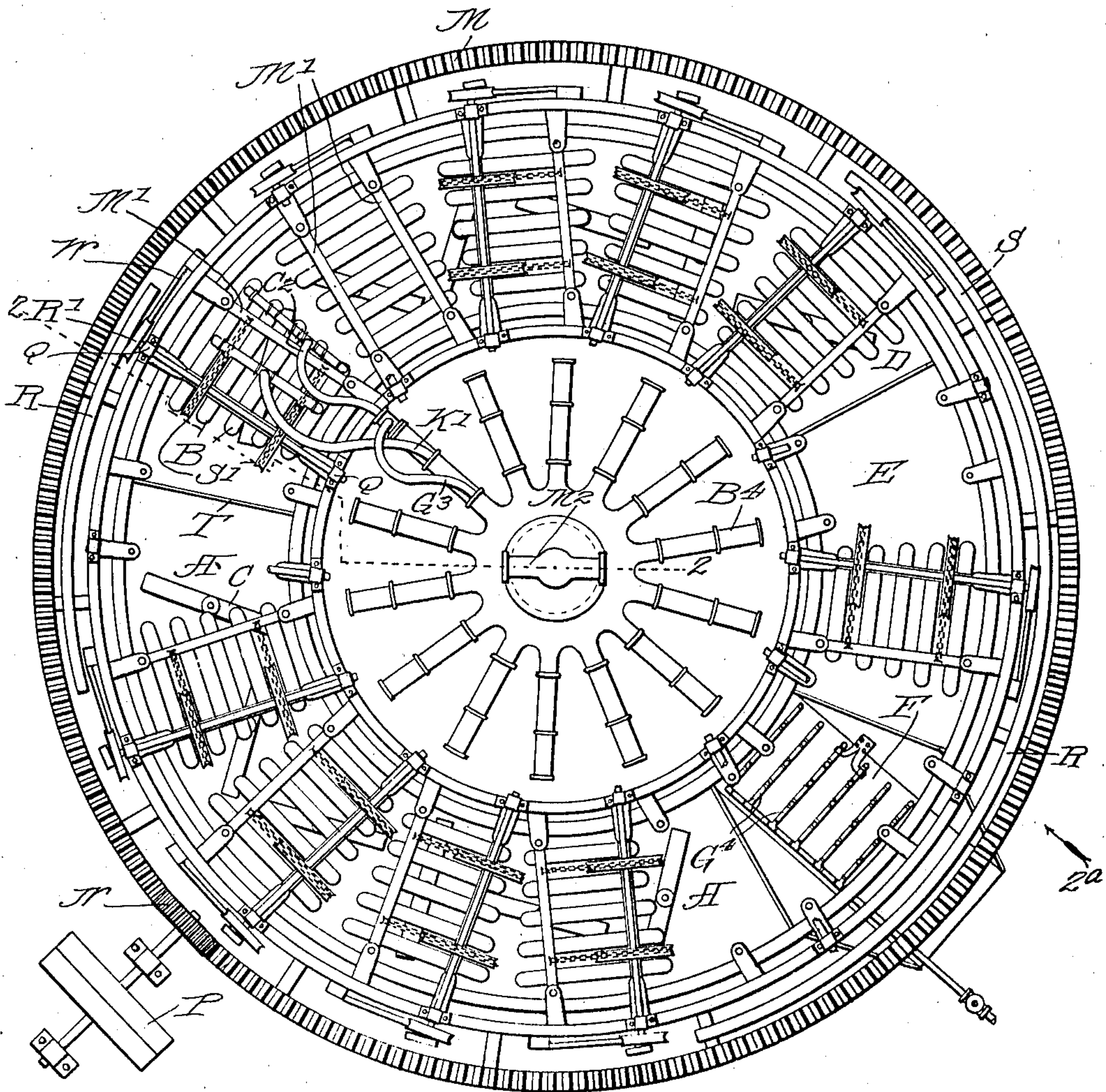


G. RIDGWAY.
 FILTERING MACHINE.
 APPLICATION FILED MAR. 30, 1908.

945,193.

Patented Jan. 4, 1910.
 4 SHEETS—SHEET 1.

Fig. 1.



