A. JORDAHL.

FILTER.

APPLICATION FILED DEC. 14, 1921.

1,426,196.

Patented Aug. 15, 1922.

3 SHEETS—SHEET 1.

Fig. 1.

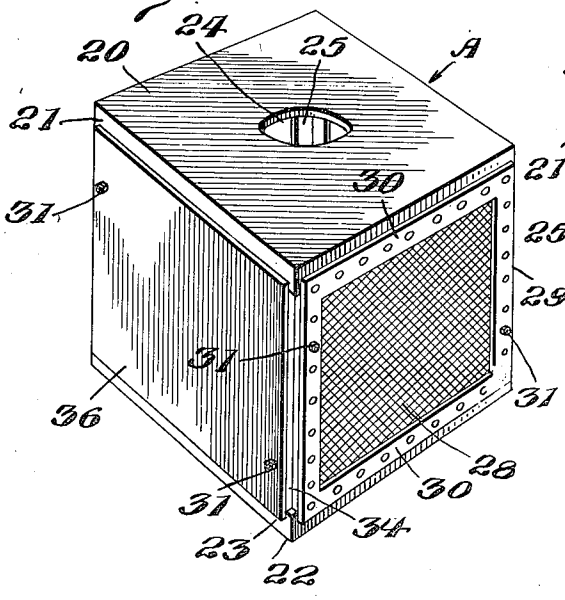


Fig. 2.

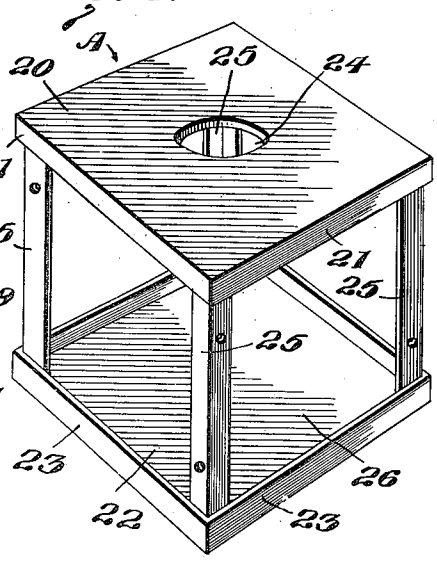
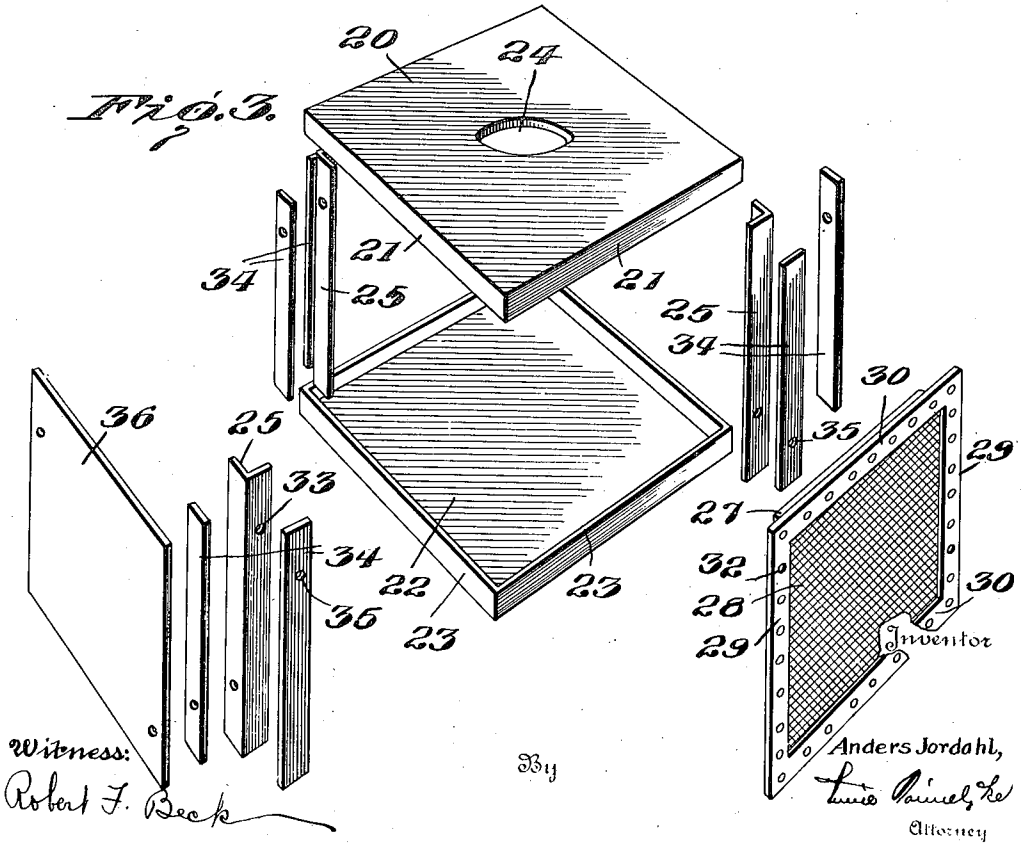


