

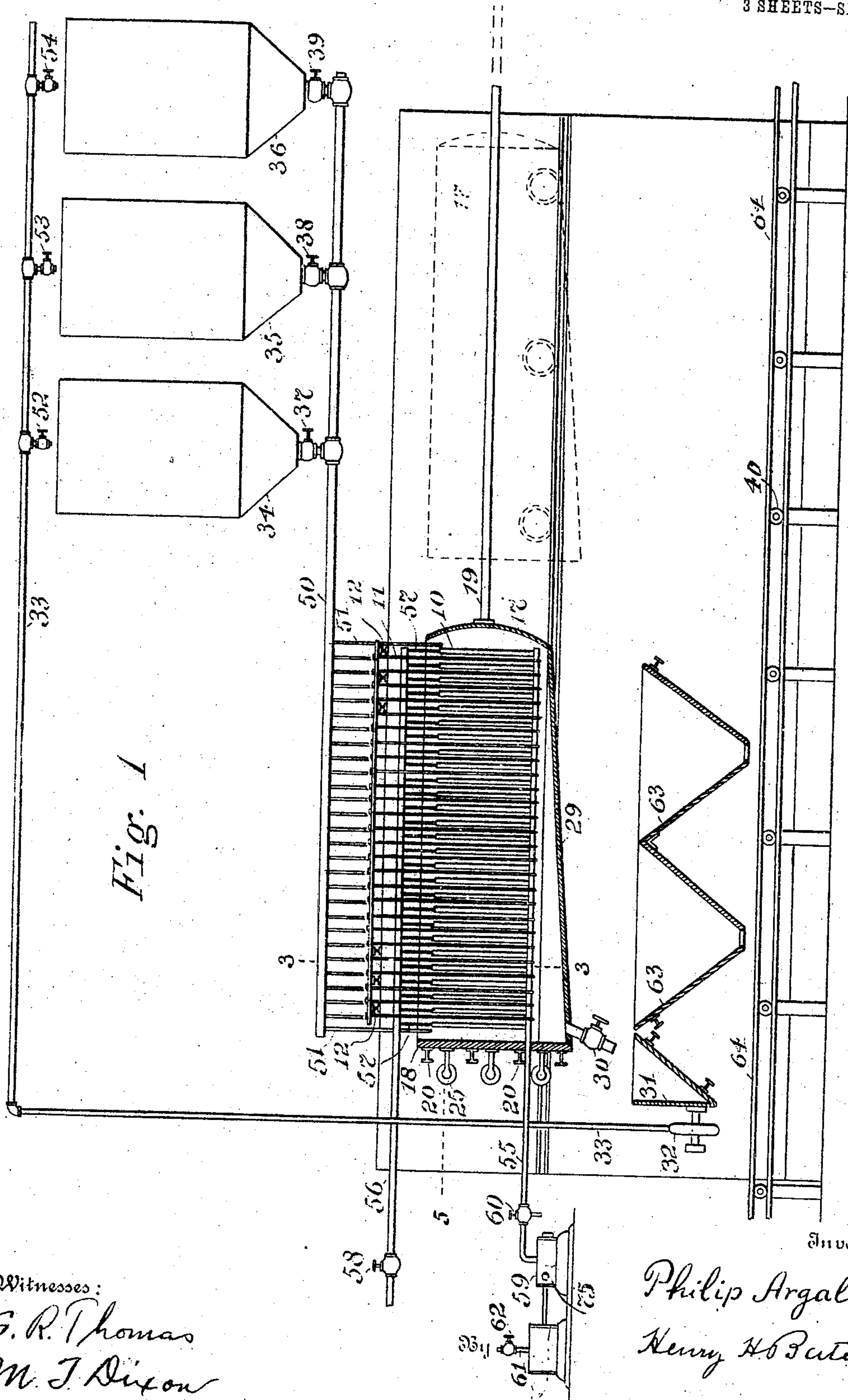
No. 822,812.

PATENTED JUNE 5, 1906.

P. ARGALL.
SUCTION FILTER.

APPLICATION FILED MAR. 2, 1906.

3 SHEETS—SHEET 1.



Witnesses:

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Inventor

Philip Argall,
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Fig. 4

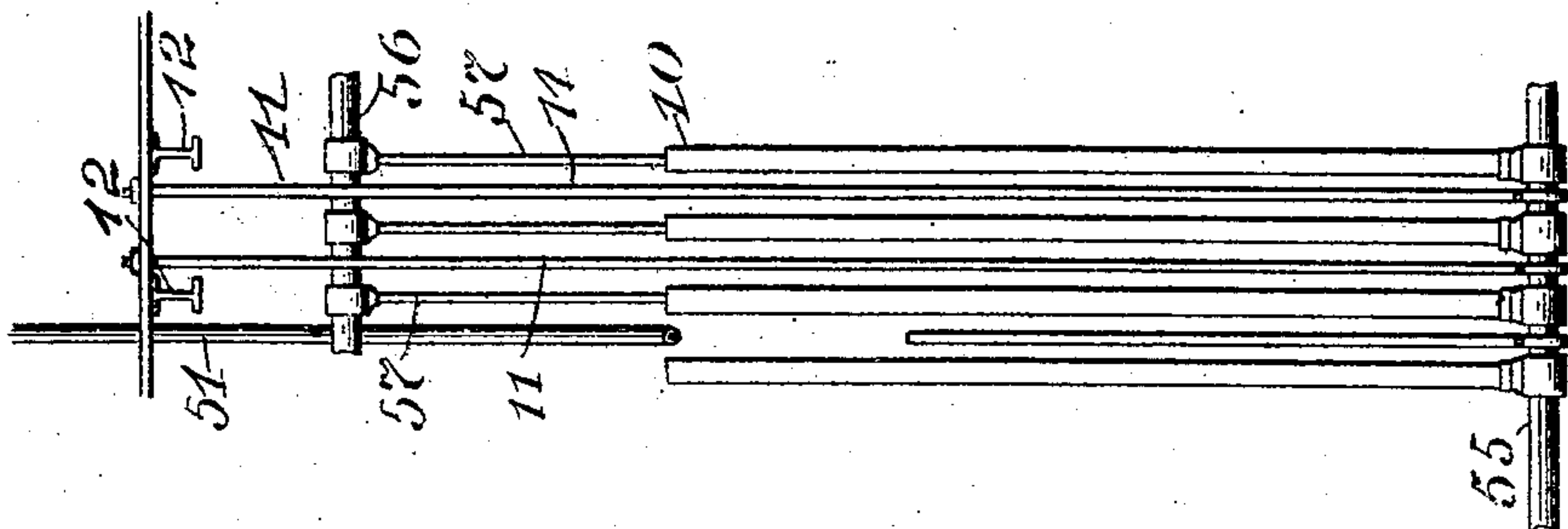


Fig. 3

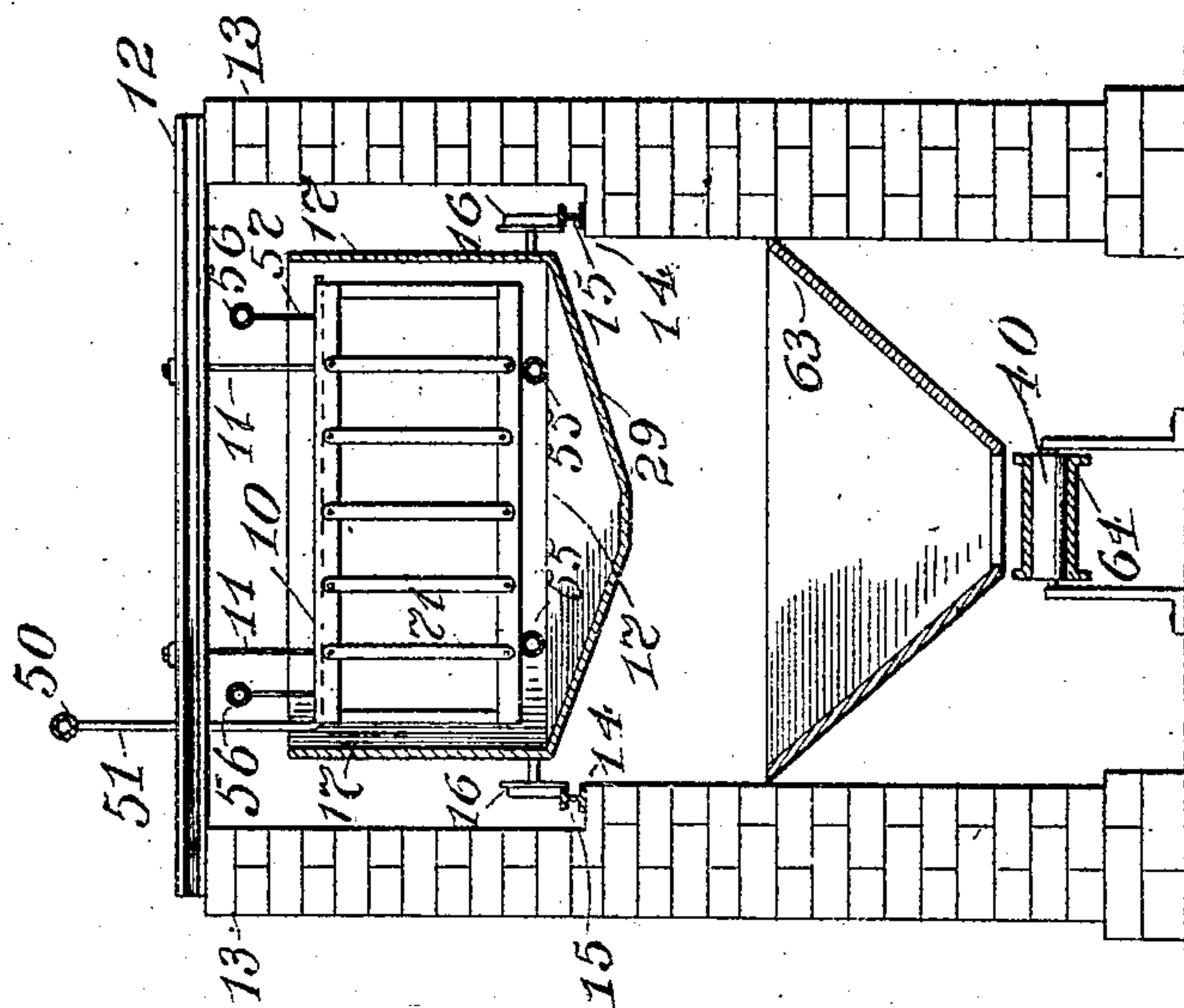
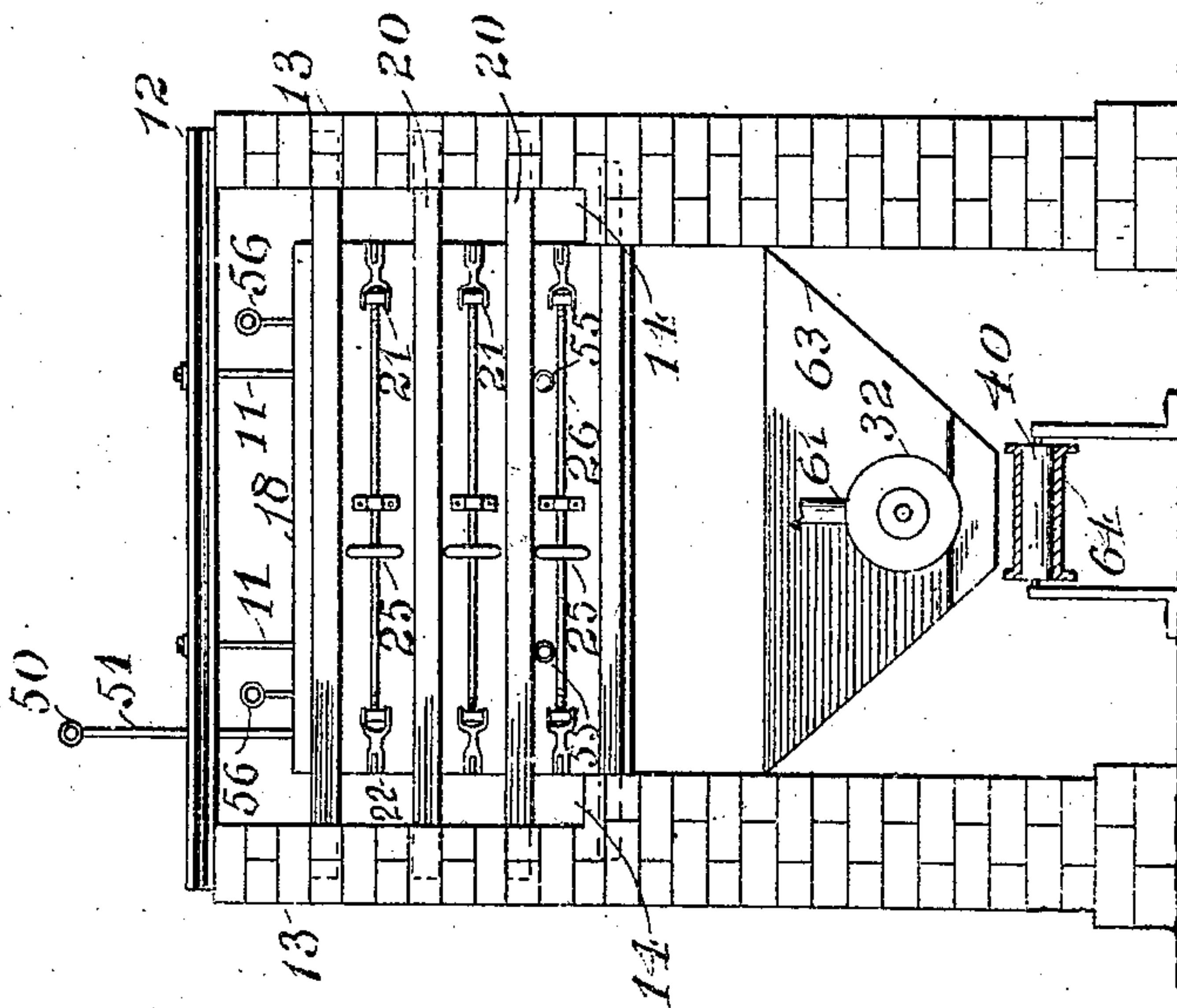


