E. E. HORSTMANN.

CONCENTRATOR.

APPLICATION FILED AUG. 15, 1919.

1,365,916.

Patented Jan. 18, 1921.

2 SHEETS—SHEET 1.

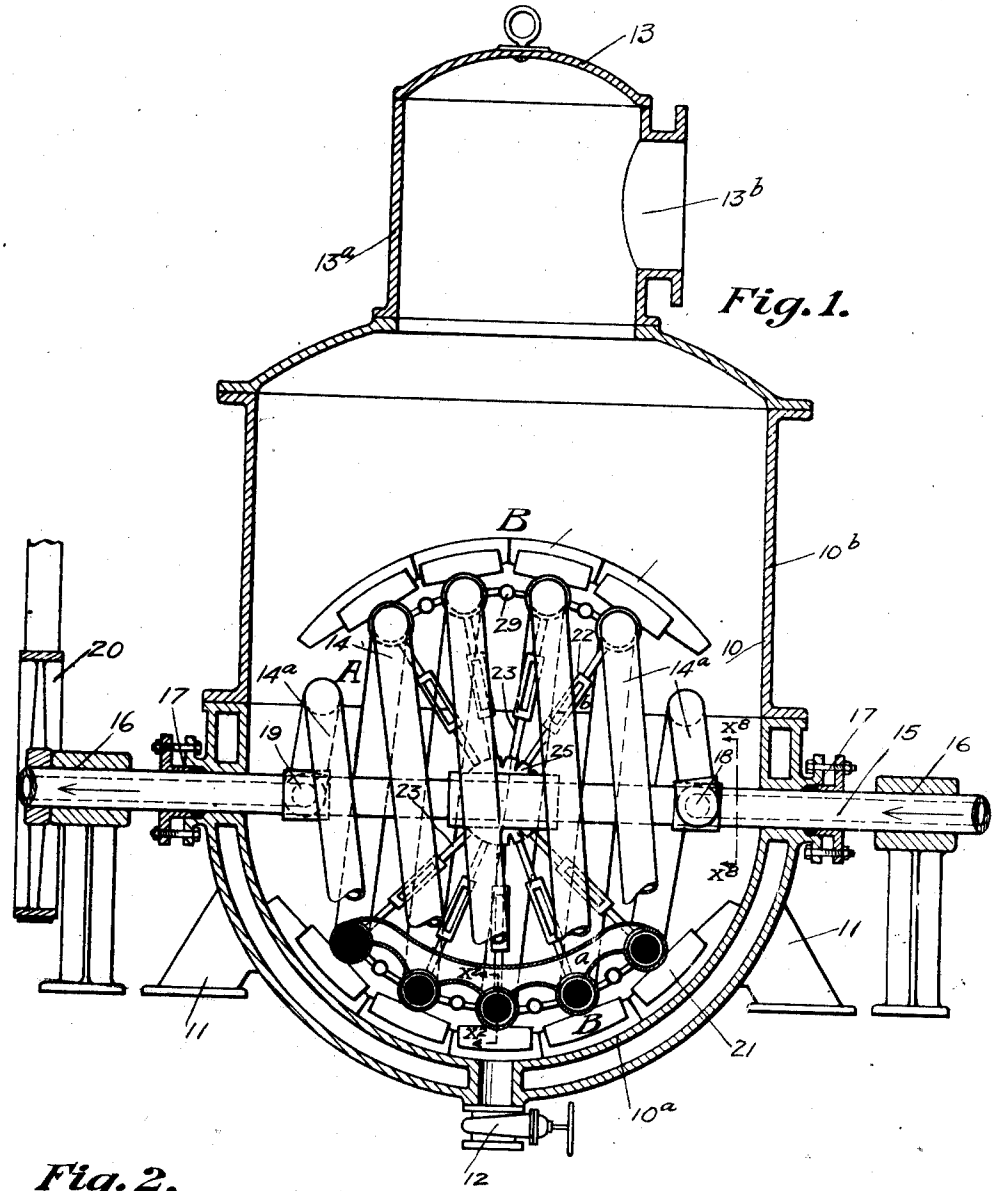
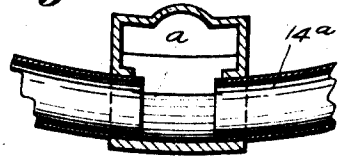


Fig. 1.