Witnesses
 E. H. Lichtenberg
 C. A. Crawford

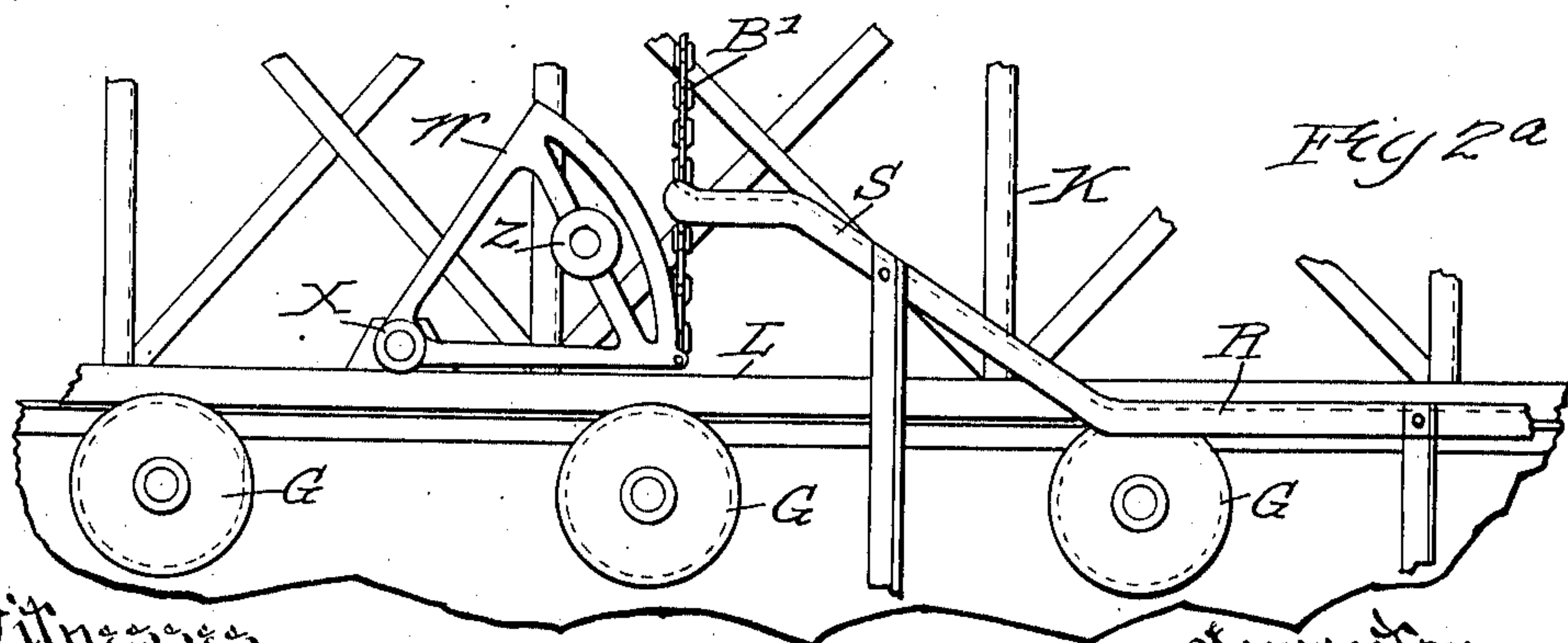
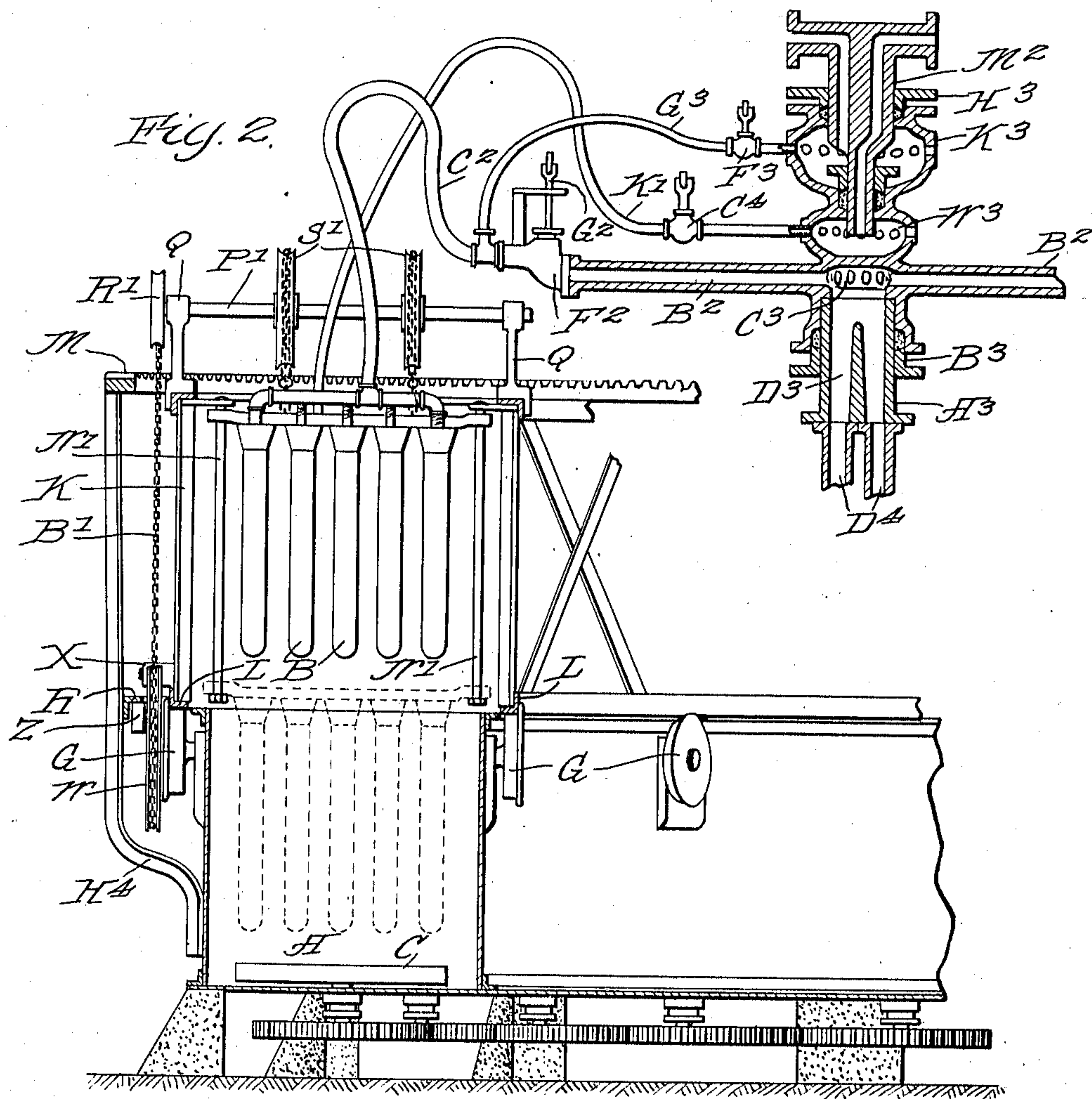
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4 SHEETS—SHEET 2.



Witnesses
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4 SHEETS—SHEET 3.