Fig. 2



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Fig. 5

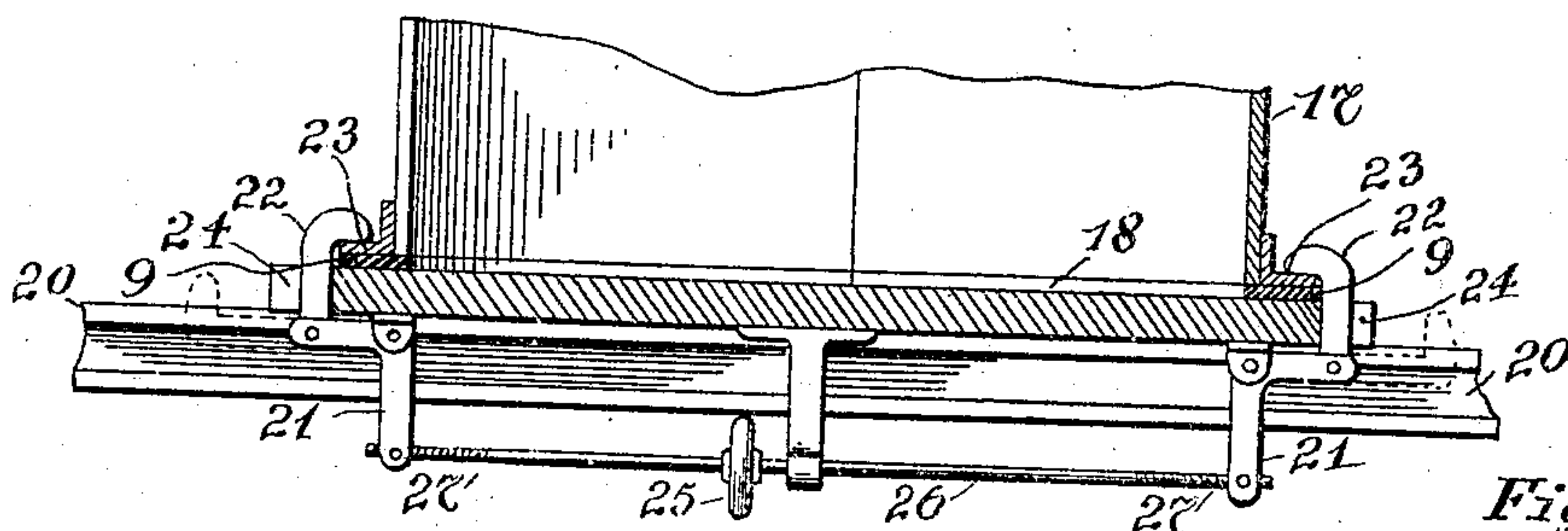


Fig. 5a



Fig. 6

