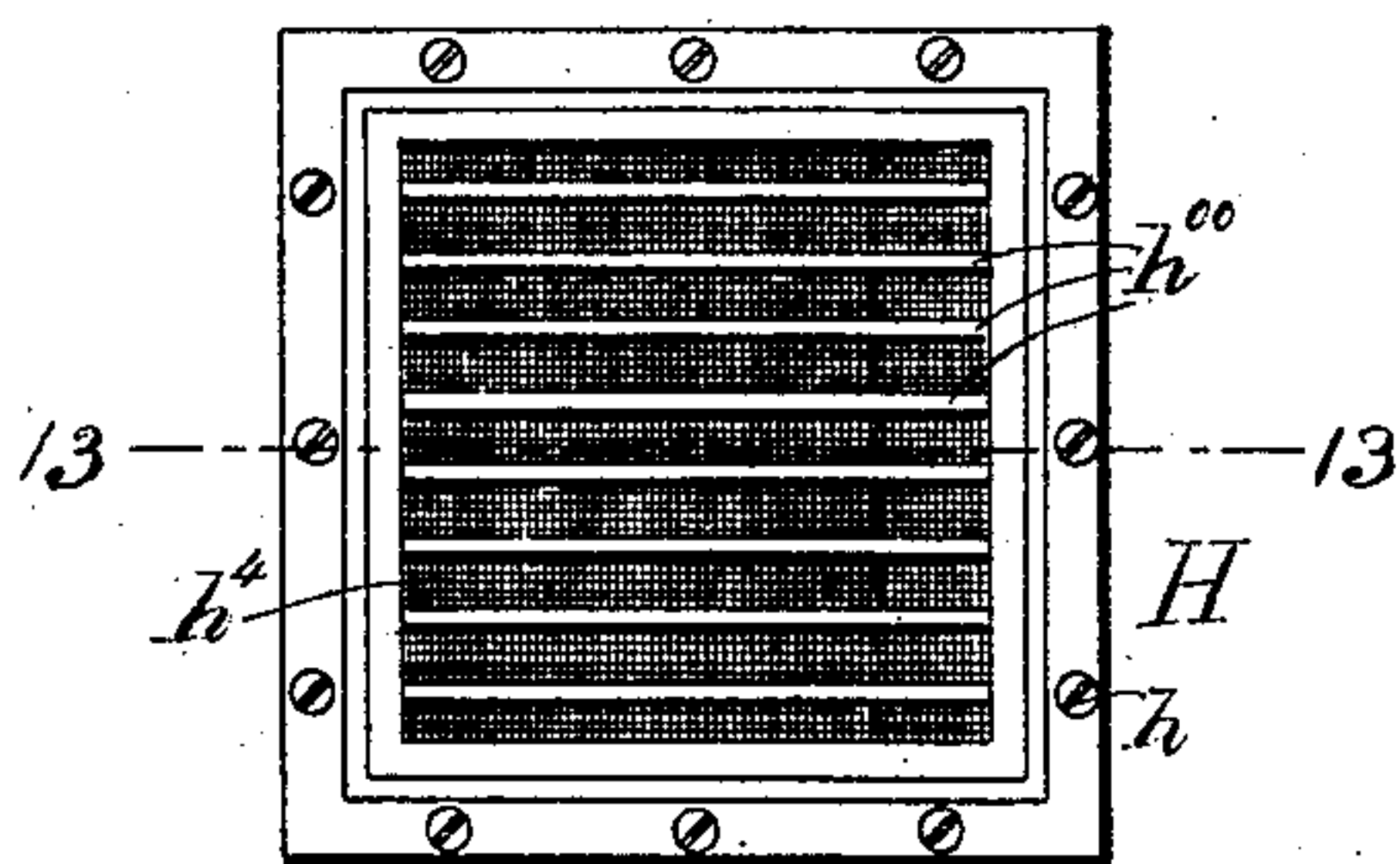


FIG. 11.