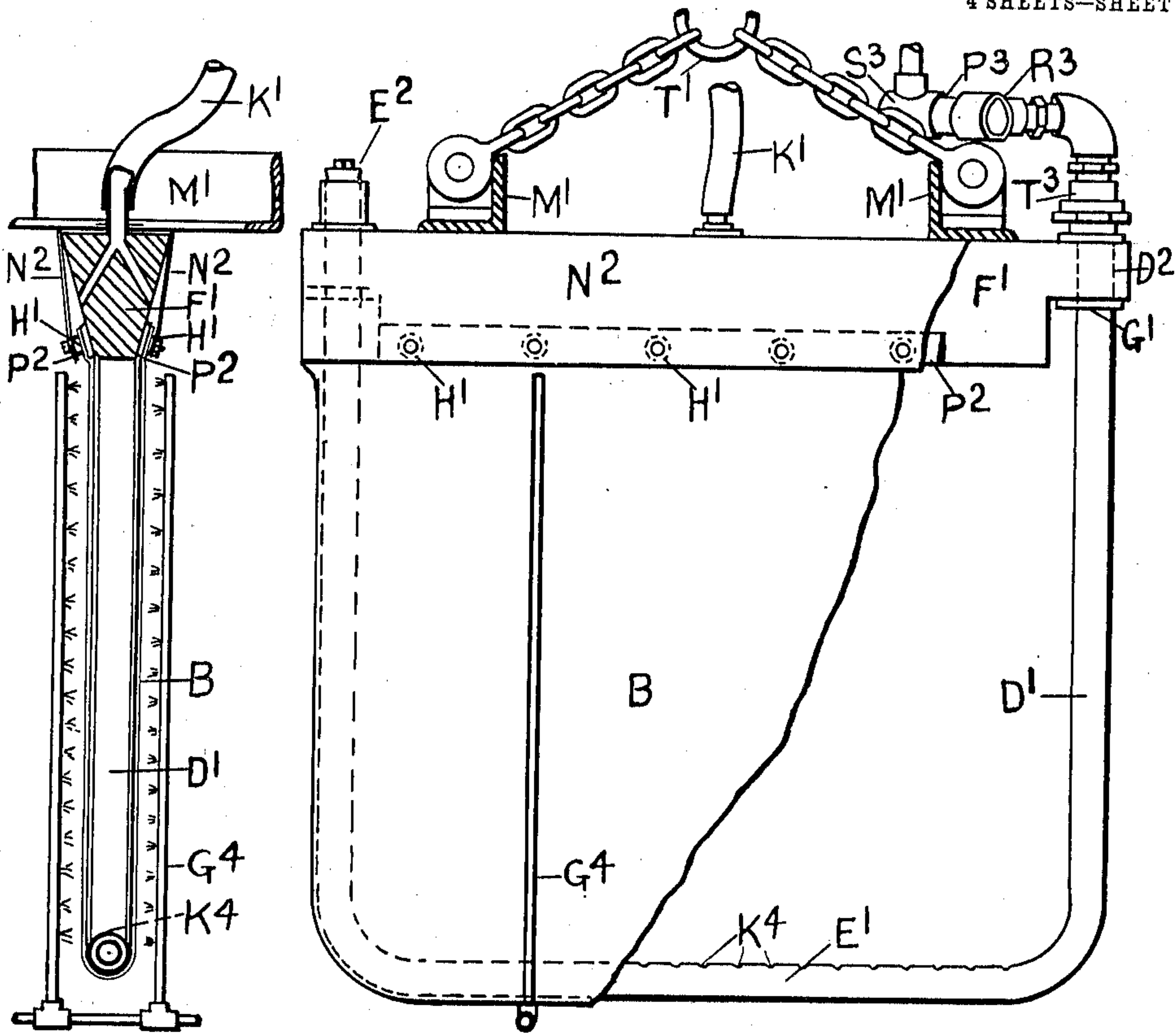


Fig 4.

Fig 3.

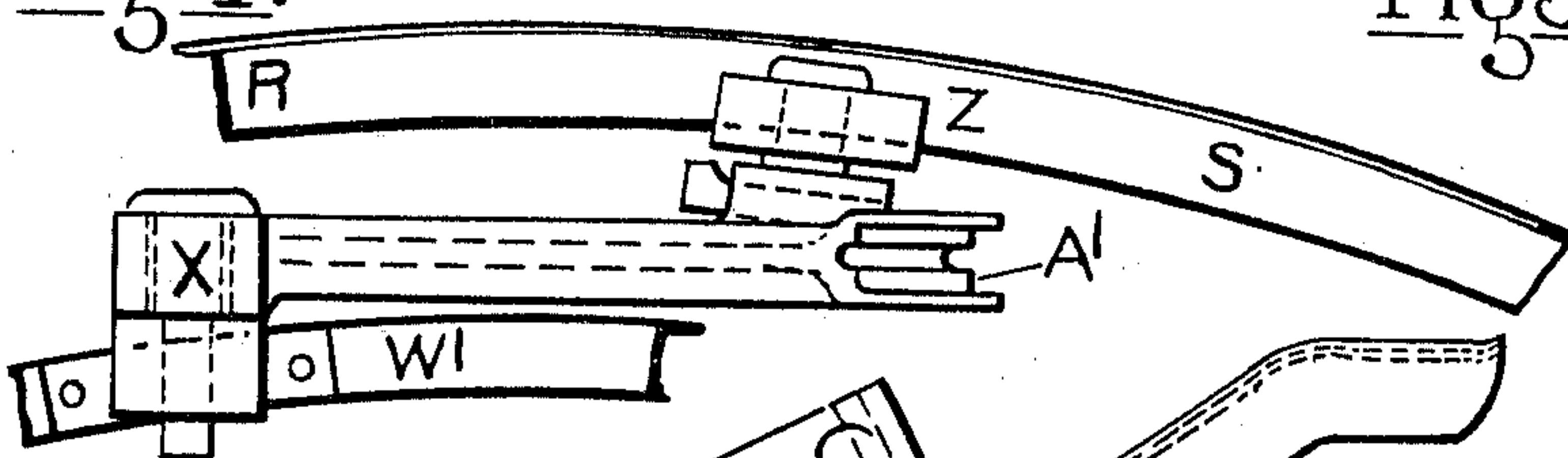


Fig 5.