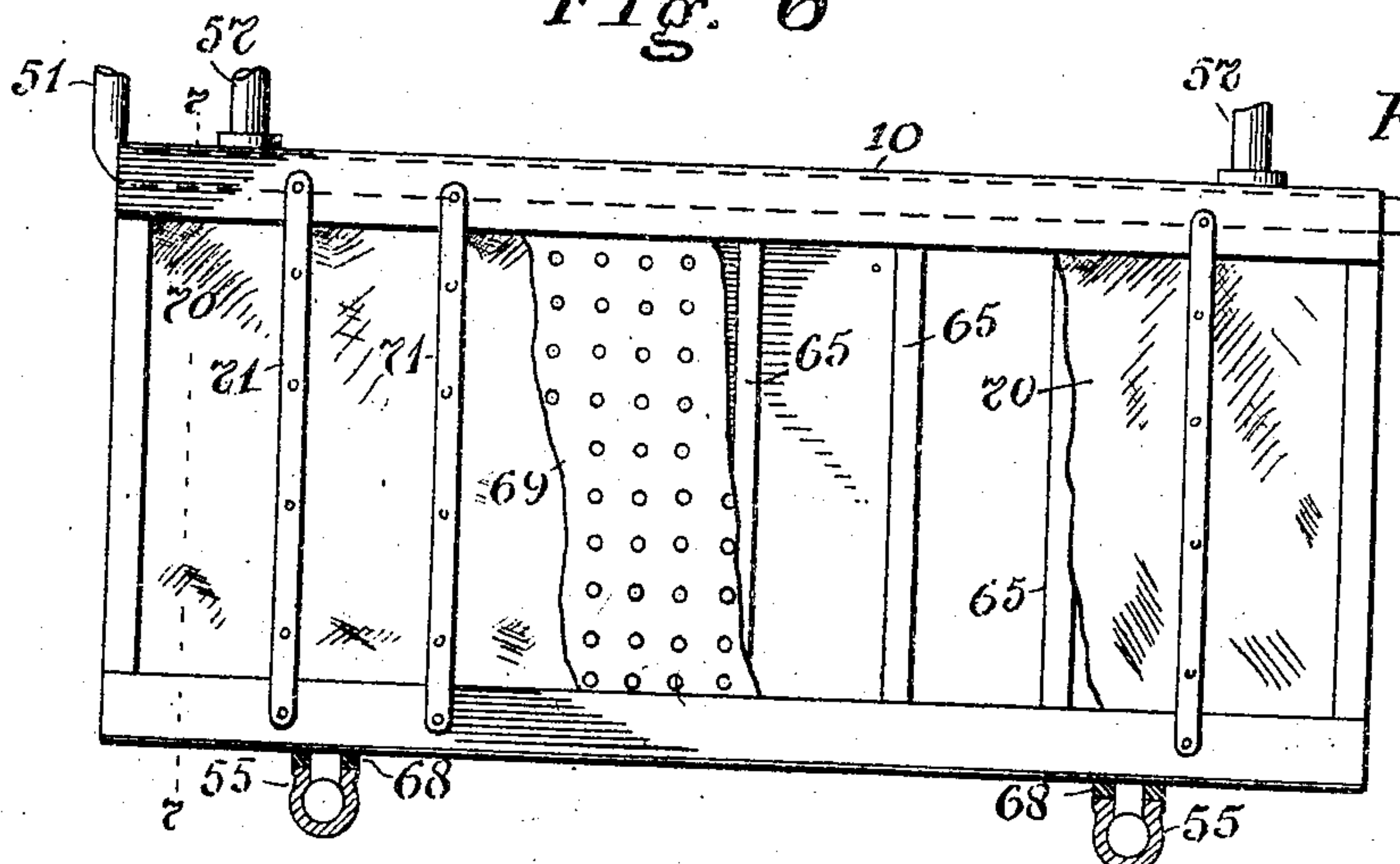


Fig. 6a

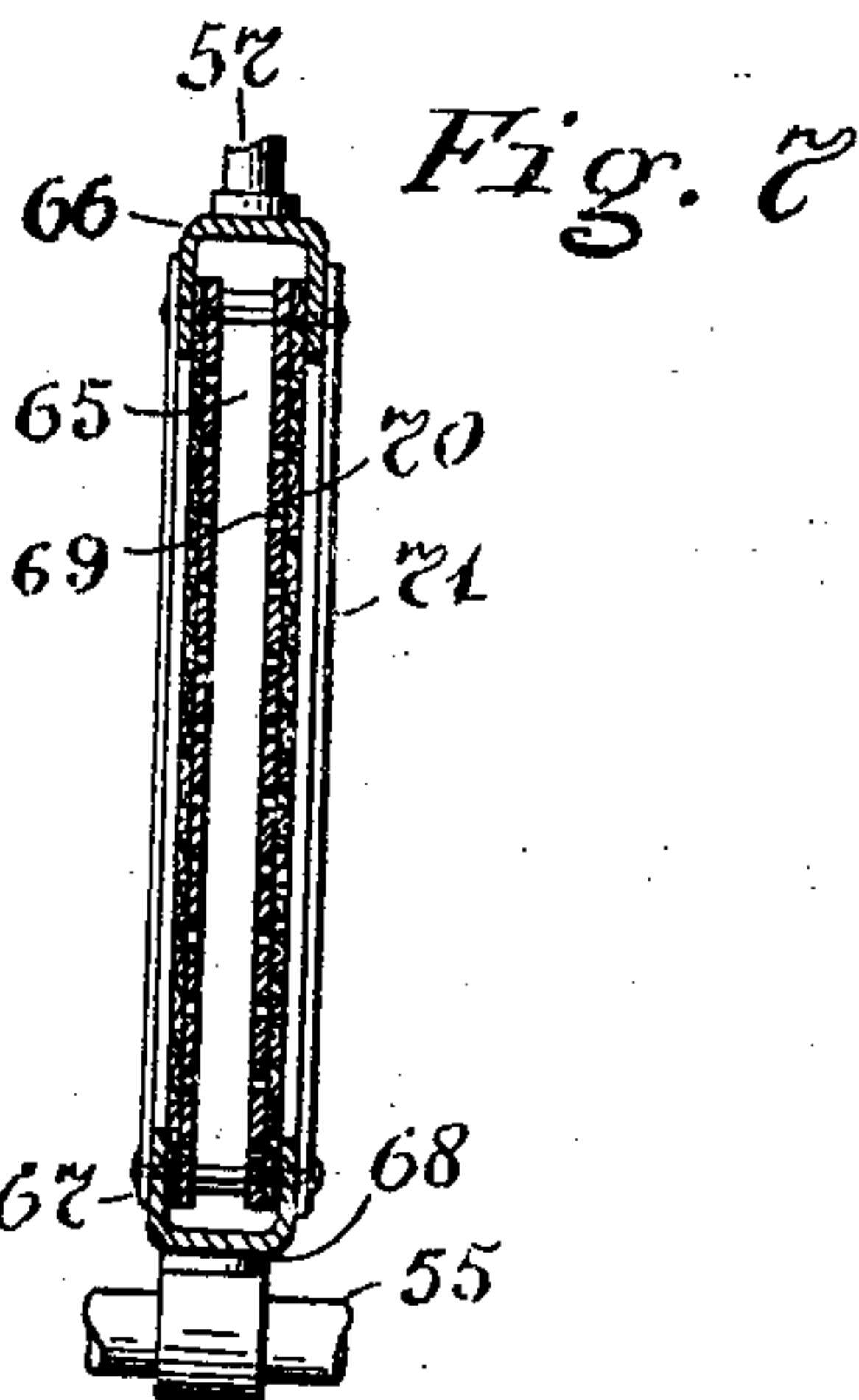
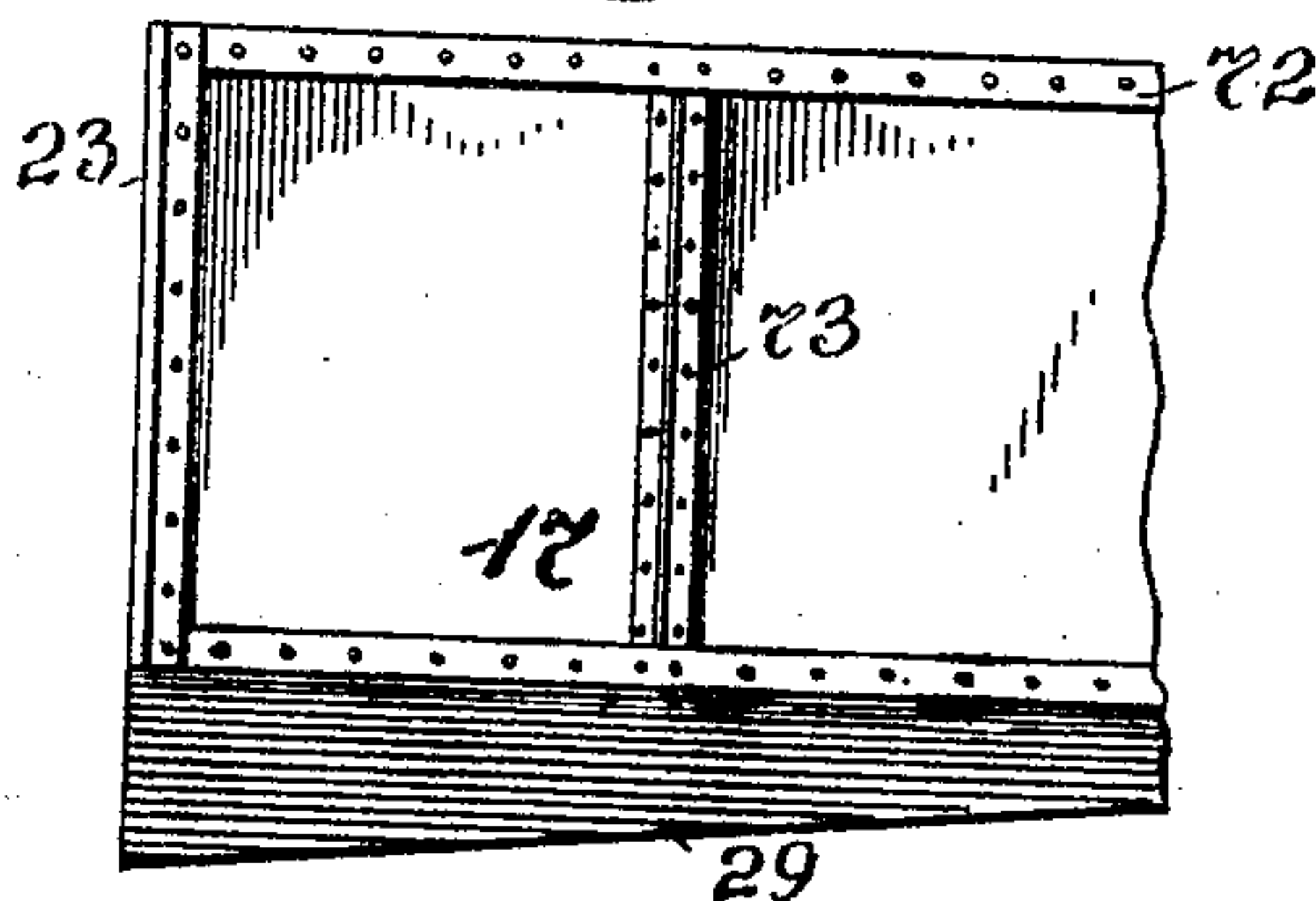