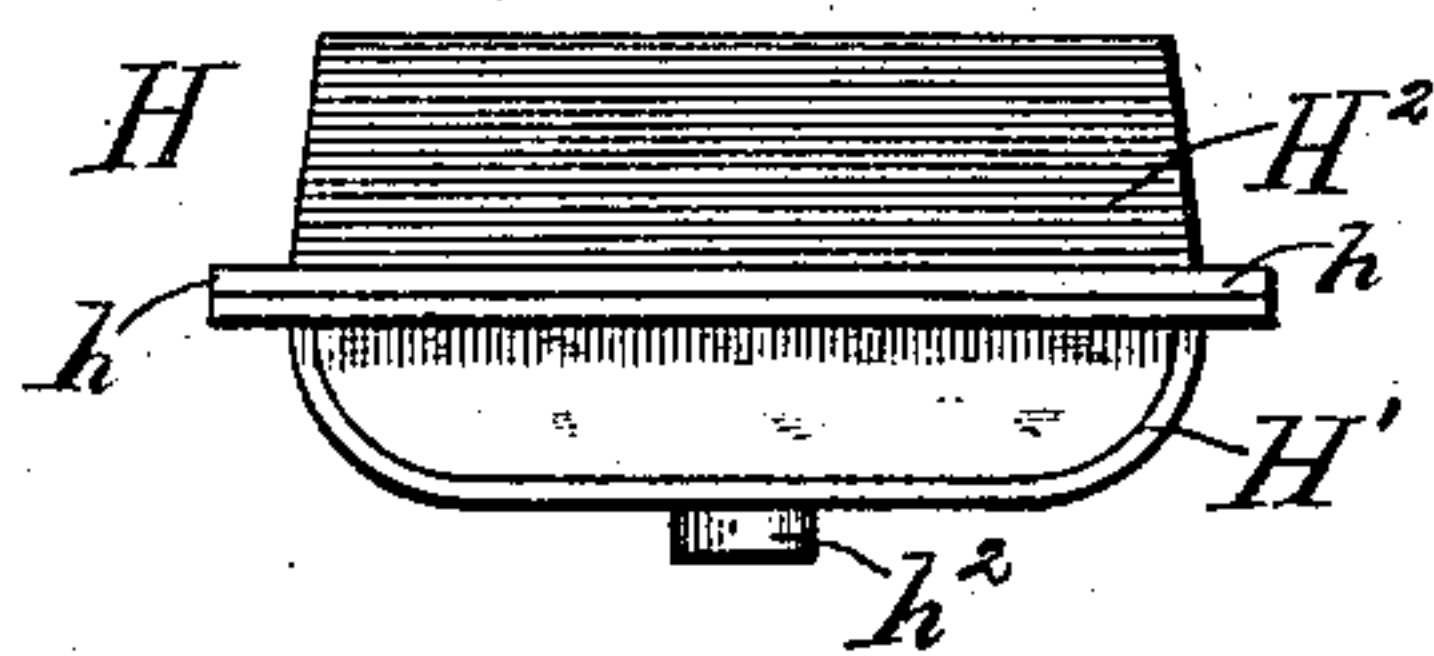
