A. MACKEY.
Filter.

No. 220,081. Patented Sept. 30, 1879.

FIG. 1.

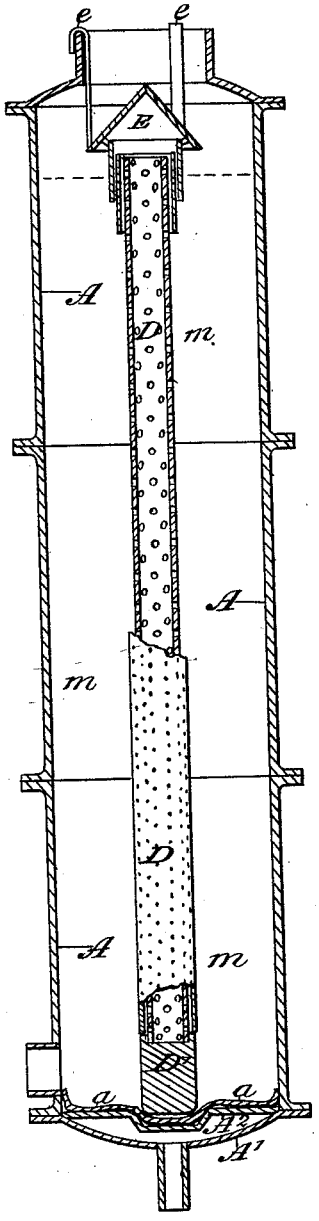
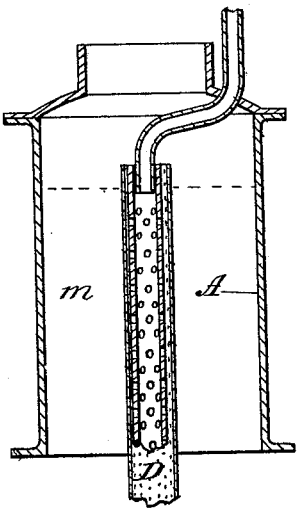


FIG. 4.



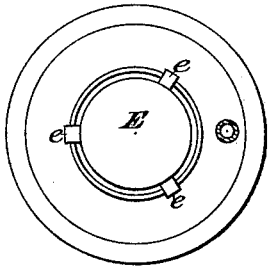
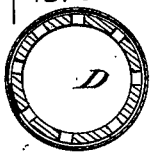


FIG. 2.

FIG. 5.



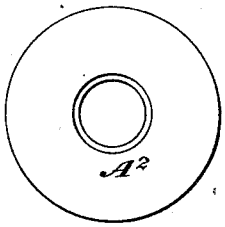


FIG. 3.

WITNESSES:

Charles C. Stetson
E. B. Bolton

INVENTOR:

Alexander Mackey
by his attorney
C. C. Stetson

UNITED STATES PATENT OFFICE.

ALEXANDER MACKEY, OF NEW YORK, N. Y.

IMPROVEMENT IN FILTERS.

Specification forming part of Letters Patent No. **220,081**, dated September 30, 1879; application filed June 9, 1879.

To all whom it may concern:

Be it known that I, ALEXANDER MACKEY, of New York city, in the State of New York, have invented certain new and useful Improvements Relating to Filters, of which the following is a specification.

My improved filter is intended more particularly for use with animal-carbon or bone-black for use in the sugar business; and I will so describe it, it being understood that it may be used with other granular material than bone-black, for filtering other liquids than sugar solutions, if desired.

This improvement allows the liquor to filter more rapidly with a given quantity of bone-black. When the decolorizing power of the material is exhausted, I empty and supply anew.

The accompanying drawings form a part of this specification, and represent what I conside the best means of carrying out the invention.

Figure 1 is a central vertical section, with the central pipe in elevation. A portion of the outer layer is represented as broken away to show the inner layer. This shows the apparatus in the act of being filled or charged with bone-black. Fig. 2 is a top view of the same. Fig. 3 is a top view of the bottom plate, with its depressed center. Fig. 4 is a vertical section of the upper part of the filter. This figure represents the connecting-pipe for supplying the liquor. Fig. 5 is a horizontal section through the central pipe on a larger scale.

Similar letters of reference indicate corresponding parts in all the figures.

A A, &c., are the sections of an upright case, which may be in all respects in the ordinary form, and equipped with the ordinary tapering bottom A^1, with the ordinary false bottom or grating A^2 a little above it. This false bottom differs from that ordinarily employed only in having a considerable depression in the middle, the purpose of which will presently appear. The top of the filter-case may be formed in the ordinary manner, as represented.

