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G. L. CUMMINGS.

FILTER.

(Application filed Feb. 18, 1899.)

(No Model.)

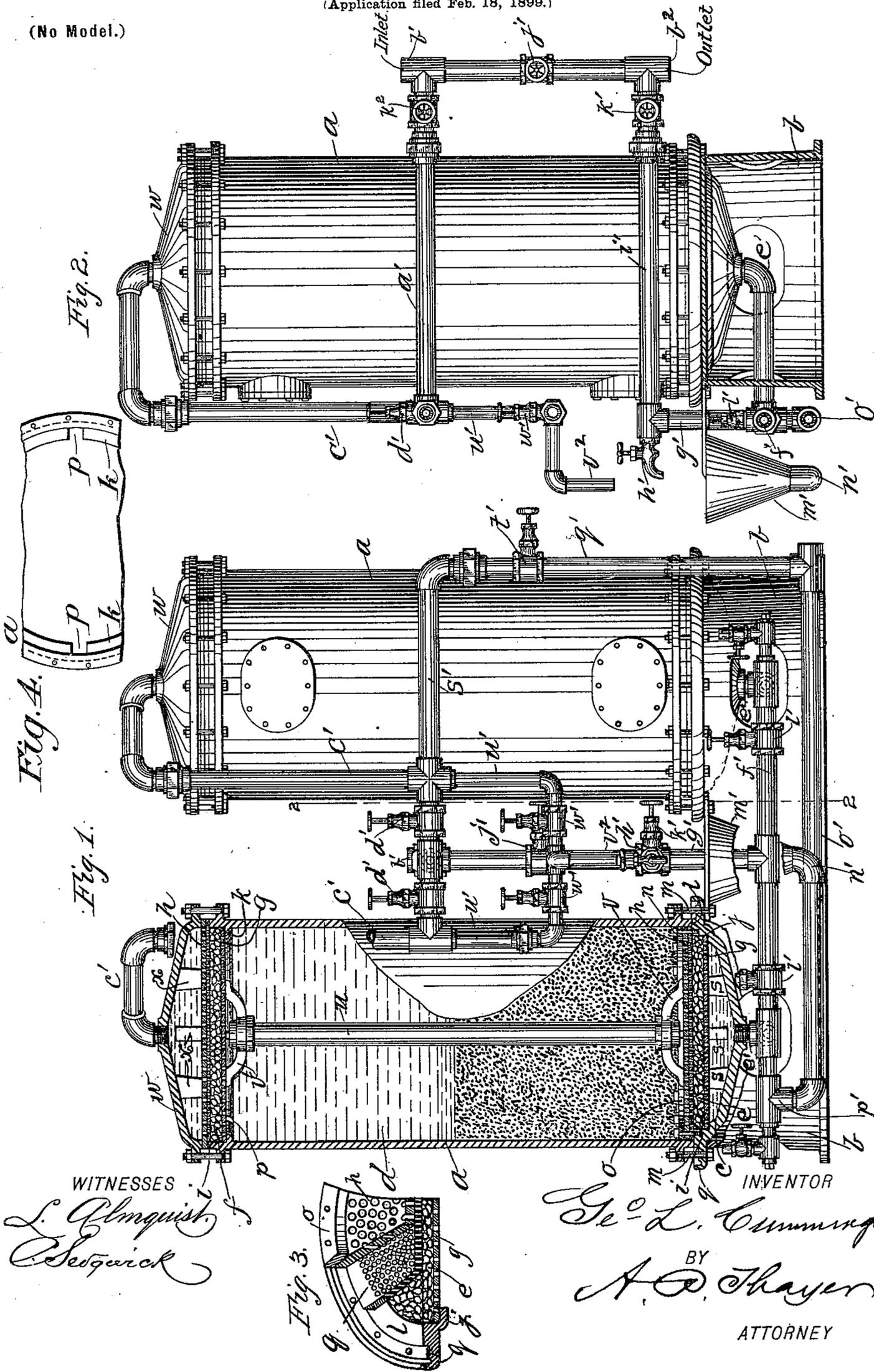


Fig. 4.

Fig. 1.

Fig. 2.

Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## FILTER.

SPECIFICATION forming part of Letters Patent No. 645,892, dated March 20, 1900.

Application filed February 18, 1899. Serial No. 705,982. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. CUMMINGS, a citizen of the United States of America, and a resident of New York city, county and State of New York, have invented certain new and useful Improvements in Filters, of which the following is a specification.

My invention relates to water-filters comprising an upright cylinder containing the filtering material between two gravel-beds, one at each end; and it consists of an improvement in the application of the lower gravel-bed for more ready removal for cleaning, also in means for supporting the two beds against displacement by undue pressure of the current of flowing liquid, and also of an improved arrangement of pipes and valves in a twin filter for controlling the washing-out process for cleaning the cylinders with filtered water from one directed backward through the other, all as hereinafter described, reference being made to the accompanying drawings, in which—

Figure 1 is partly a front elevation and partly a sectional elevation of a twin filter constructed in accordance with my invention. Fig. 2 is a sectional elevation on line 2 2, Fig. 1. Fig. 3 is a detail showing part of one of the filter-beds on a larger scale for greater clearness. Fig. 4 is a top view of one of the cylinders with parts broken off and with the cover removed.