Fig. 3.



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3 SHEETS—SHEET 2.

Fig. 4.

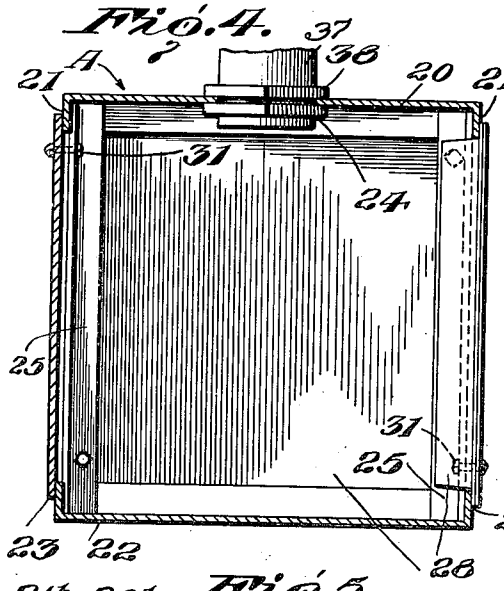


Fig. 6.

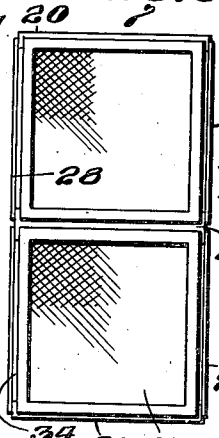


Fig. 7.

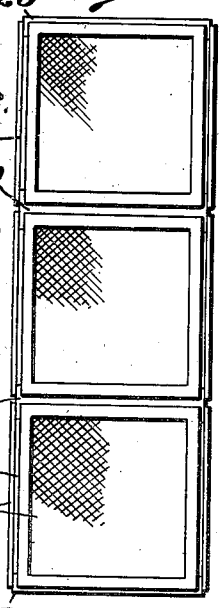
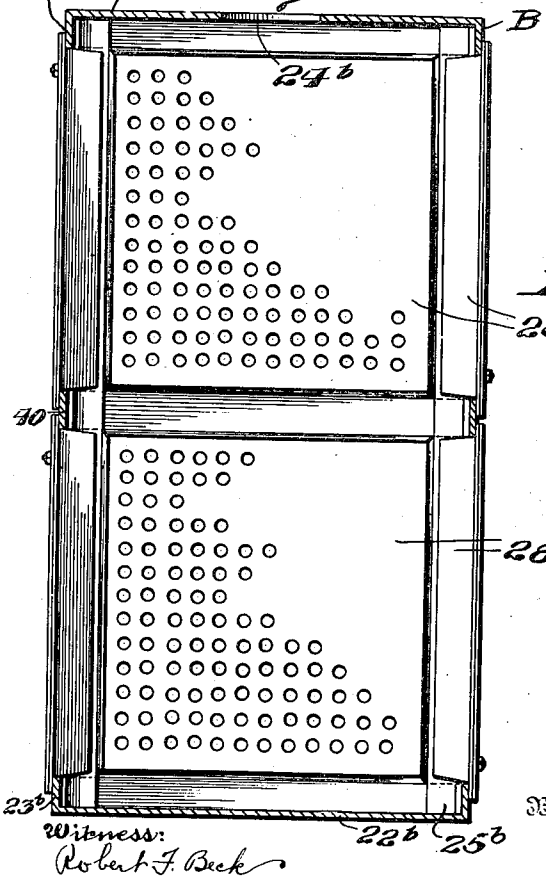


Fig. 5.