Fig. 7

Fig. 8



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UNITED STATES PATENT OFFICE.

PHILIP ARGALL, OF DENVER, COLORADO.

SUCTION-FILTER.

No. 822,812.

Specification of Letters Patent.

Patented June 5, 1906.

Application filed March 2, 1906. Serial No. 303,827.

To all whom it may concern:

Be it known that I, PHILIP ARGALL, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Suction-Filters, of which the following is a specification.

My invention relates to suction-filters, such as are used for various purposes in the arts, one of which is the extraction of the solvent holding gold in solution from the slimes of the ores from which gold is obtained. In the more common form of such apparatus light wooden frames covered with canvas or equivalent straining means are immersed in a tank containing the slimes and gold-carrying solutions. Connection from the interior of such frames is made with a suction-pump, by which means the solution is separated from the slimes and drawn through the porous filtering-cover to be conveyed to the proper place for the recovery of the gold while the slime accumulates upon the outside, forming adhering layers or cakes which must be removed when the accumulation becomes too thick and dense to permit of the continuance of the operation. The usual mode has been to lift the filters, with their accumulated cakes of slime, bodily from the tank, immersing them in another and weaker solution to displace the stronger solution remaining in the cake, and finally using clear water to dissolve out the last traces of the valuable solutions. The enormous weights to be lifted and handled, however, and the constant danger of the displacement of the slime-cakes by gravity and their falling off before the final extraction has been accomplished renders this mode of procedure hazardous and objectionable, as well as limiting the area of the filters and the thickness of the cakes to the lifting capacity of the cranes, thus materially curtailing the working capacity and the efficiency of the apparatus, all of which has led to several attempts at improvement.

My improvement consists, primarily, in making the filters stationary and the tank movable and providing means for returning the slime to the tank continuously until the adherent cakes are completely formed. The fluid slime is then withdrawn without removing the filters or the tank, and in its place a weak solution is introduced and passed through the cakes to displace the strong solu-

tions remaining in the latter, and finally water is employed to recover the last available traces of gold-bearing solution, as in former processes, but in the same tank. The water is lastly withdrawn, and the tank is removed bodily away from the gangs of suspended filters, leaving them fully exposed. Water is then passed reversely through the filters to release the accumulations of slime from their adhesions, though air may be used instead of water if the slimes are required in a dry state, and the slimes are caught by suitable hoppers as the cakes slide off from the filter-surfaces, whence they are removed by a conveyer or other appropriate means to the waste-dump. By this process any rich slime which may remain attached to the sides and corners of the tank will not be lost, and only the exhausted slimes from the filter-surfaces will be carried away to the dump, which surfaces can be made as thoroughly clean of obstructive matter as desired by sufficient washings from the filter interiors and upon the exteriors. When the filters are cleaned and inspected, the tank is replaced, and the operation is repeated.

In the drawings forming a part of this specification, Figure 1 is a side view of the apparatus, partly in section, showing the upper receiving-tanks, the movable tank, the suspended filter-frames in fixed position, the receiving-hoppers and conveyer beneath, the circulatory system for slimes and solution, and the slime-releasing means. Fig. 2 is an end view showing the movable tank, the fixed head, and the means for anchoring the former to the latter. Fig. 3 is a vertical transverse sectional view on line 3 3 of Fig. 1, showing the movable tank, the filter-frames in position, the receiving-hoppers, and the endless conveyer. Fig. 4 is a detail view showing the manner of suspending the filter-frames and the supporting suction and drainage pipes, also the pipe connections for introducing slime over and among the filter-surfaces and water into their interiors. Fig. 5 is a horizontal sectional view on line 5 of Fig. 1, of the end of the movable tank secured in position against the fixed head. Fig. 5^a is a detail view of the swivel-nut employed in the device for locking the tank end to the fixed head. Fig. 6 is a detail view of one of the filter-frames. Fig. 6^a shows in section the construction of the slime-delivery pipe. Fig. 7 is a vertical transverse sectional view on

line 7 7 of Fig. 6, showing the preferred construction of the filter-frame. Fig. 8 is a detail view of a portion of the movable tank.

10 represents the filter-frames in series supported by suspensory rods 11 on I-beams 12, which rest on suitable masonry walls 13, said walls having offsets or ledges 14 sustaining the trackways 15, on which the wheels 16 of the movable tank run.

17 is the movable tank, inclosing the filter-frames when in position, and 18 is a fixed head to which the tank 17 is securely anchored.