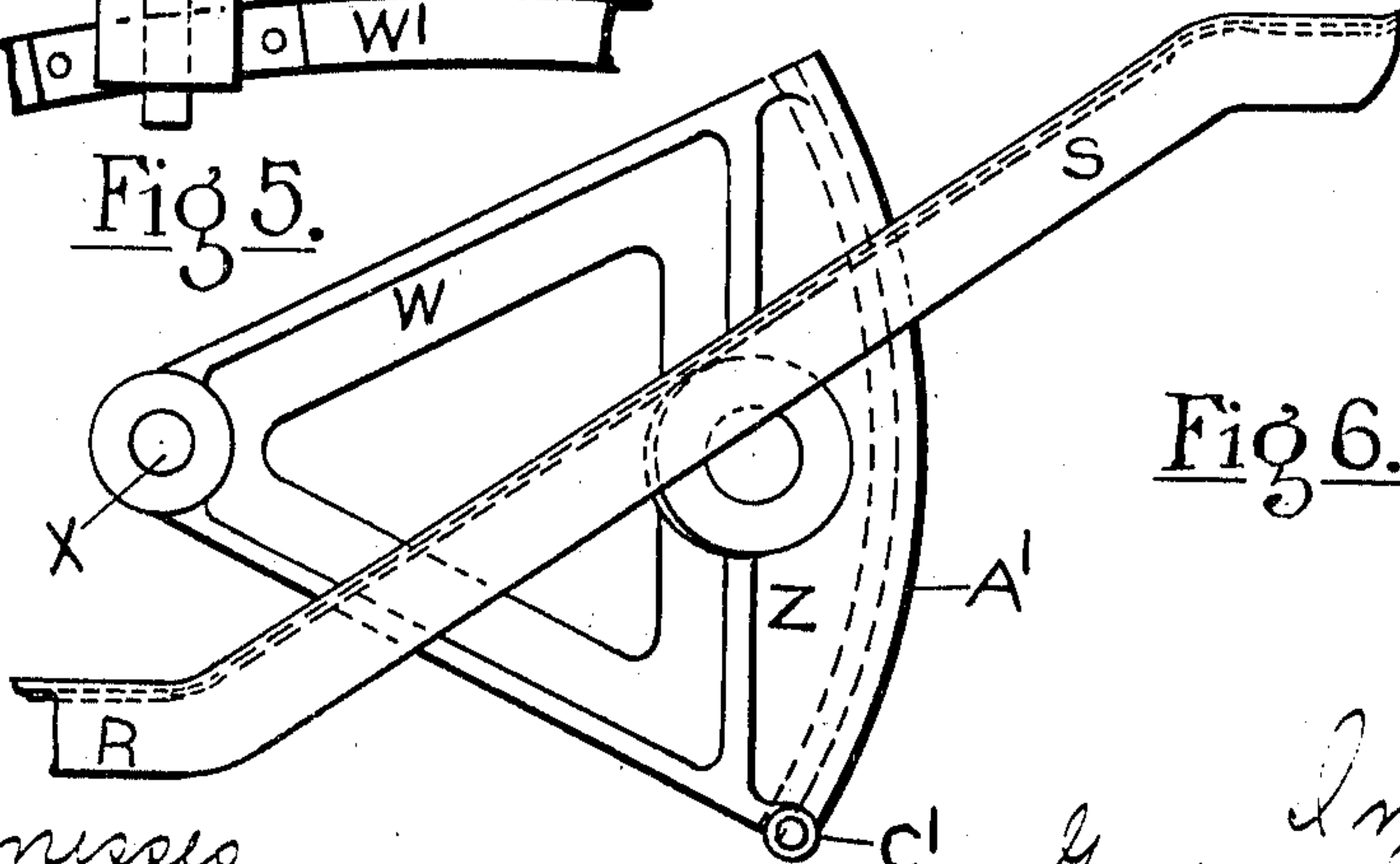


Fig 6.

Witnesses
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1 SHEETS—SHEET 4.

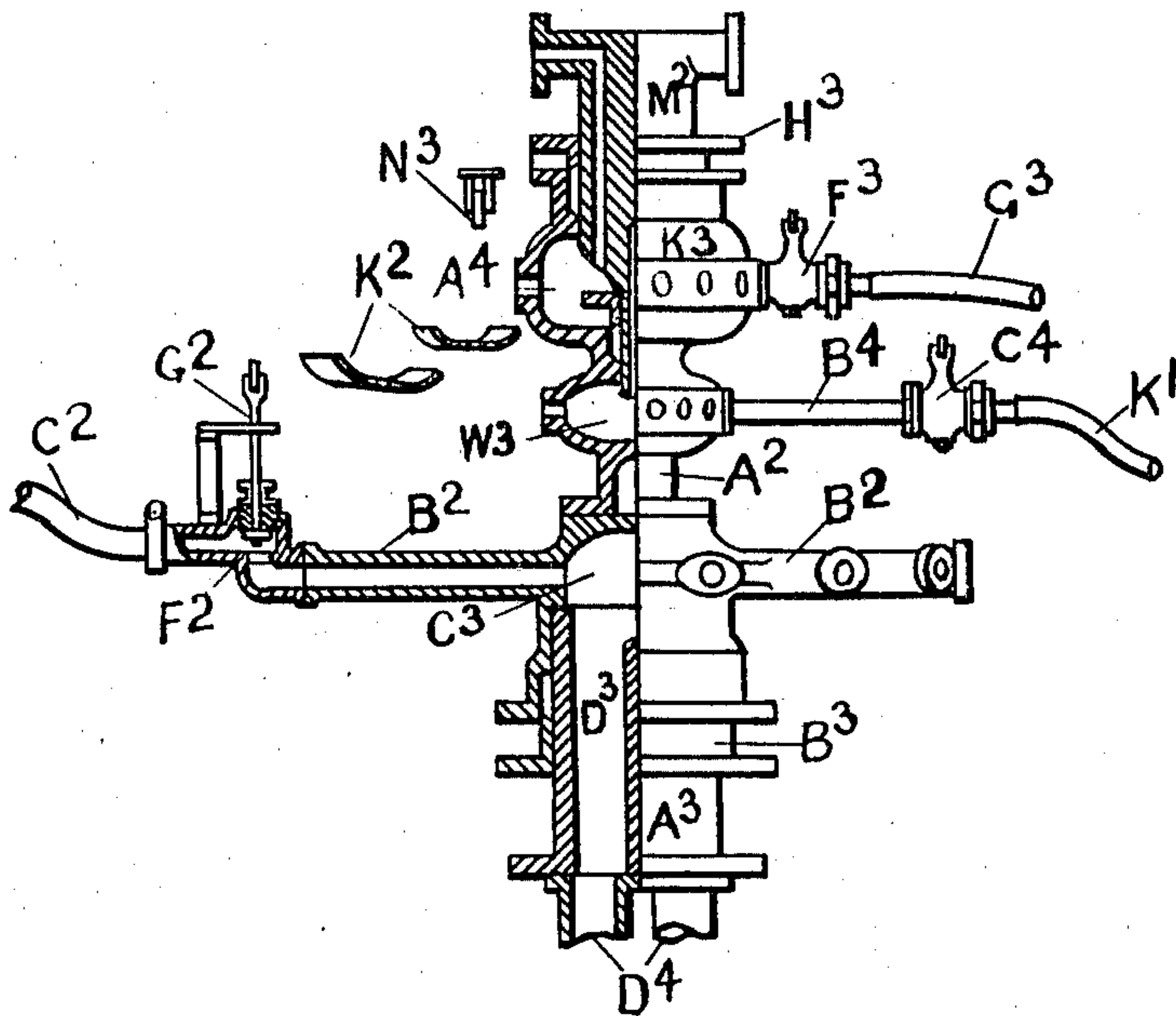


Fig 7.