In this example of my invention I represent a twin filter comprising two cylinders *a*, set upright on a common base *b* in the usual manner, said base having a receptacle *c* under each cylinder for the filtered liquid as it is discharged from the filtering-chamber *d* above. Between the receptacle *c* and the chamber *d* is a gravel-bed *e*, and at the top of said chamber is another gravel-bed *f*. Such gravel-beds are, in general, common and serve a useful purpose in this class of filters; but so far as the lower one, *e*, is concerned I have improved the construction whereby it may be removed, as is required from time to time for cleansing, more readily than as heretofore constructed and have also improved the construction for more effectively preventing the escape of particles of matter from the filtering-chamber. The gravel-beds consist, essentially, of a lower perforated metallic

disk or diaphragm *g* and upper like disk or diaphragm *h* with an intermediate space filled with gravel *i*. The lower diaphragm *g* rests by a narrow margin on an annular seat *j*, which for the lower bed is formed in the inner surface of the receptacle *c* near the top and for the upper bed is provided by the internal flange *k* of the cylinder. As heretofore constructed the upper diaphragm *h* of the lower gravel-bed has been made larger in diameter than the diameter of the cylinder and has been clamped between the lower end of the cylinder and the seat *l* of said cylinder on the base *b* to secure the bed in position, the clamping being effected by the same bolts *m* that secure the cylinder to the base; but such construction is very objectionable, because it is necessary to remove the cylinder whenever the bed has to be removed for cleansing, which is quite often, and the removal of the cylinder involves the breaking of the joint and the careful making of a new one, besides much labor and powerful tackle when the cylinders are large, as they must be for hotels, factories, and other large establishments, often weighing several tons. To avoid the necessity of removing the cylinder, I make the lower diaphragm *g* and its seat *j* of sufficiently less diameter than the inner diameter of the cylinder to enable me to provide an annular seat *l* at the top of receptacle *c* for the upper diaphragm *h*, the diameter of which is such as to permit it to be entered within the cylinder, and for securing it fixedly in position I bolt it down on said seat *l* by bolts *n*, preferably with a ring *o* above the diaphragm for more effectually clamping it down on the seat, and in connection with this construction I provide diametrically-opposite notches *p* in the flange *k* to permit the diaphragm *h* and the ring *o* to be inserted in and removed from the cylinder readily.

As heretofore constructed the gravel-beds consist only of the upper and lower diaphragms and the gravel contained in the space between them, the diaphragms being necessarily of a thickness that cannot practically be perforated so finely but that more or less particles of solid matter will pass through. I therefore provide another diaphragm *q*, of much less thickness and more finely perforated, between the upper dia-

phragm *h* and the gravel, by which the passage of such particles is greatly reduced, if not entirely prevented. The pressure of the liquid on the upper surface of this supplementary diaphragm will depress it into the spaces between the uppermost bearing-points of the gravel, so that the liquid will flow laterally from the smaller number of larger perforations in the upper diaphragm into the more numerous perforations of the lower diaphragm, some of which are under the unperforated portions of the upper diaphragm and would be obstructed thereby except for being so depressed. In practice it may only be necessary to employ such a supplementary diaphragm in the lower gravel-bed, but as it may also be useful in the upper one I have in this case represented one there also.

The receptacle *c* is provided with a series of stump-rests *s* for supporting the inner field of the gravel-bed against downward pressure of the liquid on the bed, and on the upper side of the gravel-bed is a spider-legged stand *v*, supporting a central upright shaft *u*, extending to within a short distance of the upper gravel-bed and carrying thereat a similar stand *v'*, but inverted and with its legs bearing against and supporting the upper gravel-bed against downward pressure. The lower bed is thus supported against upward pressure when the liquid is passed backward through the filter for washing it out, and to support the upper gravel-bed against like pressure in the washing-out process the cylinder-cover *w* has pendant stump-rests *x* bearing on the upper side of the bed.

The arrangement of water-pipes is as follows: *a'* is the inlet, to which the service-pipe is to be connected at *b'*. The branches *c'* of this inlet-pipe connect with the covers *w* of the cylinders, respectively, and have each a stop-valve *d'* to shut off either cylinder when required. *e'* represents the discharge-pipes for the filtered water from the receptacles *c* at the lower ends of the cylinders. They connect with pipe *f'*, through which and the stand-pipe *g'* and pipe *i'* the water flows to the outlet *b<sup>2</sup>*, whence it is conducted where required for use. The faucet *h'* is attached to pipe *i'* for drawing water thereat when required. Stop-valves *j'*, *k'*, and *k<sup>2</sup>* are provided to cut out the filter and open direct flow from the main through the outlet when desired, also stop-valves *l'* in the pipe *f'* to prevent back-flow through pipes *g'*, *f'*, and *e'* into the filters. A funnel *m'*, with a waste-pipe connection *n'*, is located under the faucet *h'* for carrying away any waste that may escape from the faucet, which is liable to be left open, and also the discharge from nozzle *v<sup>2</sup>* when washing out the filters.