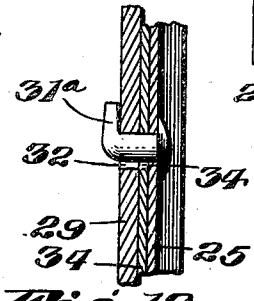


Fig. 12.

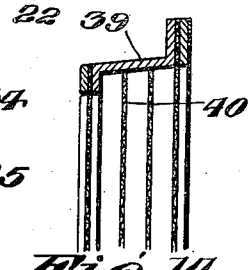


Fig. 14.

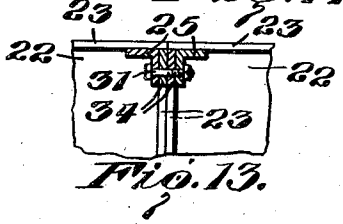


Fig. 13.

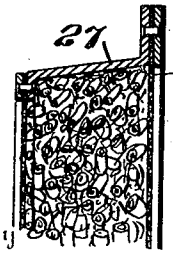


Fig. 15.

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3 SHEETS—SHEET 3.

Fig. 8.

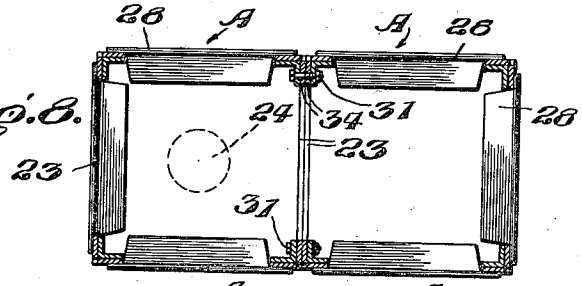


Fig. 9.

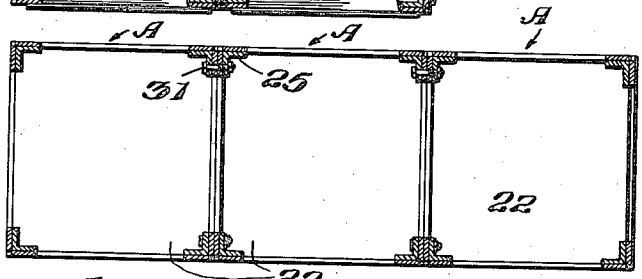


Fig. 10.

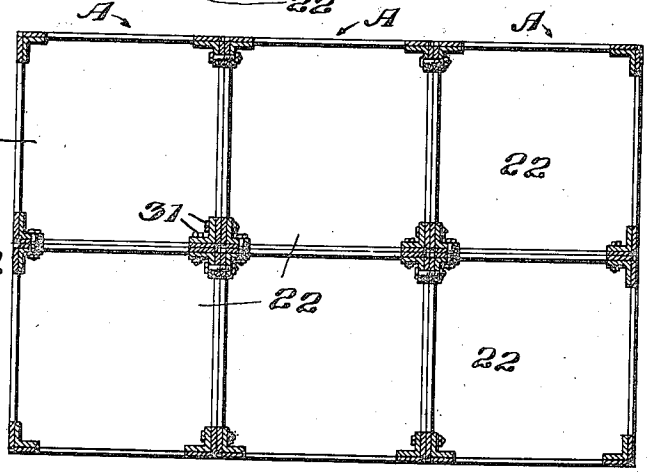


Fig. 11.

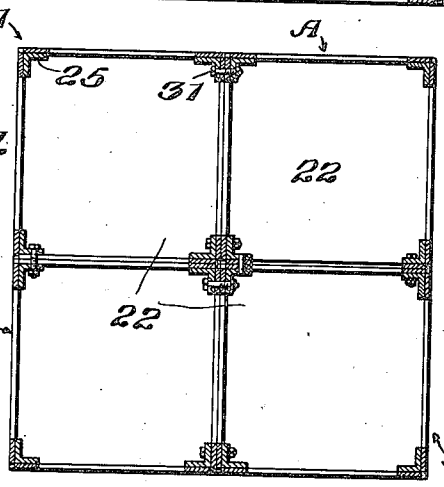
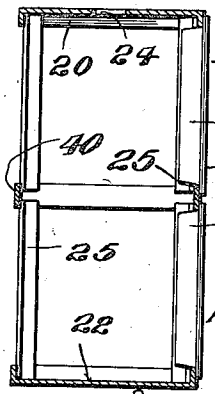


Fig. 16.