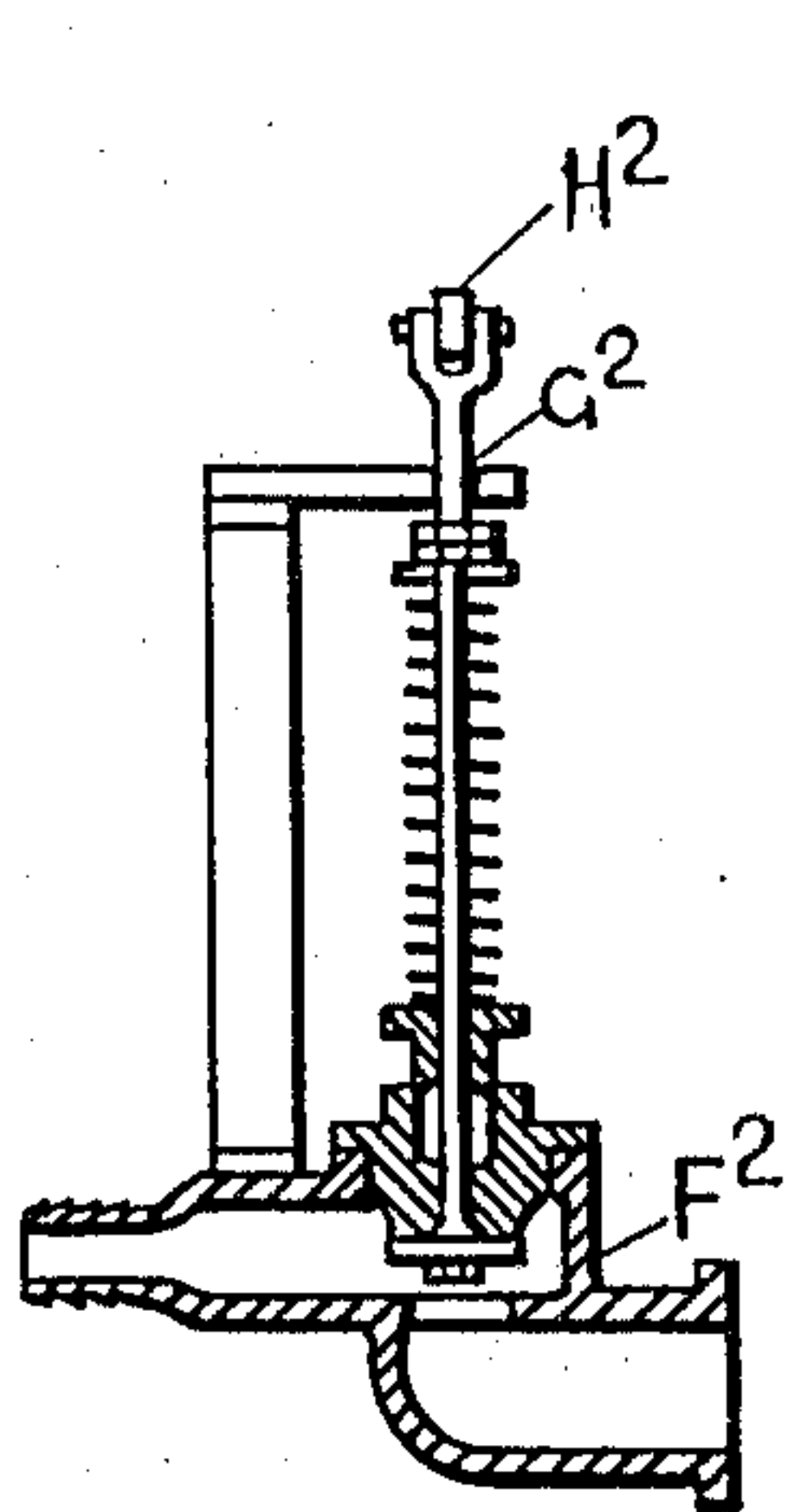


Fig 8.

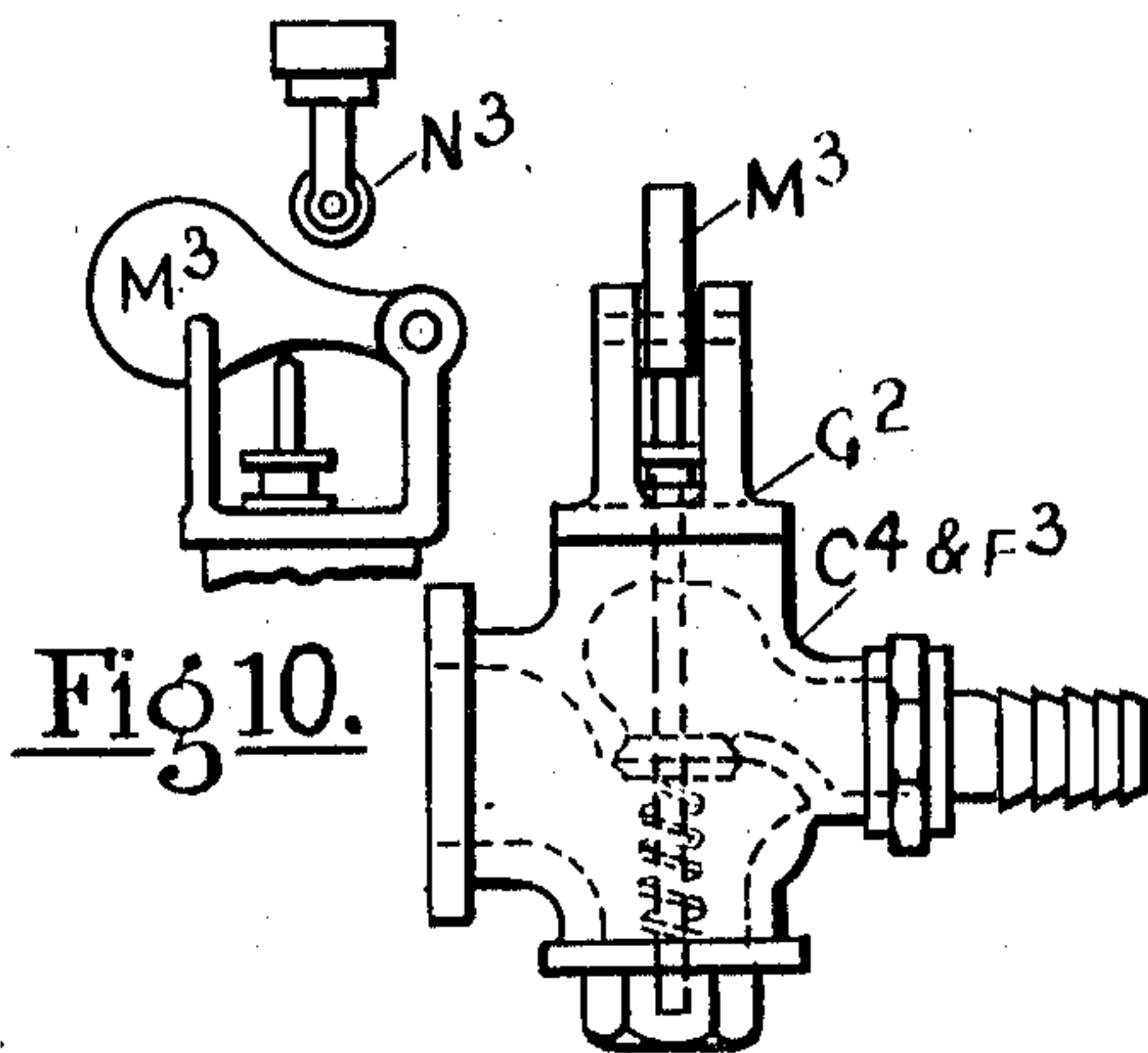


Fig 9.