I provide a reticulated tube of peculiar construction, represented by D. It is of uniform diameter throughout, closed at its lower end, and for a little distance up, as indicated by D′; but above this it is open to the free outflow of the fluid from within, which, when the filter is in operation, is supplied through the upper end, which is left open and flows freely down, filling the entire interior and issuing in all directions through the reticulated surface. This latter is of two thicknesses. The innermost is of tolerably-stout copper, and full of coarse perforations. This forms the strength or back-bone of the pipe; but immediately exterior to the stout layer is a thin coating of finely-perforated metal. It is preferably bent once around and soldered continuously to the main tube by its edges. This double tube D may be made in sections or short lengths, properly coupled together, so as, like the external casing A, to be taken apart and put together at will in applying and removing the apparatus, or in effecting repairs.

The bone-black, it will be understood, is introduced in the annular space between the exterior of the pipe D and the interior of the casing A. I adopt a peculiar provision by which I insure that the coarser particles of the bone-black lie nearest the tube and the finer particles lie nearer the outside. E is a removable hollow cone of sheet metal, equipped with three or more hooks, *e*, adapted to engage on the rim of the top, and to support the cone E with tolerable firmness in an exactly central position. The tube D is of such length that when the ordinary blankets or burlaps have been applied upon the false bottom, as indicated by *a*, and the closed end of the tube D has been firmly rested thereon, the upper end will just reach up into the interior of the cone E, and be held centrally thereby.

While the parts are thus conditioned, I apply the bone-black, letting it fall into the top of the filter through a perpendicular spout from above. (Not represented.) The stream is directed centrally upon the point of the cone E, and is deflected with tolerable uniformity in all directions by the cone. It strikes against the interior of the casing A and piles up, keeping the outer part the highest.

The coarser particles of the bone-black are the most free to roll, and the material thus conditioned assorts itself, the finer particles remaining where they are deposited near the outside of the space, while the coarser particles roll inward and arrange themselves against

the exterior of the reticulated tube D. When all is filled the cone E is removed, and the top of the black is roughly leveled.

The sugar liquor is introduced at the proper elevated temperature, as usual. The pipe through which it is supplied may be either introduced through the open top of the filter or through the ordinary side aperture. I have represented the latter. With either arrangement it is essential that it be adapted to be readily removed and reapplied. It is also important that it be capable of forming an approximately tight joint with the top of the tube D.

Thus conditioned, the liquid is admitted into the tube D, and rapidly fills it. It exudes freely in all directions through all the interstices, and traverses outward rapidly through the coarser particles, and becomes more and more effectually filtered as it traverses toward the outside. All the filtering material becomes rapidly saturated with the liquid, which latter ultimately flows out through the ordinary strainer at the bottom in the properly filtered condition.

I will designate the charcoal or analogous material by the single letter *m*. The graduation of the coarse in the center, with the finer near the outside, is not necessarily uniform, but I esteem it important that the coarser particles shall lie near the interior to facilitate the rapid outflow of the fluid and its diffusion equably through the filtering mass.

My invention accomplishes the feeding of the liquor to the coal in such way as not to have the liquor come in contact with any coal that has been previously saturated, and aids to avoid having the liquor pass from the top downward over coal so saturated. To do this I feed the liquor from the side or center through a tube and sieve in such way that the liquor first meets the coal at bottom of tank; and as fast as that coal is saturated feeds to the coal next above, and so on till the tank is full, when it can be immediately drawn off, thus saving time of standing and waste of coal, as all is used to full extent.

My plan avoids carrying down from top of tank any dust of coal that might collect in mass and obstruct the full action of coal; and my plan prevents the liquor from being chilled by the coal in passing over coal that is cooler than the liquor and already used up by having liquor passed through it before.

Modifications may be made without defeating the object of the invention. The form of the cone E and its diameter, as also the diameter of the pipe D, may be varied within wide limits.

I can, if preferred in any case, put the fine gauze inside instead of outside of the stout body of the tube D.

My filter allows a force to be applied in the same manner as any other. For this purpose it is necessary simply to fit a close cover of sufficient strength to the top, and to apply the pressure by a suitable head or pump. Thus conditioned, the filtered liquor may be led upward from the base of one filter and poured into a second, and again from a second into a third, as may be found expedient.

I claim as my improvement in filters—

1. In combination with a filter having a central upright reticulated tube, D, the removable cone E, and supporting means *e* adapted to serve in the introduction of the filtering material *m*, and to perform the double functions of centering the tube D, and of distributing the filtering material, and causing it to be arranged with its coarser particles innermost, as herein specified.

2. In combination with the upright reticulated tube D, the false bottom A^2, having a depression in the center, and provisions E *e* for centering the tube at the top, as herein specified.

In testimony whereof I have hereunto set my hand this 5th day of June, 1879, in the presence of two subscribing witnesses.

ALEXR. MACKEY.

Witnesses:
E. B. BOLTON,
CHARLES C. STETSON.