With stop-valves *k'* *k<sup>2</sup>* opened, valve *j'* closed, and valves *l'* opened the filter is in condition for filtering directly through both cylinders simultaneously.

For double filtering through both cylinders in series the pipe *o'* is connected to pipe *f'* at

*p'* and this is connected to branch inlet *c'* by the pipes *q'* and *s'*, with a stop-valve *t'* in pipe *q'*. With these connections open and with the right-hand stop-valve *d'* and the left-hand stop-valve *l'* closed and valve *t* opened the water first filtered through the left-hand cylinder will flow into the top of the right-hand cylinder and be again filtered through it. It is to be noted here that when this double filtering attachment is employed the stop-valve *t'* must be closed when filtering through both cylinders direct.

For washing out one cylinder by filtered water from the other cylinder the discharge-pipes *w'* are connected to the branch inlet-pipes *c'*, each having a stop-valve *w'* and both joining in a nozzle *v<sup>2</sup>*, discharging into the waste-receiving funnel *m'*. With these attachments the adjustment for washing out one cylinder with filtered water from the other—say washing out the right-hand cylinder—the right-hand valve *d'* and the left-hand valve *w'* will be closed, also valve *j'*, left-hand valve *d'*, and right-hand valve *w'* open, both valves *l'* open, and valves *k'* and *t'* closed. The water then discharging from the left-hand cylinder will flow upward through the right-hand cylinder and discharge through its inlet-pipe *c'*, discharge-pipe *w'*, and the nozzle *v<sup>2</sup>*. The like operation may be carried out to wash the other cylinder by reversing the valves mentioned.

I am aware that substantially the same arrangement of pipes for the double filtering has been employed; but I believe the discharge attachment which I have provided for washing out is a new and more simple and efficient arrangement.

What I claim as my invention is—

1. In a filter, the combination of the seat in the lower water-receptacle for the lower diaphragm of the gravel-bed, said seat being smaller in diameter than the diameter of the cylinder, said diaphragm located in said seat; the annular seat for the upper diaphragm of said gravel-bed intermediate of said seat for the lower diaphragm and the cylinder, and said upper diaphragm secured to said intermediate seat independently of the cylinder.

2. In a filter, the combination of the seat in the lower water-receptacle for the lower diaphragm of the gravel-bed, said seat being smaller in diameter than the diameter of the cylinder, said diaphragm located in said seat; the annular seat for the upper diaphragm of said gravel-bed intermediate of said seat for the lower diaphragm and the cylinder, said upper diaphragm located on said intermediate seat, and the clamping-ring on the upper margin of said upper diaphragm, whereby said upper diaphragm is secured to its seat independently of the cylinder.

3. In a filter the combination of the cylinder, the lower gravel-bed secured within the cylinder removably without removing the cylinder, and the internal flange at the upper end of the cylinder for support of the upper gravel-

bed, said flange having diametrically-opposite notches for permitting removal of said lower bed substantially as described.

4. The combination with the upper and lower perforated diaphragms of a gravel-bed, and with the intermediate gravel, of a supplementary thin and finely-perforated diaphragm interposed between the upper surface of the gravel and the superimposed diaphragm substantially as described.

5. In a twin filter provided with the direct filtering system of pipes and valves comprising the inlet-pipe  $a'$ , branches  $c'$ , stop-valves  $d'$  in said branches, discharge-pipes  $e'$ ,  $f'$ ,  $g'$  and  $i'$ , said pipe  $f'$  having stop-valves  $l'$ , and with the double-filtering system comprising the pipe  $o'$  connected to pipe  $f'$ ; pipes  $q'$  and  $s'$  connecting pipe  $o'$  with the branch  $c'$  of one of the cylinders and having stop-valve

$l'$ , of the washing-out attachment comprising discharge-pipes  $u'$  connected to inlet-pipes  $c'$  respectively, and provided with stop-valves  $w'$  and a discharge-nozzle  $v^2$  substantially as described.

6. The combination with the gravel-beds and the stump-bearings of the covers for supporting the middle fields of the gravel-beds, of the spider-stands and their connecting-shaft interposed between the two beds to oppose inward pressure substantially as described.

Signed by me at New York, N. Y., this 31st day of January, 1899.

GEO. L. CUMMINGS.

Witnesses:

C. SEDGWICK,  
J. HOWARD.