Witnesses
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 C. Schumann

Inventor
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 by B. Linger Attor

UNITED STATES PATENT OFFICE.

GEORGE RIDGWAY, OF KALGOORLIE, WESTERN AUSTRALIA, AUSTRALIA.

FILTERING-MACHINE.

945,193.

Specification of Letters Patent.

Patented Jan. 4, 1910.

Application filed March 30, 1908. Serial No. 424,172.

To all whom it may concern:

Be it known that I, GEORGE RIDGWAY, a subject of King Edward VII, residing at Kalgoorlie, in the State of Western Australia, Commonwealth of Australia, have invented new and useful Improvements in Filtering-Machines, of which the following is a specification.

This invention relates to improvements in filtering machines for the treatment of pulp and separating the liquid from the solid portions, washing, drying and discharging the same: and it is specially designed to handle a large tonnage while occupying a small space, and to make the action automatic and continuous.

In order that my invention may be clearly understood both as to its construction and the method of operation, I shall describe the same by the aid of the accompanying drawings, in which:—

Figure 1 is a plan view of a filtering machine embodying the main features of my invention. Fig. 2 is a sectional view thereof on lines 2—2 of Fig. 1, with certain of the connections shown in elevation. Fig. 2^a is a fragmentary elevational view looking in the direction of the arrow 2^a of Fig. 1. Fig. 3 is a sectional elevation of a filtering frame. Fig. 4 is a cross section of the same. Fig. 5 is a plan of the quadrant and a portion of the track for guiding it. Fig. 6 is an elevation of the same. Fig. 7 is a half sectional elevation of the central chamber or column. Fig. 8 is a section of the vacuum valve. Fig. 9 is a side elevation of the air and water valves. Fig. 10 is an elevation of the trigger gear for same.

Similar letters are used throughout the drawings to represent corresponding parts wherever they occur.

For the purpose of my invention, I make an annular trough or tank, which I divide into sections or compartments: the section A, being for the reception of the pulp and D, for the reception of the washing fluid. This trough or tank is preferably of rectangular section, and is as large as is necessary to allow of the required number of filtering frames B, being immersed simultaneously for a certain period to obtain the desired thickness of pulp cake. A portion of this annular trough or tank between the pulp and washing sections A and D, I reserve for a drying and dumping space, marked respectively E and F. In the space

F, I fit a hopper to receive and deliver the filtered pulp. I furnish both sections A and D, of this annular trough or tank with agitating appliances as C, operating near the bottom and preferably driven from underneath by means of gear wheels, and on the spindles through the bottom of the trough or tank, I fit stuffing boxes and glands.

At intervals around the outer and inner surfaces, near the top of the annular trough or tank A and D, I fit grooved or flanged rollers as G, whose axles or gudgeons H, are set radially and horizontally. I now make a circular framework K, preferably of rectangular section, rigidly stayed, and underneath which I fit concentric rails L, of such radii as to engage in the grooved or flanged rollers G: To this upper framework K, I attach a circular rack M, of tooth or worm gear, and engage with it a pinion N, or worm attached to a spindle and operated by belt or other convenient drive as P, by means of which the upper framework K, may be revolved above the annular trough or tank A and D, and the drying and dumping space E and F.

To the outside of the drying and dumping space E and F, also opposite the dividing partition T, between the pulp and wash compartments, and set concentrically with the annular trough, I attach guiding tracks R, the middle portion of which are horizontal as at R, and both ends inclined upward as at S; these tracks R are supported on brackets H⁴.

I now make a number of quadrants W, with pivot holes X, at their angles or apices, and I attach rollers Z, to the sides of these quadrants. The peripheries of the arcs of the quadrants are grooved as A¹ to receive a chain B¹, or the like, and lugs and eyes C¹, are formed at one end of the arcs for the purpose of securing the ends of the chain B¹. I now attach these quadrants W, to the lower outside ring W¹, of the revolving framework K, in such a manner that they are free to swing in a vertical plane, and so that their rollers G, engage under the guiding track R.

I now make a number of filtering frames B, each consisting of a pipe D¹, bent in the form of a U with a horizontal bottom as E¹, which I perforate on the upper side as at K⁴; the ends of this U shaped pipe are passed through a bar or block as F¹, and are secured to the same by means of the lock nuts G¹, and unions T³, which also act as

joints for the pipes. In the space between
 the pipe and the block, I place sheets of coir
 matting or some similar porous material,
 and cover the whole on both sides with can-
 5 vas or filtercloth or the like. I make a cap
 or cover as N^2 , preferably of sheet iron, to
 fit over this block F^1 , to the lower edge of
 which I fit a strip of metal P^2 , but held at a
 short distance apart by means of washers H^1
 10 or the like. These strips P^2 are used to
 clamp the top edges of the canvas or filter-
 cloth to the bar or block F^1 . I now attach a
 pipe or hose K^1 , to the top of this cap or
 cover N^2 , and thus when water is admitted,
 15 it will pass between the cap or cover N^2 , and
 the strip P^2 , and permit the water to pass
 over the surfaces of the filtering frames B ,
 in a thin sheet. In addition to this means of
 washing off the cake, I place vertical perfor-
 20 rated pipes G^4 , between each pair of filtering
 frames B , and on the outside of the outer
 and inner frames, and spray the surfaces of
 the frames with jets of water while they are
 over the dumping space F . I place a number
 25 of these filtering frames B , vertically side by
 side but a short distance apart, and hold them
 together by means of a bar or bracket M^1 ,
 the ends of which project beyond the outer
 surfaces of the filtering frames and are bored
 30 so as to engage a vertical rod N^1 , fitted in
 the revolving framework K , so that they
 may be raised into the framework K , or low-
 ered into the troughs or tanks A or D , under
 the said frame. I connect these filtering
 35 frames B , by means of pipes P^3 , tee pieces
 R^3 and unions T^3 , which join them to one
 end of the U shaped pipe D^1 , as at D^2 , and
 the tee pieces S^3 are connected to the vacu-
 um chamber A^3 and the air chamber A^4 . I
 40 set a number of axles P^1 , in bearings Q ,
 across the top of this revolving frame K ,
 and attach thereto pulleys R^1 and S^1 , grooved
 to accommodate chains or the like, and pro-
 vided with means of securing such chains or
 45 the like, to the said pulleys.