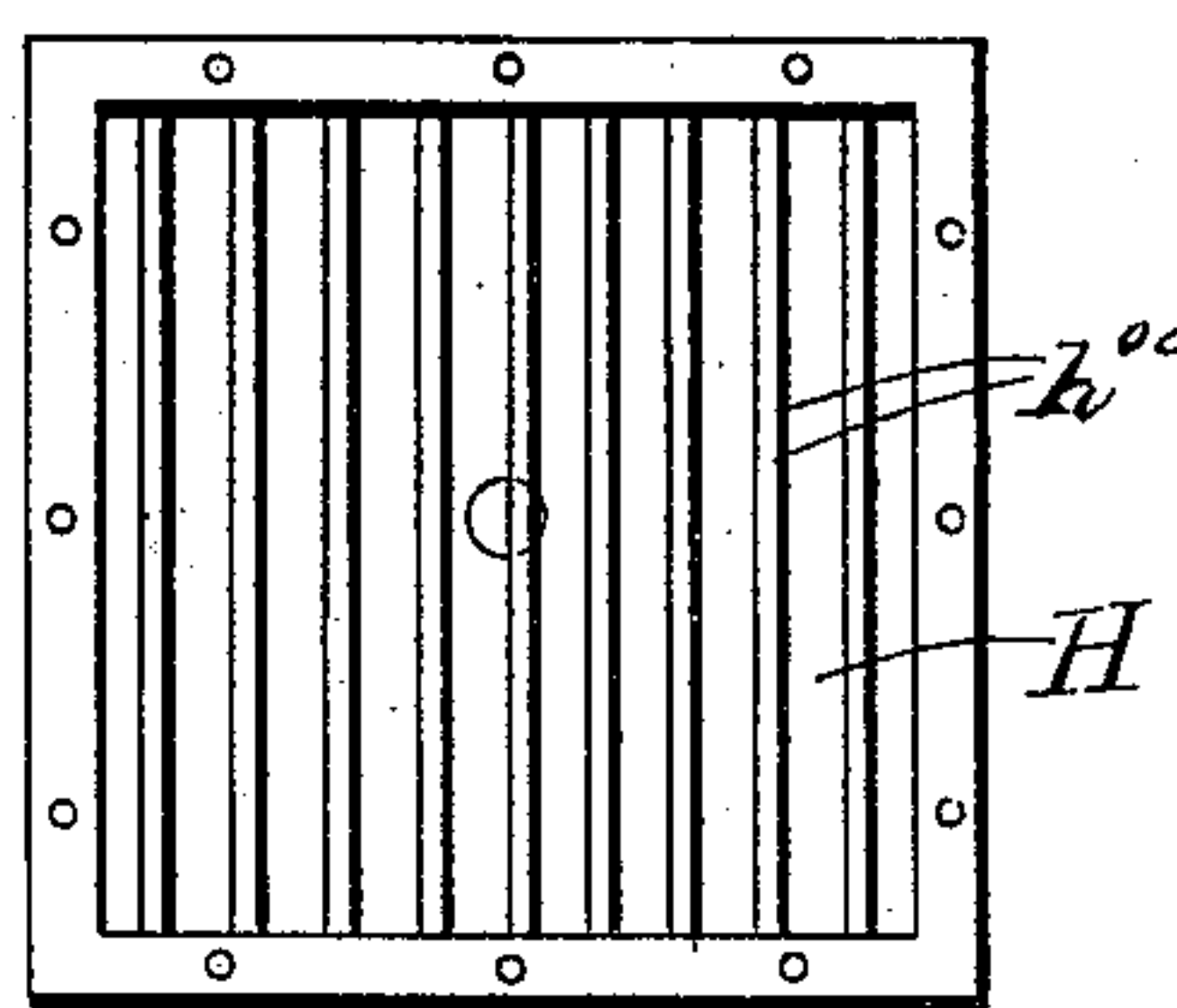