19 is a connection to a hydraulic cylinder or other suitable mechanical appliance for moving the heavy tank to and fro.

The fixed head 18 is firmly held in place by means of transverse I-beams 21, secured in the masonry walls 13.

21 represents bell-crank levers carrying swing hook-bolts 22 for drawing and holding firmly in place the tank end to the fixed head 18, by means of flanges 23 on the tank end for that purpose. Between said flanges and the fixed head 18 I interpose packing-strips 9, preferably of soft rubber, to secure a tight joint. The fixed head 18 is slotted, as at 24, to permit the hook-bolts 22 to swing into place. The levers 21 are mounted on the rear of the fixed head and are operated by means of a hand-wheel 25 and shaft 26, having right and left screws 27 on its extremities engaging nuts 28, swiveled in the ends of levers 21.

The bottom 29 of the tank 17 is made hopper-shaped in one or more divisions with slopes both ways sufficient to afford free movement to the slimes, which are discharged through an exit-pipe 30 into a receiver 31, whence they can be raised and circulated by suitable means, for which purpose I show a hydraulic lifting device 32 and pipe 33, leading to tank 34 and also to tanks 35 and 36, which are for weak gold solution and for water, respectively. All the said tanks are connected with suitable cut-off valves 37 38 39 to pipe 50, leading by branches 51 to the spaces between the filter-frames 10 in tank 17. Suitable valves 52 53 54 are also provided on pipe 33 to regulate admission of the circulatory fluids to their respective tanks. Pipes 51 turn at a right angle horizontally at the entrances between the filter-frames and are slotted beneath, as shown in Fig. 6^a, to facilitate the equal distribution of the fluid matters sent between the filter-frames.

The filter-frames 10, as before said, are suspended from the I-beams 12 by means of suspensory rods 11, which are secured to the suction and drainage pipes 55, of which there are preferably two to each basket of filters, attached to the latter in the manner shown in detail in Figs. 6 and 7. I prefer to locate these suction-pipes at the bottom of

the filter-frames instead of at the top, as they can thus serve for complete drainage, and the passage of the solutions is also facilitated by gravity. Water-supply pipes 56, two to each basket of filters, run longitudinally above the filter-frames and connect with the latter by branch pipes 57, the water-supply being controlled by a valve 58. The suction-pipes 55 lead to a suction-pump 59 and have a regulating-valve 60 to shut off the suction when it becomes necessary to wash or displace the cakes from the filters by sending water or air through pipes 56 57. This valve is preferably a two-way cock to permit of the drainage of the filter-frames without the passage of the liquid through the pump. The suction-pump sends the solutions withdrawn from the filter-frames 10 to their appropriate destination through outlet 75. Pipe 61, controlled by valve 62, is the steam-inlet to the operating-cylinder of the pump. While filtration is in progress and cakes are forming, the suction-pump runs continuously, and the solutions are sucked through the filters into the pump 59, and thence delivered where required through outlet 75.

Beneath the filter-frames is located the hopper 63, one or more; for the reception of the dumped slimes after separation of the same from the filter-frames. An endless conveyer-belt 64 of suitable construction is provided to convey away the dumps discharged from said hoppers. As shown, it has the usual raised flanges at the edges and is sustained on idler-rollers 40.

The filter-frames 10 may be of any approved construction known in this art, of which there are many. Those I have used for illustration are made as shown in Figs. 6 and 7, where 65 represents metallic spacing-ribs, affording due clearance to the interiors. To these are secured at top and bottom the gutters 66 67, apertured to make suitable connections with water-supply pipes 57 above and suction-pipes 55 below. 66 is a washer, of soft rubber or other suitable material, which sustains the weight of the filter-frame and forms a tight joint at that point. Upon the ribs 65 are secured, preferably by light rivets, the perforated or foraminous plates 69, the ribs 65 being so spaced as to form an efficient protection against collapse of said plates under the powerful suction of the pump 59. Over the said perforated plates 69 are laid sheets of canvas or other suitable porous textile fabric 70, and these are secured to ribs 65, preferably by light metallic strips 71 fastened to the ribs by a few bolts to prevent the textile covering from bulging outward under pressure of the liquid forced into the frames through pipes 57.

The tank 17, of which a partial view is shown in Fig. 8, is strengthened on the end by six-inch angle-irons, forming the flange 23 before referred to, and by a lighter angle-iron

72 at the top and T-iron-ribs 73 at intervals along the sides to give the requisite stiffness.