One pulley R^1 on each axle P^1 , I place ver-
 tically above the arc of the quadrant W , and
 attach the other end of the chain B^1 secured
 thereto to the pulley R^1 , the chain B^1 being
 50 of such a length that when it has nearly one
 coil on the pulley R^1 , the central radius of
 the quadrant W , is above the horizontal line,
 and when uncoiled or in its lower position,
 the quadrant rollers G , are close up under
 55 the horizontal portion of the track R . The
 other grooved pulleys S^1 , are placed on each
 axle P^1 , vertically above each set of filtering
 frames B , and I suspend these frames B ,
 from the pulleys S^1 by means of the chains
 60 T^1 , or the like, so that when the quadrant
 roller G , is under the track R , the pulley S^1
 will have nearly one coil of chain T^1 , and
 the filtering frames B , will be held in their
 highest position: and as the quadrant roller
 65 G , moves up the incline S , toward the end of

the track, the filtering frames B , are allowed
 to fall to their lowest position coming to rest
 by their cross bars M^1 , on the lower ring
 W^1 , of the revolving frame K , and remain-
 ing in that position until the quadrant rollers 70
 G , engage in the inclined portion S , at the
 other end of the track R , which depresses
 the quadrant W , and consequently raises the
 filtering frames B , to their highest position.
 A set of frames B , will of necessity be of 75
 greater weight than one quadrant W . I
 place as many of these series of filtering
 frames B , in the machine as it will accom-
 modate, and I place them so that their sur-
 faces are circumferential, and they thus pre- 80
 sent their edges to the pulp and wash solu-
 tions as they pass through it.

In the center of this machine I place a
 chamber A^2 , portion of which revolves with
 the machine, and is connected to a fixed por- 85
 tion or base A^3 , by means of a packing box
 and gland B^3 , and supported by a bearing
 ring with ball or roller bearings. This cen-
 tral chamber is divided into three compart-
 ments, each of which is connected to the fil- 90
 tering frames B , by means of pipes valves
 and flexible hose. One compartment C^3 , is
 for the vacuum and is connected by the radial
 pipes B^2 , valves F^2 and hose C^2 , to the filter-
 frames B ; this portion is directly connected 95
 to the fixed portion or base A^3 , which is di-
 vided into two parts by a vertical partition
 D^3 , for the purpose of receiving and deliver-
 ing the solution drawn from the pulp sepa-
 100 rately from that drawn through the cake in
 the process of washing. This fixed portion
 is connected to a vacuum pump or similar
 machine through the branches D^4 . The up-
 per compartment is for compressed air, and
 is connected to the vacuum hose C^2 , and thus 105
 to the filtering frames B , by the valves F^3
 and the hose G^3 . The third compartment
 W^3 , is for water and is connected to the
 caps or covers N^2 , on the filtering frames B ,
 by the pipes B^4 , valves C^4 and flexible 110
 hose K^1 . The air and water are admitted to
 these chambers A^4 and W^3 , by means of a
 double port pipe M^2 , and two packing boxes
 and glands H^3 and K^3 . Each one of these
 radial pipes for the vacuum, air and water is 115
 fitted with a valve of such construction, that
 when its spindle G^2 is depressed, the vacuum
 valve F^2 is closed and the compressed air
 and water valves C^4 and F^3 are opened, and
 to the top of these valve spindles are fitted 120
 rollers as H^2 or triggers as M^3 , which at
 stated periods in the revolutions of the ma-
 chine, run under short tracks or plates as
 K^2 , or in the case of the triggers M^3 , under a
 roller as N^3 , thus opening or closing them at 125
 the time and for the length of time that the
 circumstances require. Connections from the
 vacuum pump, compressed air and water
 supply are made to this central chamber A^2 ,
 by means of packing boxes B^3 , H^3 and K^3 .

through the medium of the fixed portion A³, and the pipe M², enabling the central chamber to revolve while the base A³ and the pipe M² remain stationary.

5 The method of operating my invention is as follows:—I fill the first portion of the annular trough or tank A, with the pulp required to be filtered, and the second compartment D, with the water or wash solution, and set the machine in motion. The agitators C
10 in the pulp and wash tanks A and D, keep the solid particles of the pulp in suspension. All the filtering frames B, that are not in contact through their quadrant rollers G,
15 with the track R, are immersed in the pulp and wash tanks A and D, and the valves F² in the radial pipes B², are open and the compressed air and water valves F³ and C⁴, are closed, thus the frames B, are subjected
20 to the action of the vacuum and the liquid matter is sucked through the filtering medium of the frames B, and the perforations K¹, in the U shaped pipes D¹, into the vacuum chamber and delivered by the pump where
25 required. The solid matter accumulates on the filtering medium in the form of cakes or layers. On each of the series of filtering frames B, reaching near to the ends of the troughs A or D, the quadrant roller G belonging to that series engages the track R, at
30 the point S, and passing down to the horizontal portion, raises that series of frames out of the trough or tank; At the same time other frames disengaging from the said track
35 at the other end are lowered into the trough or tank: Thus the frames are lowered into the pulp tank A, and are carried along in it, and on reaching the end of the said tank are raised over the partition T, and lowered into
40 the wash tank D, and conveyed through it and again raised out of it and then carried along in the elevated position until again lowered into the pulp tank A. The vacuum is still retained in these frames B, while they
45 are over the drying space E, and thus the greater portion of the moisture is sucked out of the pulp. On reaching the discharge hopper F, the vacuum valve F² in the radial pipe B² engages with the track or plate K²,
50 and by depressing the spindle G², closes it and at the same time the compressed air and water valves F³ and C⁴, are engaged by their respective tracks F⁴ and E⁴, and compressed air is thus admitted to the inside of the filtering
55 frames B, thus loosening or cracking the cake or layer of pulp and the stream of water flowing down the filtering surfaces removes the cake or layer which drops into the hopper F, and is removed by sluicing, pumping
60 or other means. When each series of filtering frames B, has passed the discharge hopper F, the valves are disengaged from their tracks, plates or rollers, and the air and water valves closed and the vacuum valves opened,
65 as the frames B are immersed in the pulp

tank A, to receive another cake, and thus the process is repeated continuously.

In the event of requiring to use my machine for washing and drying pulp only, such as treatment after other machines or processes, as in the case of treating metalliferous slimes or ores, I would dispense with the annular trough D, or properly speaking the partition T, and the track R opposite to it, in which case when the frames B, were
70 raised from the pulp tank A, they would be supported in the elevated position until dried and dumped. The action of the valves would be similar to the former method.