FIG. 12.

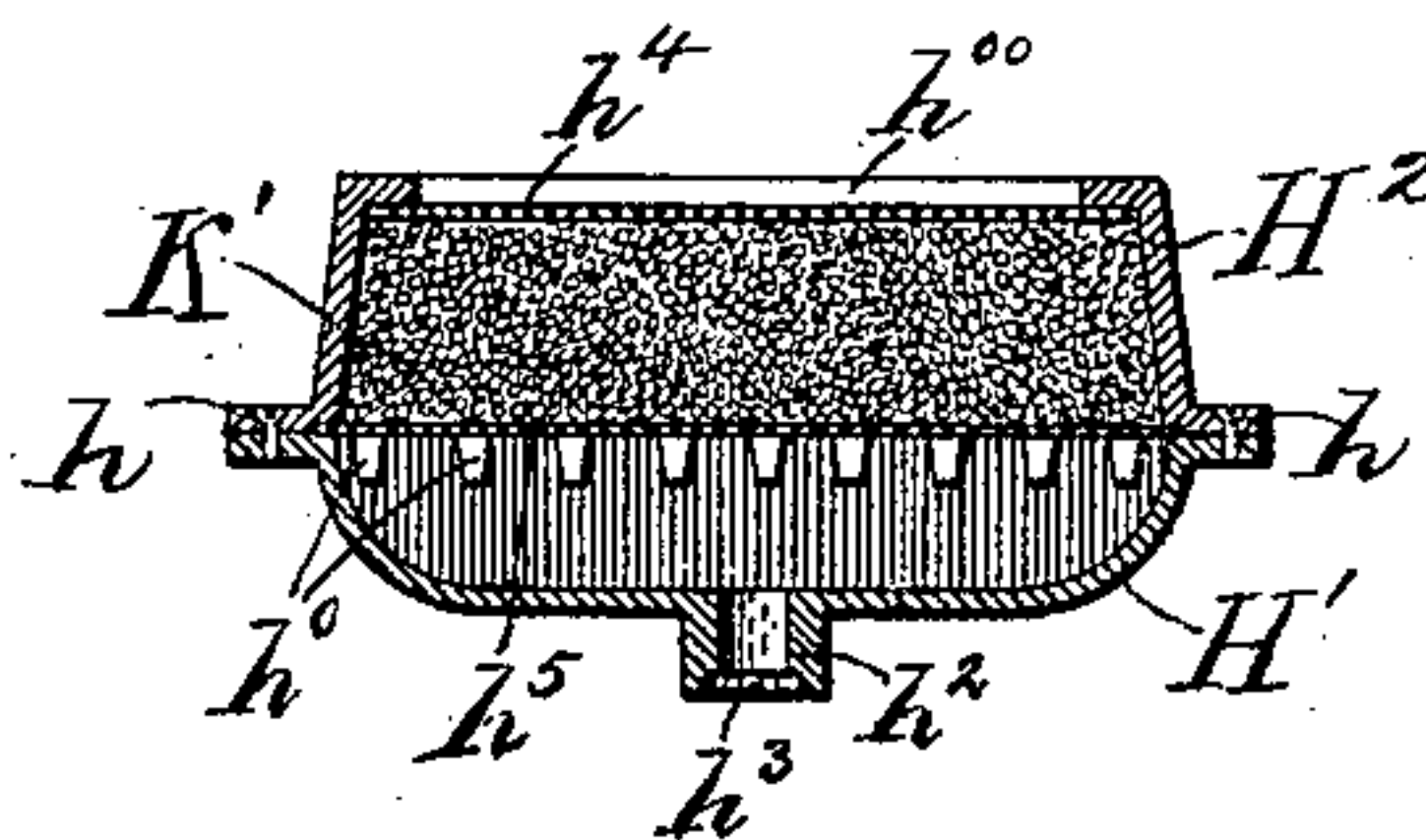


FIG. 13.

Witnesses

John H. Holt.  
J. Stephen Ruster.

Inventor

Marion E. Jones,  
by Whitman & Wilkinson,  
Attorneys.



# UNITED STATES PATENT OFFICE.

MARION E. JONES, OF GADSDEN, ALABAMA.

## FILTER.

SPECIFICATION forming part of Letters Patent No. 591,279, dated October 5, 1897.

Application filed January 8, 1897. Serial No. 618,479. (No model.)

*To all whom it may concern:*

Be it known that I, MARION E. JONES, a citizen of the United States, residing at Gadsden, in the county of Etowah and State of Alabama, have invented certain new and useful Improvements in Filters; and I 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.