The operation is as follows: The basket of filter-frames being securely suspended in place with fixed pipe connections to the suction-pump, water-supply, and upper tanks, respectively, the movable tank 17 is pushed up against the fixed head 18, so as to inclose the filter-frames and is made fast to the fixed head by means of the swing hook-bolts 22, levers 21, and hand-wheel 25. The valve 37 is then opened and rich slime from tank 34 is permitted to flow down through pipe 50 and branches 51 between the filter-frames, so as to suffuse their surfaces as the slime flows downward until tank 17 is filled to the top of the filter-frames. Meantime the suction apparatus is put in motion, extracting the gold porous surfaces, depleting it and rendering it thicker. The valve 30 is now opened, permitting a stream of slime to flow into the receptacle 31. The lifting apparatus 32 then being set in motion, the slime is forced up through pipe 33 to tank 34, whence it again descends in continuous circulation through pipes 51 over and between the surfaces of the filter-frames, the suction process meantime drawing and holding a part of the slime on the filter-surfaces, while the solution is drawn through the filtering medium and the cakes of stiff slime accumulate on the filter-surfaces. The maintenance of the circulation and distribution prevents the cakes from forming unevenly, as they would do under the operation of gravity in a tank in which the contents did not circulate. When the cakes are fully formed on the filter-surfaces, the supply of slime is cut off, tank 17 is emptied, and a weak solution is sent from tank 35 into said tank 17, filling up the latter to penetrate the cakes and thereby displace the stronger solution lodged therein. After a suitable time for the displacement to occur, the contents of tank 17 are again discharged into the receptacle 31 and returned by the elevating means 32 to tank 35. This having been accomplished, valve 30 is closed and clear water is admitted to tank 17 from tank 36 to be passed through the slime-cakes and so recover the last available traces of the gold solutions remaining therein. Finally, the water in tank 17 is drained off through valve 30 and returned to tank 36 and the hydraulic lift apparatus is stopped. The slime-cakes on the filter-surfaces being now made as free as possible of gold solution, it becomes necessary to be rid of them, and this is accomplished by first releasing the swing-bolts 22 from fixed head 18, running back the empty tank 17 from the vicinity of the filter-frames so as to expose them, cutting off connection with the suction apparatus by closing valve 60 and admitting water through branch pipes 57 to the interiors of the filter-frames, whereby the

slime-cakes become loosened and detached from the filter-surfaces and readily slide off into hoppers 63 to be removed by conveyer 64 to the waste-dump. The water is drained from the filter-frames through pipe 55 and two-way cock 60. The filter-frames are severally cleansed and inspected and repaired if necessary; when all is ready for a repetition of the operation.

I claim and desire to secure by Letters Patent—

1. In suction-filters, a stationary filter-frame, with fixed inlet and outlet-pipe connections thereto, and a movable tank inclosing said filter-frame but removable therefrom at will, substantially as specified.

2. In suction-filters, fixed filter-frames, with outlet-pipe connections at bottom, giving gravity flow from the interior of said filter-frames, and inlet-pipe connections at top, in combination with a movable tank adapted to inclose said filter-frames or be moved away therefrom at will, substantially as specified.

3. In suction-filters, a series of stationary filter-frames suspended from suitable supports, outlet-pipe connections to each filter-frame at bottom, inlet-pipe connections to each filter-frame at top, fluid-supply-pipe connections to the spaces between the filter-frames, and a tank inclosing said filter-frames when in working position, but removable therefrom at will, substantially as specified.

4. In suction-filters, a fixed filter-frame with porous sides, an inlet-pipe at top and an outlet-pipe at bottom of said filter-frame, a suction apparatus connected with said outlet-pipe, a removable tank inclosing said filter-frame, means for filling said tank, and means for emptying said tank, substantially as specified.

5. In suction-filters, a fixed filter-frame with porous sides, an inlet-pipe at top and an outlet-pipe at bottom of said filter-frame, a suction apparatus connected with said outlet-pipe, a removable tank inclosing said filter-frame, a discharge-pipe from said tank, a receptacle for the fluid contents of said tank, fixed tanks for containing slimes, solution and water respectively, circulatory apparatus between said receptacle and said fixed tanks respectively, with means for connecting with either tank at will, pipe connections leading from said fixed tanks respectively to said movable tank, and a receiver for waste contents from the movable tank, substantially as specified.

6. In suction-filters, a movable tank with an open end, a fixed head for closing said open end, with locking means for securing the closure, filter-frames fixed in position to be inclosed by said movable tank and fixed head, fixed tanks for containing fluids, with controllable outlets discharging respectively therefrom into said movable tank, a dis-

charge-pipe from said movable tank, a circulatory apparatus between said movable tank and said fixed tanks, means for filling and emptying said filter-frames, and a suction apparatus connected respectively with said filter-frames, substantially as specified.

7. In suction-filters, a gang of fixed filter-frames having porous sides, inlet-pipes at top of said filter-frames respectively, outlet-pipes at bottom of said filter-frames respectively, a suction apparatus connected with said outlet-pipes, fixed tanks for containing slimes, solution and water respectively, pipe connections leading from said fixed tanks respectively to the interspaces between said filter-frames, a movable tank inclosing said filter-frames, but removable therefrom, a discharge pipe and valve for said movable tank, a receptacle for the contents discharged through said discharge-pipe, a hydraulic apparatus between said receptacle and said fixed tanks respectively, a hopper for the reception of waste-dumps from the filter-frame surfaces, and means for carrying away said dumps, substantially as specified.

8. In suction-filters, a series of stationary filter-frames, with inlet and outlet pipe connections, a removable tank inclosing said filter-frames, means for filling and emptying said tank, a receptacle for the fluid contents of the movable tank, a series of fixed elevated

tanks, mechanism for circulating the fluids treated between said movable tank and said fixed tanks, a receiver for the depleted slime-cakes, and means for conveying away the dumped contents of said receiver, substantially as specified.

9. In suction-filters, fixed filter-frames, with fixed pipe connections, a fixed head, a movable open-ended tank inclosing said filter-frames and abutting by its open end against said fixed head, means for securing the tank end to the fixed head, means for filling said tank, and a discharge-pipe for said tank, substantially as specified.

10. In suction-filters, a series of fixed filter-frames, with fixed inlet-pipe connections at top and fixed outlet-pipe connections at the bottom, a suction-pump connected to said outlet-pipe connections, a movable tank inclosing said filter-frames, means for filling said tank, a receptacle for the contents of said tank, and mechanism for circulating the contents of said tank between said receptacle and said tank, substantially as specified.

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

PHILIP ARGALL.

Witnesses:

JAMES A. McCLURG,
L. R. SCOTT.