Fig. 2.



INVENTOR.

Ernst E. Horstmann.

BY

ATTORNEY.

E. E. HORSTMANN.

CONCENTRATOR.

APPLICATION FILED AUG. 15, 1919.

1,365,916.

Patented Jan. 18, 1921.

2 SHEETS—SHEET 2.

Fig. 3.

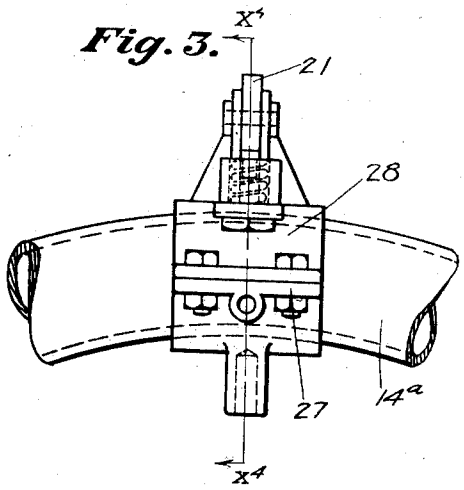


Fig. 4.

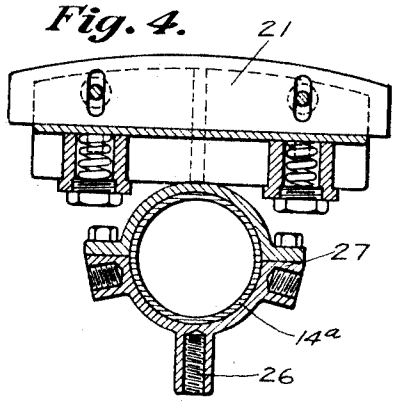


Fig. 5.

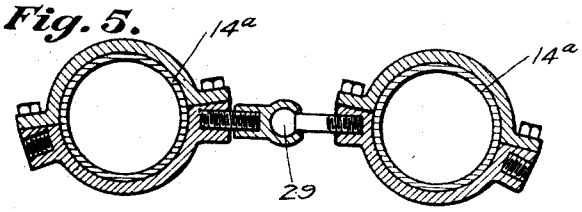


Fig. 6.

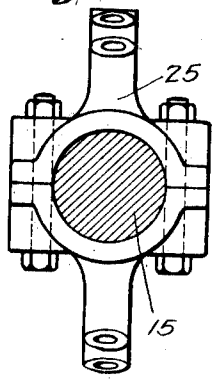


Fig. 7.

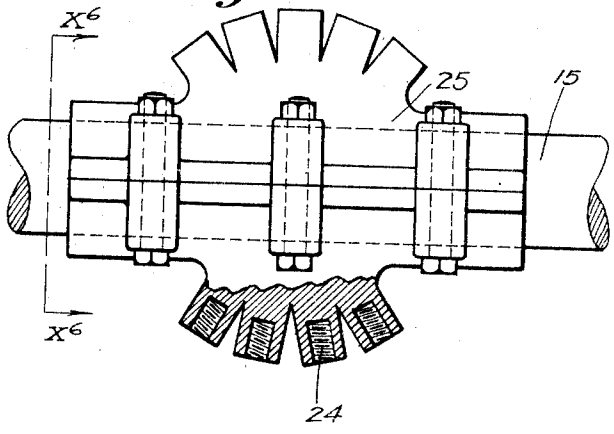
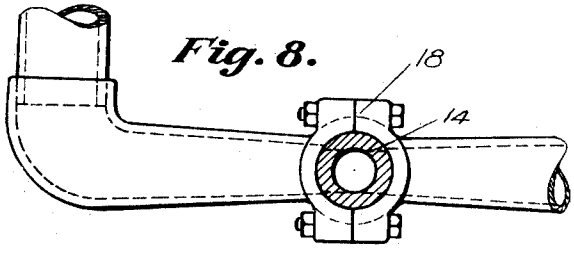


Fig. 8.



INVENTOR,

Ernst E. Horstmann;

BY

Raymond Hudson

ATTORNEY.

UNITED STATES PATENT OFFICE.

ERNST E. HORSTMANN, OF LOS ANGELES, CALIFORNIA.

CONCENTRATOR.

1,365,916. Specification of Letters Patent. Patented Jan. 18, 1921.