My invention relates to improvements in filters, and especially to that class of filters intended for use on a large scale, as in supplying water to towns, factories, and the like, and the said invention consists of certain novel features hereinafter described and claimed.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 represents a side elevation of my improved filter. Fig. 2 represents a section along the broken line 2 2 of Fig. 1 and looking in the direction of the arrow, the gravel and some of the valves being removed to more clearly show the pipe connections. Fig. 3 represents a central vertical longitudinal section of the filter. Fig. 4 represents an end view as seen from the right of Fig. 1. Fig. 5 represents a section along the line 5 5 of Fig. 1 and looking in the direction of the arrow. Fig. 6 represents a detail view in cross-section of another means for raising the rakes from that shown in the preceding views. Fig. 7 represents a longitudinal sectional view of the same device. Fig. 8 represents a detail view in cross-section of another means for raising and lowering the rakes. Fig. 9 represents a longitudinal sectional view of the same. Fig. 10 represents a plan view of the improved valve. Fig. 11 represents a plan view of the bottom portion of the valve, the upper portion being removed. Fig. 12 represents an end view of the valve shown in Figs. 5 and 6. Fig. 13 represents a section along the line 13 13 of Fig. 10.

A represents a box or tank, which may be made either of wood, as shown, or may be made of metal or other suitable material, and which is preferably mounted on a suitable platform or support B.

C represents the main supply-pipe provided

with a delivery-pipe C', opening into the top of the filter, which is controlled by a valve c'. (See Fig. 4.) Connected to this pipe C is a branch pipe D, which is cut off from said pipe C by means of the valve d, which is joined to the clear-water pipe D' and the drain-pipe D<sup>2</sup>, which latter are shut off from the said pipe D by means of valves d' and d<sup>2</sup>, respectively. The pipe E for the water from the filter is connected to this pipe D, as shown in Figs. 2 and 3, and the said pipe E is preferably made of a plurality of portions E', E<sup>2</sup>, E<sup>3</sup>, and E<sup>4</sup>, progressively decreasing in diameter toward the end of the filter away from the delivery end of the pipe E. Each of these sections of the clear-water pipe E E<sup>4</sup> is provided with one or more branch pipes e, and these have branches e', and these branch pipes e' in turn are provided with laterals e<sup>2</sup>, having upwardly-extending openings e<sup>3</sup>, on which openings the valves H are fitted, as will be hereinafter described.

Overflow-pipes F, controlled by valves f, are also provided for the purpose of carrying off the muddy water in the process of washing out. These valves f are normally closed during the operation of the apparatus, as are also the valves d d<sup>2</sup>, the valves c' and d' being open and the flow of water into the filter through the pipe C' and out therefrom through the pipe D' being ordinarily continuous.

On the interior of the filter a plurality of valves H are mounted on the open ends of the pipes e<sup>3</sup>. These valves H (shown most clearly in Figs. 10 to 13) consist of two superimposable parts H' and H<sup>2</sup>, the lower one of which, H', is in the form of a flanged saucer with an opening h<sup>2</sup> in the base thereof expanded, as at h<sup>3</sup>, to fit over the top of one of the pipes e<sup>3</sup>. This lower member H' of the valve is provided with a grating h<sup>0</sup> to support the lower wire screen h<sup>5</sup> of the upper member h<sup>2</sup> of the valve. This upper member is also provided with a flange h and is also secured to the lower member by screws or in any other convenient way. This upper member H<sup>2</sup> comprises a shell with a grating h<sup>00</sup> at the top thereof, and two screens h<sup>4</sup> and h<sup>5</sup>, between which is placed gravel, or sand and gravel K'. Thus the two wire screens are protected from above by the grating h<sup>00</sup> and are supported from below by the grating h<sup>0</sup>,



and the whole forms a strainer which prevents the filter material from passing out with the water. It will be seen from Fig. 2 that these valves are arranged in the bottom of the tank in such a manner as to occupy nearly the whole of the bottom of the filter, thereby obtaining a maximum filter-surface, which in this case is very large. The bed of the filter is filled with coarse gravel K for some distance above the valves H, above which there is a layer of sharp sand L, or, if desired, the gravel may be graded upward, increasing in fineness, and coarse sand may be used beneath fine sand, if desired.