Witness:

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By Louis Daniels

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UNITED STATES PATENT OFFICE.

ANDERS JORDAHL, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO MIDWEST STEEL AND SUPPLY COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

FILTER.

1,426,196. Specification of Letters Patent. Patented Aug. 15, 1922.

Application filed December 14, 1921. Serial No. 522,447.

To all whom it may concern:

Be it known that I, ANDERS JORDAHL, a subject of the King of Norway, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Filters, of which the following is a specification.

This invention relates to filters and particularly to those which are used for cleaning air and operate in conjunction with compressors and the like.

Heretofore, filters having been provided for this purpose and, since each filter made had a definite and invariable capacity, it was necessary to either carry a large variety of sizes in stock or separately design and make each filter for the particular capacity desired.

These and other disadvantages, some of which will be pointed out and others of which will be apparent to those skilled in the art, have been overcome by the present invention and an important feature of this invention is the provision of a filter structure which will enable the capacity of the filter to be quickly and easily varied. This is done by forming each filter of a plurality of separate filter-units, each of which may be applied or removed independently of the others, the portion of the frame adapted to receive the filter-units being suitably covered when a filter-unit is not to be applied thereto.

Another feature of this invention is the provision of a frame structure for such filter which is composed of a few simple, inexpensive standard parts or elements.

A further feature is the provision of each frame as a unit which may be connected to other counter-part units to make up a battery when it is desired to have a capacity greater than the maximum capacity of each unit frame.

In practice these features are extremely advantageous since, with a stock of a few standard parts, it is possible to manufacture filters of almost any capacity desired, making it possible to fill orders upon short notice. A further advantage in this connection is that the capital which would otherwise be rendered idle in stocks of filters of various sizes is released for other use.

As hereinafter explained, the unit frames may be connected together by unskilled labor in either one or more horizontal rows or vertical tiers and if conditions of installations warrant it they may even be connected together in both horizontal rows and vertical tiers. The arrangement is preferably such that each unit is directly connected to an adjacent unit or units and each may constitute the sole means of support of the units connected to it.

It is at present considered preferable to use the Midwest filter units of commerce in the most suitable size, which units may each be placed in an opening in the side of the filter-frame. It should be noted, however, that it is also contemplated to use other filter arrangements such as woven wire or textile in cases where the highest degree of filtration is not required.

Other features will hereinafter appear.

In the accompanying drawings:

Figure 1 is a perspective view of the unit filter of the present invention showing a filter-unit and a cover plate in place.

Fig. 2 is a similar view, but showing the skeleton frame without the filter-units attached.

Fig. 3 is a disassembled perspective view showing the various parts constituting a unit filter.

Fig. 4 is a sectional view taken through the center of the unit filter shown in Fig. 1.

Fig. 5 is a sectional view of a pair of sets of filter-units, one set being arranged over the other, and the frame therefor, this arrangement being capable of accommodating eight filter units.

Fig. 6 is an elevation of the construction shown in Fig. 5.

Fig. 7 is a similar view showing a tier of three sets of filter-units, this arrangement being capable of accommodating twelve filter-units.

Fig. 8 is a horizontal sectional view showing two skeleton frames connected side by

side and capable of accommodating six filter-units.

Fig. 9 is a similar view showing three skeleton frames connected side by side for the purpose of accommodating eight units.

Fig. 10 is a similar view showing six skeleton frames arranged in two rows connected together, each row comprising three skeleton frames arranged side by side, this arrangement being capable of accommodating ten units.

Fig. 11 is a view similar to Fig. 10 but in this case only four unit frames are used, this arrangement being capable of accommodating eight units.

Fig. 12 is a detail view showing a hook carried by the skeleton frame adapted to support the filter units thereon.

Fig. 13 is a detail view showing the connection between filter-units arranged side by side or in vertical tiers.

Fig. 14 is a fragmentary sectional view showing part of a Midwest type filter-unit, which is adapted to be used with the skeleton frames.

