

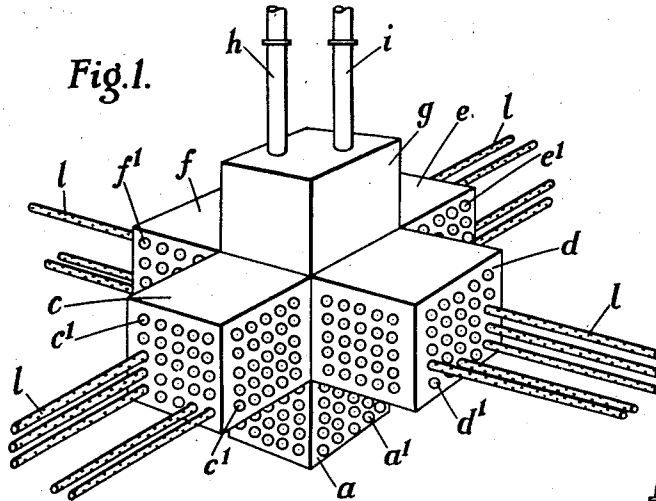
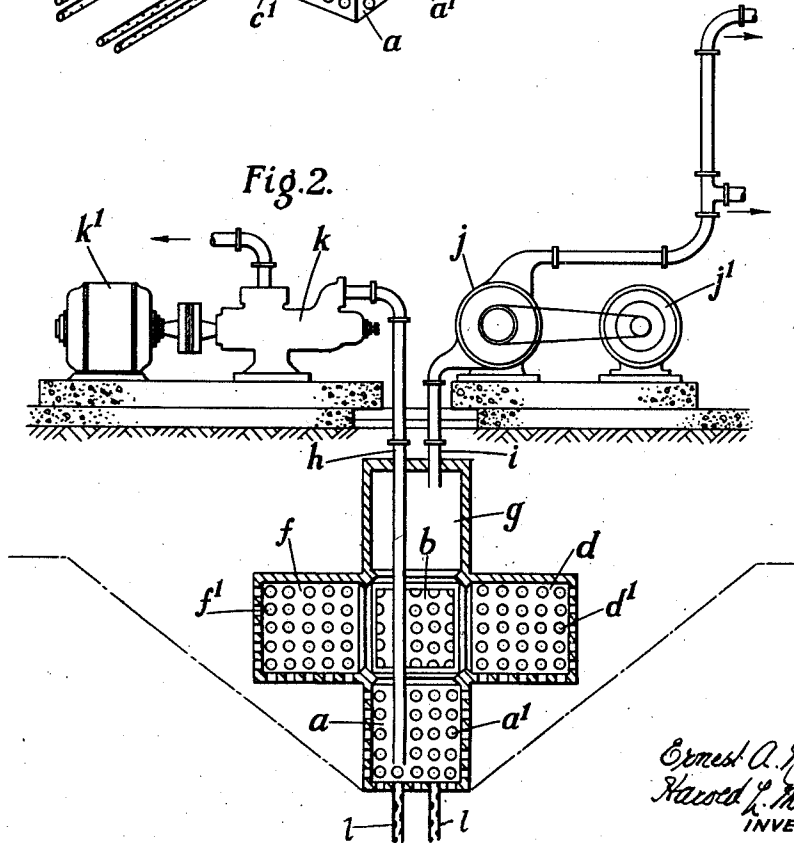
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VENTILATION OF ROOMS AND THE LIKE

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VENTILATION OF ROOMS AND THE LIKE

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This invention relates to the ventilation of rooms and the like and is applicable for use in the ventilation of air raid shelters or like enclosed spaces or where air conditioning is required as in shops, offices and industrial works.

It is known that earth is a good filter and purifier for air and that air can be drawn from below the ground which will be filtered and of even temperature, i. e., relatively cool in the summer and warm in the winter. For such purpose it has been proposed to construct underground chambers having perforated walls or an underground strainer with radiating perforate tubes or helices. In some countries, however, the water level in the soil is often too near the surface for such underground arrangements to be satisfactory or reliable as the same have to be a certain depth below the surface in order to ensure both a sufficient depth of soil to filter the air and to tap suitable strata for ready extraction of air.

The object of the invention is an improved apparatus for obtaining filtered air from below ground level.

According to the invention the improved apparatus comprises air extracting and underground air collecting means in combination with means for maintaining a sub-soil water level below such air collecting means.

In a preferred embodiment of the invention sub-soil water collecting means is provided below and structurally combined with the air collecting means.

In a further preferred arrangement of the invention mechanically combined air and water extracting means are provided.