A plurality of shafts  $m$  extend longitudinally through the filter and carry stirring-arms M, which shaft and arms are located in that portion of the filter normally filled with sand, and during the operation of washing out the filter these arms are agitated. These shafts  $m$  are mounted at each end in the stuffing-boxes  $m'$ , and in the middle, if desirable, in the hangers  $m^2$ , carried by the cross-timbers M'. These shafts may be vibrated by any suitable mechanism—such, for instance, as that shown most clearly in Figs. 1 and 4, where  $P^1$ ,  $P^2$ ,  $P^3$ , and  $P^4$  represent sprocket-wheels carried upon the shafts  $m$  and driven by the chain Q from the sprocket-wheel P, which latter is driven by the pulley R. The sprocket P is so geared with the other sprocket-wheels as to rotate those adjacent to each other in opposite directions. It often happens that a layer of mud will be formed over the top surface of the filtering-sand, which retards the free percolation of the water and hence checks the action of the filter. To provide against this contingency, I employ a device whereby the surface of the sand may be scratched, as it were, which at once permits the water to percolate freely. Such a device is shown in the drawings, where W represents a plurality of rakes mounted on the shafts  $w$ , which latter extend longitudinally of the filter. In order that these rakes may be made to sufficiently scratch the surface of the sand, the shafts carrying them are so mounted as to be capable of longitudinal and transverse motion relative to the tank. The depth to which the teeth of the rakes extend into the sand is varied at the same time that the transverse motion is imparted to them. I accomplish these results by mounting the shafts  $w$  in eccentrics T, which latter are mounted in the boxes T', carried by the cross-timbers T<sup>0</sup>. These eccentrics T are each provided with an arm  $t$ , and all of the arms pivoted at their upper ends to the cross-arm  $t'$ . The levers S, provided with sectors  $s$  and pivoted at  $s^0$  to the cross-timbers Y, are slotted, as at  $s^1$ , at their lower ends and there pivoted to the cross-arm  $t'$ , so that when the levers S are thrown to the right or left the eccentrics are thrown accordingly, which shifts the rakes in the same direction and at the same time buries the teeth of the said rakes deeper in the sand, though these

teeth are ordinarily never sunk more than slightly below the surface of sand; but cases may arise where the mud is thick, when it will become necessary to sink them deeper.

Motion lengthwise of the tank is imparted to the shafts  $w$ , and hence to the rakes W, by the levers V, which are mounted on the cross-pieces Y, as at  $v$ , and at their lower ends  $v'$  are bifurcated to engage the shaft  $w$ , upon which the collars  $v^2$  are mounted fast on each side of the levers. The shafts  $w$  being loosely mounted in the eccentrics T, it will be readily seen that by throwing the levers V the said shafts and rakes may be moved longitudinally of the tank.

In Figs. 6 and 7 is shown a means for giving an extended and vertical motion, as well as horizontal motion, to the rakes. In this device the shafts  $w$  are mounted in the boxes  $w'$ , carried by the cross-timbers T<sup>2</sup>. These cross-timbers are secured to the lower ends of the side runners Z, upon each of which is mounted a rack Z', engaging the pinions Z<sup>2</sup>, carried upon the shafts  $z$ . These shafts carry the sprocket-wheels Z<sup>3</sup>, connected by the chain  $z^0$ , so that when one of the shafts  $z$  is rotated by the hand-wheel Z<sup>0</sup> motion is imparted to both shafts simultaneously and the rakes raised. Longitudinal motion may be imparted to the shafts by levers V, similar to those above described.

