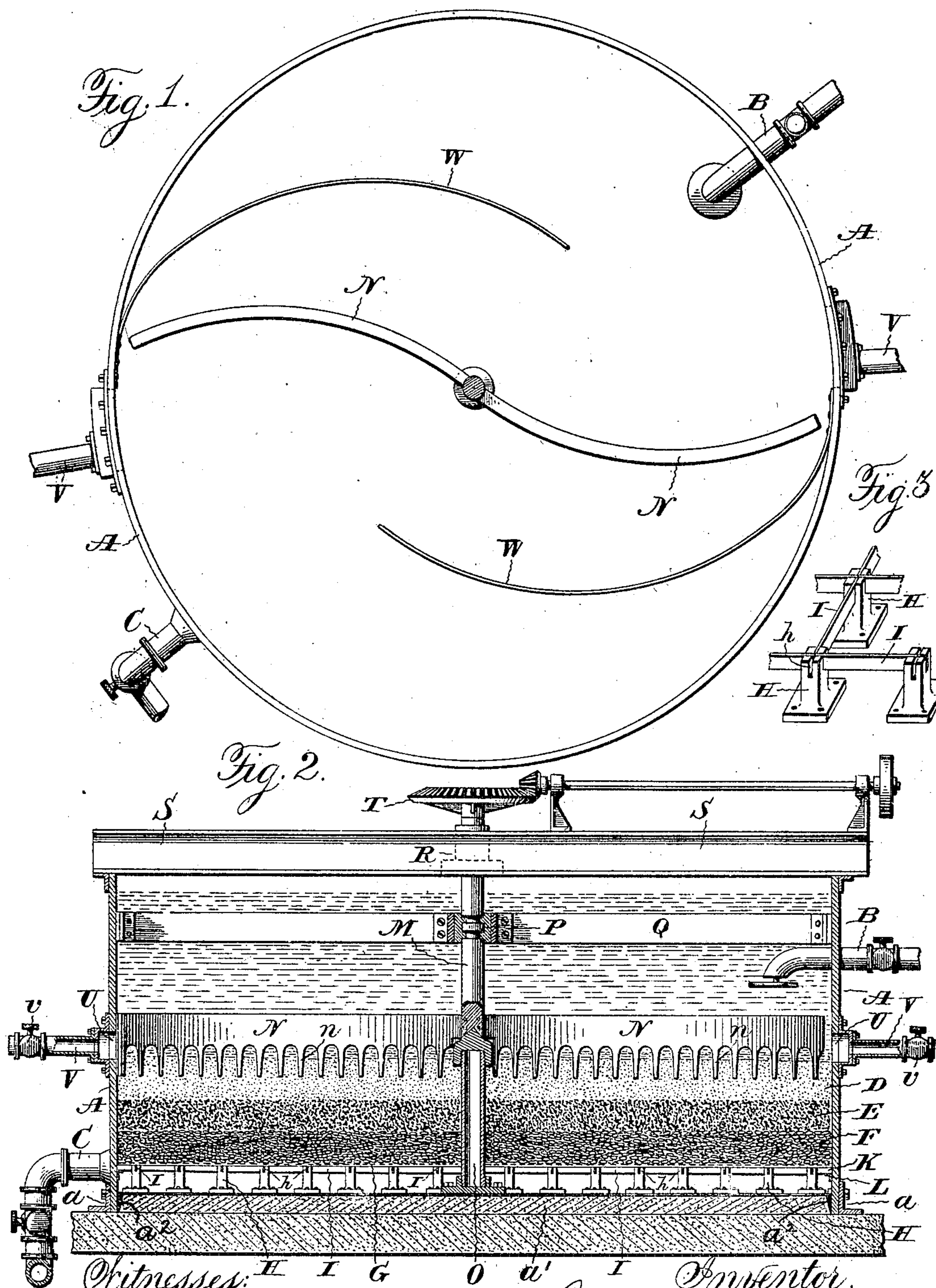


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PATENTED DEC. 4, 1906.

J. MACDOUGALL.
FILTER.

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UNITED STATES PATENT OFFICE.

JOHN MACDOUGALL, OF DETROIT, MICHIGAN.

FILTER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN MACDOUGALL, of Detroit, in the county of Wayne, and in the State of Michigan, have invented certain new and useful Improvements in Filters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a top plan view of a filter embodying my invention, parts above the filter-bed agitator being omitted for the sake of clearness. Fig. 2 is a vertical section through the same, and Fig. 3 is a detail perspective view of a portion of the filter-bed support.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to provide a water-filter of the granular-bed type having a strong and durable tank capable of cheap construction, a simple, efficient, and convenient form of support for the filter-bed, and means for efficient and economical cleaning of the bed; and to these ends said invention consists in the filter having the features of construction substantially as hereinafter specified.

In the carrying of my invention into practice a suitable tank or receptacle A is employed, into which runs an inlet-pipe B, by which water to be filtered is conducted to it, and having an outlet-pipe C for filtered water. The tank has metallic sides or walls, and riveted to it around its lower end or bottom is a ring of angle-iron a , that forms a support or base and stiffens it. It rests on a bed or foundation, preferably of concrete, and within it and resting on the bed is a bottom a' of concrete or the like, the surface of which is coated with asphalt or tar and the joint between it and the walls made tight by a filling a^2 of the same material. Thus constructed the tank is cheap, strong, durable, and efficient, and while I therefore prefer it it is to be understood that as far as other features of my filter to be described are concerned tanks of different construction may be employed. Within the tank A and resting on a false bottom or support is a bed of filtering material formed, preferably, of a top layer D of fine sand, a second layer E of coarse sand, and a third layer F of broken stone, which rests directly on the false bottom.