In the accompanying drawing:—

Fig. 1 is a diagrammatic perspective view of one example of apparatus made in accordance with the invention;

Fig. 2 is a vertical cross section of the apparatus shown in Fig. 1.

In the example of the invention shown in the drawing a plurality of box-like hollow cubes are provided, all of the same size. The boxes are sunk into the ground so that there is one *a* at the bottom, another or central one *b* on top thereof with four others *c*, *d*, *e*, and *f* attached to each side of it, and another *g* on top of the center one, the top of such last box being, if desired, approximately at ground level. A convenient size for such boxes is 2' 6" cube, external measurement. Of these seven boxes, all except the center box *b* has one open face where it joins to the adjacent box, such face having

an inwardly directed flange to form a joint. The bottom box *a* is made with its side walls and bottom perforated at *a*¹ to admit water. The boxes *c*, *d*, *e*, and *f* around the center one *b* have an imperforated top whilst all the other exposed sides are similarly perforated as at *c*¹ and *d*¹. The uppermost box *g* has imperforate exposed walls at the top and sides except for apertures in the top to receive air and water pipes *h* and *i* respectively. The center box *b* has openings on all of its four sides to register with the openings in the contiguous sides of the adjacent side boxes. The horizontal faces of boxes toward ground surface are therefore sealed to prevent suction of air direct from the immediate surface.

The boxes are adapted to be arranged in or adjoining the ground below the concrete floor of an air raid shelter or other structure on the floor of which are provided an air and a water extractor *j* and *k* respectively of the centrifugal type, driven by the electric motors *j*¹ and *k*¹ respectively. Original or alternative drive by hand or bicycle attachment may be provided.

In order to control the water-extractor automatically, according to the prevailing water level to bring it into or put it out of action, a float may be provided coupled to a controlling switch for the pump motor so as to switch such motor on and off respectively as the water level in the box *b* rises to or falls to a predetermined level. The water and air pumps may be arranged in line, with the driving shaft of one extended to couple to the other, with a single driving motor or means and preferably with a clutch to enable the water pump to be uncoupled or coupled up according to the water level in the box *a*.

The air-collecting elements may be of any shape desired.

In use, where the air-collecting boxes, which are those *c*, *d*, *e*, and *f* around and including the center box *b*, are below the subsoil water level, the operation of the water pump will act to lower the water level, producing a local hydraulic gradient below the said air-collecting boxes. Any water which does get into such air-collecting boxes may flow through the center box into the bottom box where it will be removed by the pump or will be extracted through the perforations in the bottom of the air-collecting boxes and through the adjacent sub-soil by the water-collecting and extracting action of the bottom box.

The air pipe *i* will obviously terminate at the

top of the upper box *g* which merely operates as an air receiving chamber, whilst the water-extracting pipe *h* will terminate near the bottom of the bottom box *a*.

Such apparatus with a half horse power motor to drive the air pump would, it is estimated, provide sufficient fresh filtered air for about 60 persons. Unless there is an excessive amount of water in the sub-soil the electric motor, hand or bicycle drive would have sufficient power to operate the water pump also and when the water level in the bottom box has been lowered, such box will also operate to collect air through the surrounding soil.

The boxes, which may be made of concrete, metal, brick, asbestos, cement or other suitable material will conveniently be grouted together with or without bolts or other means to hold them together, and any suitable locating means may be provided to locate them in their pre-arranged formation, as by making the centre box larger and with facial recesses in which the other boxes may be located. It will be seen that the top air collecting chamber *g* which may be located adjacent to the surface of the ground has imperforate or sealed top and side wall and space the central and laterally and horizontally extending side chambers below the surface of the ground, so that air will not be drawn from the soil close to the surface of the ground, the horizontal top walls of the horizontally extending chambers being imperforate or sealed to prevent air being drawn from the soil directly above the chambers.

The horizontally extending air collecting chambers are provided at their vertical and horizontal bottom faces with air inlet perforations and as the central air collecting chamber is open at the top, bottom, and all of its sides, and has unrestricted communication with all of the contiguous chambers, it will be clear that there is a free flow of air from all of the perforated walls of said chambers to the top air collecting chamber and to the suction pipe *i* leading therefrom. At the same time any water entering through any of the perforations of said chambers will have free unobstructed flow to the bottom water collecting chamber from which it is removed by the pump *k* and its suction pipe *h*. The pump and the fan are independently operated and controlled so that they may be operated simultaneously and independently to meet requirements at the expenditure of a minimum amount of power and without flooding of the air collecting chambers while maintaining free passage of water from all of the air collecting chambers to the hollow water collecting chamber and free passage of air from the water collecting chamber to the air collecting chambers.