Another method of adjusting the rakes is shown in Figs. 8 and 9, where the shafts  $w$  are mounted in boxes  $w'$ , carried by cross-timbers T<sup>3</sup>, each end of which timbers engage the lower ends of the screw-threaded rods N, which latter pass through the cross-pieces N<sup>2</sup> and engage the hand-wheels N', screw-threaded to receive the said rods, so that when hand-wheels N' are operated the rakes may be either raised or lowered, as desired. Longitudinal motion in this case, as in the cases above, is imparted to the shafts  $w$  by the levers V, as above described.

The operation of the device is as follows: The filter being charged with filter material, as shown in Fig. 5, the valves  $d$ ,  $c$ , and  $d'$  are closed and the valves  $c'$  and  $d^2$  are open, when water will flow through the pipe C' into the filter and find its way out through the filter material and through the valves H, escaping through the pipes E and D and down through the pipe D<sup>2</sup>, where it will go to waste. As soon as the water running through the pipe D<sup>2</sup> becomes pure, or, in other words, as soon as the impurities originally contained in the filter material are washed out, the valve  $d^2$  should be closed and the valve  $d'$  should be opened and the filtered water should be allowed to flow through the clear-water pipe D' to the reservoir or other place of consumption.

The operation of the filter will now be continuous until impurities begin to appear in the water delivered by the pipe D', when it will become necessary to wash out the filter. To do this, close the valve  $d'$  and the valve  $c'$  and open the valves  $d$  and  $f$ , at the same



time setting the stirrer M in motion. The water will now flow from the pipes C and C<sup>2</sup> into the pipe D and then into the pipe E, whence it will find its way in the reverse direction through the branch pipes up into the bottom of the valves H, whence it will flow upward through the filter material K' and K and L, and will escape through the pipes F to the waste. When it is desired to carry the water off from the pipe C without carrying it through the filter or filter-pipes, the valve c is opened and the valves d and c' are closed. The water in passing upward through the system of filtering material will flow much more freely than in its downward path, especially as the stirrers loosen the sand and will speedily wash upward the mass of accumulated material that has been filtered. As soon as the water flowing through the pipes F becomes comparatively clear the process of washing out may be discontinued and that of filtering may be resumed.

It will thus be seen that I provide an extremely simple, economical, and efficient means of filtering water in large quantities and at the same time of washing out the filter material without the necessity of the frequent changing thereof, which latter is attended with great delay and expense.

The various advantages of the herein-described construction will readily suggest themselves to any one skilled in the art.

It will be obvious that various modifications in the herein-described apparatus might be made which could be used without departing from the spirit of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a filter of the character described, the combination with a box or tank partly filled with filter material, with valves mounted in the said filter material near the base thereof, and filter material contained within said valves, of branch pipes connected to said valves, a clear-water pipe connected to said branch pipes, a waste-outlet connected to said clear-water pipe, a main supply-pipe connected to said clear-water pipe and also opening into the upper portion of the filter-box, overflow-pipes opening into said filter-box, stirrers in said filter material, longitudinal shafts carrying said stirrers, sprocket-wheels mounted on said shafts outside of said tank, a driving-sprocket, a chain connecting the same with the aforesaid sprockets, a plurality of shafts above said stirrers, rakes mounted on said shafts, means for imparting longitudinal, transverse and vertical motion to said shafts and rakes, and valves controlling all of said pipes, whereby the supply of water may be directed either into the upper portion of the filter-box upon said filter material, or may be forced in a reverse direction through the clear-water pipe up through the filter material, whereby water is passed downward through the clear-water pipe and off to waste or to the

reservoir for use, or up through the filter material for washing the same and then off to waste, substantially as and for the purpose described.