Fig. 15 is a similar view showing a different type of filter-unit adapted to be used with the frame of the present invention.

Fig. 16 is a sectional view showing an arrangement similar to that shown in Fig. 5.

As shown in the accompanying drawings, the unit skeleton frame A of the present invention comprises a top plate 20 having flanges 21 and a bottom plate 22 having flanges 23. These plates are substantially identical in shape but the upper plate is provided with an opening 24 for the reception of a suitable conduit for the dry, clean air which has passed through the filter. The top plate 20 and the bottom plate 22 are preferably square and are connected together by angle bars 25, welded or otherwise secured to the flanges of the plates 20 and 22 at the corners thereof. There is thus provided, on each of the vertical sides of the regular polyhedron, an opening or pocket 26 over which, or into which, the body 27 of the filter-unit 28 is adapted to be placed.

As shown in the drawings, each filter-unit 28 comprises side flanges 29 and top and bottom flanges 30 and when the filter-unit is placed in the pocket 26 of the unit frame, the top and bottom flanges 30 engage and lie upon the flanges 21 and 23 respectively, of the top and bottom plates. In this position the filter-unit is held to the frame by means of bolts 31 which pass through apertures 32 in the side flanges 29 and aperture 33 in the angle bars 25. The filter-unit, so positioned, closes the opening or pocket 26 with the exception of a narow space at each side between its side flanges 29 and the angle bars 25 resulting from the fact that the bars 25 are located inside of the flanges 21 and 22.

Of course, the filter-unit may be so constructed that this space is filled, but, according to the form at present preferred, this space is filled by a filler bar 34 which is interposed between the angle bars 25 and the flanges 29 before the filter unit is applied and has its outside surface flush with the outside surface of the flanges 21 and 23 of the top and bottom plates. The filler bar 34 is provided with apertures 35 similar to the apertures 32 of the flanges, to permit the passage of the bolts 31.

If it is desired the bolts 31 may be replaced by hooks 31[a] shown in Fig. 12, which are rigidly secured to the angle bars 25 and which freely pass through the apertures 32 in the flanges 29 of the filter-unit and the apertures 35 in the filler bars 34.

It will be seen from the foregoing that the skeleton frame A of the filter comprises a few parts which can be used interchangeably. This structure is advantageous in that it is not necessary to carry in stock a large number of parts in order to be able to make the filter frames as they are required.

It will also be seen that the filter may be arranged for whatever capacity, within certain maximum limits of course, the conditions warrant. For instance, if a small amount of air is to be cleaned and dried it will be necessary to apply to the skeleton frame A only one filter-unit 28. In this case the pockets 26 of the unused sides of the skeleton frame are each closed by a plate 36 which is secured to the angle bars 25 in the manner that the filter units are attached and with the filler plates 34 interposed. If, after the filter has been in use, it is desired to increase the capacity of the filter, one or more of the plates 36 may be removed and filter-units 28 substituted therefor. Of course, when the filter is initially constructed it may be provided with the desired number of filter-units, which number is only limited by the number of vertical sides of the polyhedral skeleton frame A.

The filter herein described is particularly adapted for use in connection with air compressors, for generators, pumps, motors, etc., and when so used may be supported by its connection to the conduit 37, see Fig. 4, the conduit being held to the top or bottom plate 20 by means of suitable nuts 38, or flanges and bolts if desired. The frame itself is extremely light and with the filter-units attached may well be supported as above described. If it is desired the filter may be supported by the bottom plate 22 resting upon a suitable base or support.

The filter-units may readily be removed for the purpose of cleaning them by removing them one at a time. The moisture which is collected by the filter-units falls into the bottom plate 22 which acts as a pen for the reception of the same.

It will be understood that the filter 39

shown in Fig. 14 which comprises a plurality of screens or woven fabrics 40 may be substituted for the filter shown in Fig. 15.