The suction pipe *h* of the pump extends through the top wall of the top chamber *g* and terminates in the bottom chamber *a* a short distance above the bottom thereof. The suction pipe *i* of the fan *j* extends through the top wall of the top chamber *g* and terminates a short distance below the top of said chamber *g*.

Where the subsoil is heavy or close packed and a larger air or water collecting surface is required other box-like units may be added to extend the perforated surface area thereof, or collecting pipes *l* or the like may be fitted extending from the walls of any of the boxes to any desired distance and in any desired arrangement. Alternatively, where a larger capacity is required, two or more sets of boxes may be pro-

vided suitably spaced apart and connected to one another below ground or to the same air and water pumps possibly of greater extraction power, above ground.

Obviously, the invention is not limited to all the details of construction of the examples and alternatives above described as for example the shape, construction and arrangement of the air and water collecting apparatus may be varied without departing from the nature of the invention as herein previously defined and explained.

What we claim is:

1. Apparatus for extracting air from the soil below ground level comprising a group of hollow bodies having perforated walls and forming air collecting chambers and buried in the soil below ground level for collecting air directly from the surrounding soil, means for extracting air from said chambers, a hollow body having perforated walls and forming a water collecting chamber and also buried in the soil and located below the zone of the group of air collecting chambers and communicating therewith and arranged for collecting water from said surrounding soil below the zone of the air collecting chambers, a tubular conduit communicating with the water collecting chamber and means for lifting water through said conduit so as to remove water collecting in said water collecting chamber and thereby lower the hydraulic level in the vicinity to a level below the air collecting chambers, and for discharging said water remote from the apparatus.

2. Apparatus for extracting air from the soil below ground level, comprising air collecting means consisting of a nest of rectangular air collecting elements having a central rectangular element, a laterally disposed rectangular element secured on each side thereof and an upper rectangular element secured above the central one, air passages between the lateral elements and the central element and between the central element and the upper element, air inlet apertures in the outer side faces of the lateral elements, and an air extracting pipe connected to the upper element, in combination with a water collecting means consisting of a rectangular water collecting element secured to and below the central air collecting element, water inlet apertures in the side and bottom faces of the water collecting element and a water extracting means connected to the said water collecting element to lift collected water therefrom.

3. Apparatus for extracting air from the soil below ground level, comprising air-collecting means consisting of a nest of rectangular air collecting elements having a central rectangular element, a laterally disposed rectangular element secured on each side thereof and an upper rectangular element secured above the central one, air passages between the lateral elements and the central element and between the central element and the upper element, air inlet apertures in the outer side faces of the lateral elements and an air extracting means connected to the upper element, in combination with a water collecting means consisting of a rectangular water collecting element secured to and below the central air collecting element, water inlet apertures in the side and bottom faces of the water collecting element and a water extracting means connected to the said element to lift collected water therefrom, in further combination with an extension air collecting element in the form of a pipe extending into the subsoil from at least one of the rectangular air collecting elements,

4. Apparatus for extracting air from the soil below ground level, comprising air collecting means consisting of a nest of rectangular air collecting elements having a central rectangular element, a laterally disposed rectangular element secured on each side thereof and an upper rectangular element secured above the central one, air passages between the lateral elements and the central element and between the central element and the upper element, air inlet apertures in the outer side faces of the lateral elements, and an air extracting means connected to the upper element, in combination with a water collecting means consisting of a rectangular water collecting element secured to and below the central air collecting element, water inlet apertures in the side and bottom faces of the water collecting element and a water extracting means connected to the said element to lift collected water therefrom, in combination with an extension water-collecting element in the form of a pipe extending into the subsoil from the rectangular water-collecting element.

5. Apparatus for extracting air from the soil below ground level, comprising air collecting means consisting of a nest of rectangular air col-

lecting elements consisting of a central rectangular element, a laterally disposed rectangular element secured on each side thereof and an upper rectangular element secured above the central one, air passages between the lateral elements and the central element and between the central element and the upper element, air inlet apertures in the outer side faces of the lateral elements, and an air-extracting pipe connected to and terminating in the upper element, in combination with a water-collecting means consisting of a rectangular water-collecting element secured to and below the central air-collecting element, water inlet apertures in the side and bottom faces of the water collecting element and a water-extracting pipe extending into and terminating near the bottom of the said element in combination with power driven means for extracting air from the air-collecting elements and separate power driven means for extracting water from the water-collecting elements to maintain the hydraulic level in the surrounding soil below the level of the air-collecting elements.

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