2. In a filter of the character described, the combination with a box or tank partly filled with filter material, with valves mounted in the said filter material near the base thereof, and filter material contained within said valves, of branch pipes connected to said valves, a clear-water pipe connected to said branch pipes, a waste-outlet connected to said clear-water pipe, a main supply-pipe connected to said clear-water pipe and also opening into the upper portion of the filter-box, overflow-pipes opening into said filter-box, rotary stirrers embedded in said filter material, longitudinal shafts carrying said stirrers, sprocket-wheels mounted on said shafts outside of said tank, a driving-sprocket and a chain connecting said driving-sprocket to the sprockets on said shafts, a plurality of shafts above said stirrers, rakes mounted on said shafts, eccentrics mounted in said tank and engaging the ends of said shafts carrying the rakes, a lever connected with a plurality of said eccentrics for rocking the same, levers engaging said shafts for imparting longitudinal motion thereto and valves controlling all of said pipes, whereby the supply of water may be directed either into the upper portion of the filter-box upon said filter material or may be forced in a reverse direction through the clear-water pipe up through the filter material, whereby water is passed downward through the clear-water pipe and off to waste or to the reservoir for use, or up through the filter material for washing the same and then off to waste, substantially as and for the purpose described.

3. In a filter of the character described, the combination with a box or tank partly filled with sand and gravel, with valves H mounted in the said gravel near the base thereof, and filter material contained within said valves, or branch pipes connected to said valves, a clear-water pipe E connected to said branch pipes, a waste-outlet D<sup>2</sup> connected to said clear-water pipe, a main supply-pipe C connected to said clear-water pipe and also opening into said filter-box just above said filter material, stirrers in said filter material, longitudinal shafts carrying said stirrers, sprocket-wheels mounted on said shafts outside of said tank, a driving-sprocket and a chain connecting said driving-sprocket to the sprockets on said shafts, a plurality of shafts above said stirrers, and means for supporting the same, rakes mounted on said shafts, means for raising and lowering said rake-shafts and imparting longitudinal motion to the same, and valves c', d, d', d<sup>2</sup> and f controlling said pipes respectively whereby the supply of water may be directed either into the upper portion of the filter-box upon said filter material, or may be forced in a reverse direction through the clear-water pipe up through



the filter material, whereby water is passed downward through the clear-water pipe and off to waste or to the reservoir for use, or up through the filter material for washing the same and then off to waste, substantially as and for the purposes described.

4. The combination with a filter of an agitating apparatus consisting of a plurality of longitudinal shafts mounted in said filter, a plurality of stirrers mounted on said shafts, sprocket-wheels mounted on one end of each of said shafts, a driving-sprocket mounted near said first sprockets, a chain connecting the sprockets on the shafts with said driving-sprocket, a plurality of shafts mounted above the aforesaid shafts, with a plurality of rakes on the said shafts, a plurality of eccentrics mounted in said filter, the said shafts mounted in said eccentrics, arms connected to a number of said eccentrics and a lever connected to said arms for rocking the same, and levers engaging the said shafts for imparting longitudinal motion thereto, substantially as described.

5. The combination with a filter, of an agi-

tating apparatus consisting of a plurality of longitudinal shafts mounted in said filter, a plurality of stirrers mounted on said shafts, sprocket-wheels mounted on one end of each of said shafts, a driving-sprocket mounted near said first sprockets, a chain connecting the sprockets on the shafts with said driving-sprocket, a plurality of shafts mounted above the aforesaid shafts, with a plurality of rakes on the said shafts, a plurality of eccentrics mounted in boxes in said tank and carrying said rake-shafts, a plurality of arms connected to the eccentrics, a cross-arm attached to all of the said arms, slotted levers connected to said cross-arm for rocking said eccentrics, and a lever connected to the said shafts for imparting longitudinal motion to the same, substantially as described.

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

MARION E. JONES.

Witnesses:

W. G. BROCKWAY,

R. J. WHITE.