Under some conditions it is desirable to provide more filter-units than can be accommodated in a single unit-frame A and in this case the filter frame may be constructed as shown in Figs. 5, 6 and 7, that is in a vertical tier with a plurality of sets of filter-units, one set above the other. As shown in these figures, there is arranged a skeleton frame B comprising top and bottom plates 20^b and 22^b which are the same as plates 20 and 22 used in the frame A. These plates, however, are connected by angle bars 25^b which are of sufficient length to enable the desired number of sets of filter-units 28 to be placed one above the other. Intermediate the top and bottom plates 20^b and 22^b there is providd a strengthening band 40 riveted or welded to the angle bars 25^b. The band 40, in adition to serving the above function, acts like the flanges 21^b and 23^b of the plates 20^b and 22^b to receive against it top and bottom flanges 30 of the lower and upper filter-units 28 respectively (see Figs 5 and 6). In the form shown in Fig. 7 there are two bands 40 and the structure is adapted to hold three sets of filter-units 28.

In the forms of the invention just above described, the pockets are exactly the same as the pockets 26 in the frame A and the filter-units are attached thereto with the filler plates 34 interposed just as they are attached in the first form described.

The chamber within the frame B is entirely open and air passing through the various filter-units in either set passes out through the aperture 24^b in the top plate 20^b.

If it is desired, instead of using the long angle bars 25^b in the frame B, the bars 25 used in the frame A may be used as shown in Fig. 16 to construct a frame C for vertically arranged sets of filter units. In this case the usual top and bottom plates are used and the alined angle bars 25 are secured together through the band 40 by riveting, welding or otherwise.

As shown in Figs. 8 to 11 the filter frames A may be connected together to form various figures or shapes for the purpose of accommodating any desired number of filter-units. When this is done as shown in Fig. 8 the two frames A are connected together side by side with flanges of the top and bottom plates contacting and with the filler bars placed between the sides of the adjacent angle bars. The frames are then secured together by passing the bolts through the apertures 33 and 35 in the angle bars and filler bars respectively, these being the same apertures that are used for holding the bolts used to secure the filter-units in place on the frame. It will thus be seen that the space between the two frames is therefore open and the air passing through any of the filter-units is discharged through the opening 24 (shown in dotted lines in Fig. 8) in one of the frames. If it is desired to have only one pipe or conduit supplied with clean, dry air, the other frames are constructed without an apertured top plate. In other words, when this is done a bottom plate is used as the top plate for the other frames A. The frames A can be connected together in various ways to provide the desired number of filter-units and the arrangement can be made to fit the space most convenient to mount or lodge the entire assemblage. For example, if a long narrow space is available it is only necessary to use three frames A side by side to accommodate eight filter-units but if the space is square it will be necessary to use four frames A to accommodate the same number of filter units. The unit frame of the present invention is adapted to be placed where there is very little head room but if it is convenient to employ twice the head room only two unit frames arranged as shown in Fig. 6 or 16 will be necessary to accommodate eight filter-units. The arrangement shown in Fig. 10 comprises six unit frames and is capable of accommodating ten filter-units.

Variations may be resorted to within the scope of my invention and portions of the improvements may be used without others.

Obviously the filter may be inverted making the bottom plate the top plate and the top plate the bottom plate.

I claim as my invention:—

1. A filter comprising a frame unit having a plurality of open sides; filter units adapted to be secured in some of said open sides; and plates adapted to be secured in the remaining open sides, the filter units being interchangeable with each other and with the plates.

2. A filter comprising a frame having a plurality of openings; filter units adapted to be secured in one or more of the openings; and plates adapted to be secured in the remaining openings, the filter units being interchangeable with each other and with said plates.

3. A filter comprising top and bottom flanges plates; angle bar members secured to said flanged plates and cooperating therewith to form openings; filter units adapted to be secured in at least one of the openings; and plates adapted to be secured in the remaining openings, said filter units being interchangeable with each other and with the last-named plates.

4. In a filter of variable capacity, a polyhedral frame embodying top and bottom members and sides, the sides having opening therein; one or more filter unit adapted to be secured in said openings; and plates

adapted to be secured in the remaining openings, said filter units being interchangeable with each other and with the plates.

5. In a filter of variable capacity, a polyhedral frame having top and bottom members and sides, the sides having openings therein; one or more filter units adapted to be placed in said openings, the number of filter units used being in accordance with the desired capacity of the filter and each being adapted to fill the opening in which it is placed; and plates adapted to be placed in the openings which are without filter units, said filter units being interchangeable with each other and with the plates.

In testimony whereof I affix my signature.

ANDERS JORDAHL.