The false bottom is composed of one or more layers G and G of woven wire or other

foraminous material, resting upon a grid composed of numerous posts H and H, secured to the tank-bottom, and thin bars I and I, that are supported by the posts. The upper ends of the posts are provided with vertical slots or notches h and h , in which the ends of the bars I and I are placed. The length of each of the bars is preferably such that it reaches from one post to the one nearest it, and the bars are not fastened to the posts, but merely rest freely in the notches therein, so that they may be readily removed and replaced. Between the posts nearest the side walls of the tank bars K and K are placed, whose ends next the wall rest on flanges L and L thereon. Should there for any reason be occasion to have access to any particular portion of the water-space in the tank below the filter-bed, such access can be had without disturbing the entire filter-bed and grid, it being necessary simply to remove the filter-bed at the desired point and to take out the bars thereat.

At the center of the tank is a vertical shaft M, that at its lower end carries one or more (as shown, two) arms or paddles N and N, from whose lower edges project teeth n and n , that extend into the upper part of the filter-bed. The teeth n of one paddle are preferably located so as to come opposite the space between the teeth of the other paddle to cause the two sets of teeth to traverse different paths, and so insure in more thorough and complete agitation of the sand during the process of washing than would be the case were both sets of teeth to traverse the same paths. The shaft rests at its lower end upon the upper end of a post O, that rises from the tank-bottom, the upper end of the post being conical and the shaft having a correspondingly-shaped cavity to fit said post end. Intermediate its ends the shaft is supported against pressure in a vertical direction by a thrust-bearing P upon a beam Q, that extends diametrically across the tank and is bolted at its ends to the sides thereof, and at its upper end the shaft is journaled in a bearing R upon a cross-beam S, that rests at its ends on the top of the tank. Above the bearing R the shaft carries a suitably-driven bevel gear-wheel T, which has a hub or collar that rests on the top of the bearing R, and the shaft is thereby additionally supported or sustained against downward movement.

For the outlet of wash-water from the

tank the side walls of the latter have one or more, preferably several, openings U and U, from which, respectively, pipes V and V, each having a valve *v*, run to a sewer or other place of discharge. The openings U and U are placed just above the top of the filter-bed and in line horizontally with the paddles, and as the latter by their revolution throw the water in a centrifugal direction its discharge through said openings can be quickly effected. As it is undesirable to permit the water to have a circular motion in the tank, because of the possibility that its momentum may be sufficient to cause its passage by the outlets, means are provided to break up or prevent such motion and assist in the expulsion of the water through the outlets. As shown, the means for this purpose consists of one or more, preferably two, plates W and W, that are attached at one of their ends to the side wall of the tank and project inwardly therefrom, so as to be in the path of the water in its circular motion in the tank. As the plates are therefore in the path of the paddles, the construction employed is such that when engaged by the paddles they will yield before them and move out of their way. To enable them to do this, they may, as shown, be sufficiently flexible or elastic to yield under the pressure of the paddles, but stiff enough to oppose and change the direction of the water. That the paddles may most readily and easily thrust the plates aside and the better perform their function of imparting centrifugal movement to the water their advancing or forward sides are curved convexly, as shown. By reason of this curvature their general direction is such that they incline rearward from a plane radial to the shaft. Because of this rearward inclination their action in forcing the water outward or centrifugally is materially enhanced. As it is desirable to arrest the circular motion of the waters in filters having differently-located wash-water outlets, it is to be understood that, broadly considered, this feature of my invention is not to be restricted to the location or kind of wash-water outlet used.

When the filter-bed is to be cleaned, the valve of the inlet-pipe B is closed and the valve of the outlet-pipe C is kept open until the level of the water in the filter is lowered to a point where the paddles are a little more than submerged, and when this level is reached the outlet-pipe valve is closed. The paddles are now revolved to agitate the upper part of the filter-bed to loosen up and dislodge the accumulated matters thereon and to cause their commingling and suspension in the body of water left in the filter above the bed, and when this treatment has been carried to the desired degree, as evidenced by

the condition of the water, the valves in the outlet-pipes are opened and the befouled or dirty water rapidly carried off therethrough by reason of the combined action of the paddles and the obstructing devices or plates. To complete the washing, filtered water, by pumping or otherwise, is forced through the effluent-pipe C or a pipe provided for the purpose back into the filter at such a rate as not to disturb the bed, but sufficient to carry such sediment as may yet be present out of the same, where, with the water, it may be carried off through the wash-water outlets. During the last-described part of the operation the revolution of the paddles is continued, but preferably at a slower rate, and at no time is the revolution so rapid as to result in the carrying off of any of the sand with the water.

Though preferring to employ all of the features of construction shown and described in a single filter, it is evident that some only may be used in a particular filter and that changes in details of construction in many respects may be resorted to which will involve no change in the principle of the invention.

Having thus described my invention, what I claim is—

1. In a filter, the combination of a tank having a wash-water outlet, means for imparting centrifugal motion to the water, and means for arresting circular motion of the water, substantially as and for the purpose described.

2. In a filter, the combination of a tank having a lateral wash-water outlet, means for imparting centrifugal motion to the water, and means for arresting circular motion of the water, substantially as and for the purpose described.

3. In a filter, the combination of a tank having a wash-water outlet, rotary paddles, and means for arresting circular motion of the water, substantially as and for the purpose described.

4. In a filter, the combination of a tank having a wash-water outlet, rotary paddles, and one or more yielding water obstructions, substantially as and for the purpose described.

5. In a filter, the combination of a tank having a wash-water outlet, a granular filter-bed, rotary paddles carrying teeth, and means for arresting circular motion of the water, substantially as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand this 30th day of July, A. D. 1900.

JOHN MACDOUGALL.

Witnesses:

A. J. MACDOUGALL,
WM. G. CLARK.