I am aware that prior to my invention vacuum filtering machines have been used in which the filtering frames have been immersed in pulp tanks, I therefore do not claim such a combination broadly; but

What I claim as my invention, and desire to secure by Letters Patent, is:—

1. In improvements in filtering machines, annular trough or troughs fitted with agitator gear, a drying space and dumping hopper, a set of rollers radially arranged on
80 said trough, a circular framework carried on said rollers and operated by gearing, guiding track or tracks attached to said trough, quadrants attached to said revolving framework with vertical action, chains or
85 ropes attached to said quadrants and carried on the peripheries of their arcs, spindles or axles arranged on said revolving framework having grooved wheels connected with the said quadrant chains, also grooved
90 wheels from which filtering frames are suspended, filtering frames having caps or covers with slots or openings contiguous to the filtering surfaces, a central chamber with three compartments, pipes and hose connections from the central chamber to the filtering
95 frames, valves in said pipes and tracks, means for actuating said valves, spraying pipes arranged to spray the filtering surfaces, the whole comprising a pulp filtering machine for automatically carrying, raising
100 and lowering the filter frames, filtering, washing and drying the pulp and dumping the residues, as described and illustrated in the accompanying drawings.

2. In improvements in filtering machines, an annular trough divided into compartments and fitted with agitating appliances, a circular carriage carried on rollers above
105 said annular trough and arranged to revolve concentrically, filtering frames adjustably suspended in the said circular carriage, chain and axle gear actuated by a guiding track as means of raising and lowering the
110 said filtering frames out of and into the said annular trough while being carried around by the said circular carriage, a central column divided into compartments separately connected to the said filtering frames, valves
115 and tracks for actuating same, automatically

opening and closing connection between said filtering frames and central column and chamber, a cap or cover on said filtering frames arranged to distribute water over the filtering surfaces, and perforated pipes arranged to spray the filtering surfaces substantially as shown and for the purpose specified.

3. In improvements in filtering machines, an annular trough or tank divided by a partition into compartments and fitted with agitating appliances, an annular carriage carried on flanged or grooved rollers above said annular trough, concentric rails fitted to carriage running on said flanged or grooved rollers, gearing revolving the annular carriage concentrically above said annular trough, filtering frames adjustably suspended in said annular carriage, chain axle and quadrant gear actuated by rollers and guiding track as means of raising and lowering out of and into said annular trough while being carried around by the said carriage, a central column or chamber divided into compartments for compressed air, water supply and vacuum, packing boxes and glands on stationary parts and pipes, permitting portions to revolve with the carriage, pipes, hose and valve connections from separate chambers in the said column to the filtering frames, means for actuating the said valves, automatically opening and closing connection between the filtering frames and central column, a cap or cover on filtering frames arranged to distribute water over the filtering surfaces and perforated pipes for spraying the same while over the dumping space, as described and illustrated.

4. An annular trough or tank or series of segmental troughs fitted with agitators, drying space and dumping hopper in combination with a concentrically revolving frame or carriage, fitted with adjustably suspended filtering frames, chain and axle and means for automatically immersing the said filtering frames in the said trough or troughs and raising them therefrom, guiding tracks for actuating same, a central column having separate compartments, connections therefrom having valves, means for automatically opening said valves, means for connecting the filtering frames with a source of pressure supply or vacuum, compressed air or water, a fixed base with gland box and a dividing partition for separate solutions, also spraying pipes in juxtaposition to filtering frames over the dumping space, thereby filtering pulp, washing, drying and dumping the same, automatically and continuously as described and illustrated.

5. A filter comprising in combination, a circular tank provided with partitions dividing it into a pulp section, a wash section, a drying section and a dumping section provided with cam tracks, a circular frame ro-

tatably mounted on said tank, a plurality of sets of filters movably suspended from said frame, filter lifting members connected with said filter and carried by said frame and actuated by said cam tracks for lifting said filters over said partitions, an upper stationary member connected with a source of supply of compressed air and water, a lower stationary member connected with a vacuum creating device, an intermediate member rotatably mounted on said upper and lower stationary members and provided with a compressed air chamber and a water chamber communicating with said upper member and a vacuum chamber communicating with said lower member, valved connections between said filter and said air, water and vacuum chambers, and means for automatically operating said valves to effect and cut off communication between said filter and chambers at predetermined times.

6. A filter comprising in combination, a circular tank provided with partitions divided into a plurality of sections, cam tracks engaging said tank, a circular frame rotatably mounted on said tank, a plurality of sets of filters movably suspended from said frame, filter lifting members connected with said filters and actuated by said cam shaft for lifting said filters over said partition, stationary members connected with a source of supply of compressed air, water and a vacuum creating device, a rotatable member mounted in said stationary member and provided with an air, water and vacuum member communicating with said stationary members, valved connections between said chambers and cylinders, and means for actuating said valves at predetermined times.

7. A filter comprising in combination, a circular tank divided into sections, a frame rotatably mounted above said sections, filters movably suspended from said frame and adapted for immersion in said sections, cam tracks, filter lifting members connected with said filters and actuated by said cam tracks for lifting said filters, connections between said filters and a source of pressure supply of air and water and a vacuum creating device, and means for controlling communication between said filters and said air, water and vacuum creating device.

8. A filter comprising in combination, a circular tank divided into a plurality of sections, a plurality of filters adapted to be lowered into and raised out of said sections, means for carrying and rotating said filters through said sections, means for raising and lowering said filters out of and into said sections, and a rotatable member provided with an air chamber, a water chamber and a vacuum chamber, means communicating respectively with a source of supply of air, water and a vacuum creating device, and controllable means for establishing and cut-

ting off communication between said chambers and said filters.

9. A filter comprising in combination, a circular tank divided into a plurality of sections, a plurality of filters adapted to be bodily rotated through said sections, means for suspending said filters, means for raising and lowering said filters out of and into said sections, a stationary member connected with a source of supply of air and water, a stationary member connected with a vacuum creating device, a rotatable member mounted in said stationary members and provided with an air chamber, a water chamber and a vacuum chamber communicating respectively with the source of supply of air, water and said vacuum creating device, and controllable means connecting said chambers with said filters.

10. A filter comprising in combination, a circular tank divided into a plurality of sections, a plurality of filters adapted to be carried through said sections, movable means for suspending said filters, means for raising and lowering said filters out of and into said sections, and a movable member connected with a source of supply of air, water and a vacuum creating device, and controllable means connecting said members with said

filters to supply the same with air, water and to establish a vacuum therein.

11. A filter comprising in combination, a circular tank divided into a plurality of sections, a frame movably mounted on said sections and upon said tank, a cam track, a plurality of filters mounted on said frame, filter actuating members carried by said frame and connected with said filters and operated by said track, and controllable means for connecting said filters with independent sources of supply of air and water and a vacuum creating device.

12. A filter comprising in combination, a circular tank divided into a plurality of sections, a movable frame, a plurality of filters suspended from said frame and carried thereby to said sections, filter lifting members carried by said frame and connected with said filters, a cam track for operating said filter members, and means for connecting said filters with a source of supply of air and water and a vacuum creating device.

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

GEORGE RIDGWAY.

Witnesses:

SIDNEY ARNOLD TUDE,
WILLIAM GEORGE MANNERS.