Application filed August 15, 1919. Serial No. 317,732.

To all whom it may concern:

Be it known that I, ERNST E. HORSTMANN, a subject of Germany, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Concentrators, of which the following is a specification.

This invention relates to improvements in concentrators such as used in providing or preparing food or other essences, and the invention consists in the provision and construction and combination and relative arrangement of parts, members and features, all as hereinafter described, shown in the drawings and pointed out in claims.

The invention has for objects the provision of a concentrator which will be relatively simple and inexpensive in construction, taken in conjunction with compactness in form and efficiency in operation.

This invention constitutes an improvement upon or departure from the concentrator shown in my prior Patent No. 1,335,504, granted March 30, 1920, and in which patent the general construction and mode of operation of the concentrator are disclosed and made the subject of claims. One of the principal objects of that invention is to provide for an expeditious and thorough cooking or trying out action, the particular association of the cooking or heating element relative to and within the working chamber, and the construction of said heating element, providing for highly efficient concentrator action. A further object is the provision of novel means for maintaining the inner surface of the working chamber clean and free from accumulations or deposits of the material being subjected to concentrating action, or of scale.

In common with such prior invention, the present concentrator, the subject-matter involved in the present invention, comprises a revolving coil disposed within the working chamber within which the concentrating action takes place, a circulation of heating medium, such as steam, being maintained through such coil, during its rotation. By experiment and practice I have determined that inequalities of pressure, temperature and other factors are likely to result or occur, as between the several zones or turns or loops of such coil, inasmuch as the heating medium, such as live steam, is introduced at one end of such coil, and in traversing the same and giving up its heat in concentrating action, is subjected to depletion with respect to temperature, pressure and other factors. Therefore, in accordance with the present invention, I provide what I have termed a "flash manifold," which connects, and through which communicate, the several loops or turns of the coil, such flash manifold or pipe or passage being disposed between the coil loops and the axis of rotation of the coil, whereby centrifugal action tends to scavenge from the manifold the condensates which otherwise would accumulate therein. Thus, in using live steam as a heating medium, its condensate, water, is kept within the turns of the coil, and is advanced through the coil and discharged from the far end of the same with the spent or partially spent or exhausted steam. By the use of this flash manifold I am enabled to obtain equal pressure throughout the entire coil between the inlet point of heating medium and the outlet point of such spent or partially spent medium and the condensate. Likewise I am enabled to maintain equal temperature throughout the entire coil, and also an increase in heat transmission per unit of surface of the coil, due to the fact that, due to maintenance of equal temperature and pressure as recited, the temperature difference between the heating medium and the boiling substances of the working chamber is greatly in excess of that which could be maintained without the use of this manifold. Likewise I obtain increased efficiency of condensate removal, because the condensate is forced through and discharged from the coil at a constant pressure at all points. I likewise obtain a relative increase in the coefficient of heat transmission, and I am enabled to operate the coil through a very large range of volume of heating medium without restricting or limiting the effective heat transmission to only a part of the coil, all due to the compensating and equalizing effect of the manifold. Thus equal pressures and temperatures are maintained throughout the entire coil irrespective of the length of the coil or the number of turns or loops thereof, or the initial pressure or temperature or quantity of the heating medium at its point of admission.

Other advantages, including the advantages and objects stated, will occur and be evident in conjunction with a perusal and

consideration of the following description, and a study of the accompanying drawings.

In the drawings:

Figure 1 is a central vertical sectional view of a concentrator embodying the invention, parts being in elevation, and parts being broken away for clearness of illustration;

Fig. 2 is a detail fragmentary enlarged sectional view taken upon the line x^2—x^2, Fig. 1, and looking in the direction of the appended arrows;

Fig. 3 is an enlarged sectional view showing a fragment of the heating coil and an end view of one of the scraping members in connection therewith;

Fig. 4 is a detail sectional view, partly in elevation, taken upon the line x^4—x^4, Fig. 3;

Fig. 5 is a detail cross sectional view showing the manner and means of connecting the several members for supporting the scraping members;

Fig. 6 is a detail sectional view taken upon the line x^6—x^6, Fig. 7, and looking in the direction of the appended arrow;

Fig. 7 is a fragmentary elevation, partly in section and broken away, of a hub structure shown in Fig. 1, and utilized in supporting the coil in connection with the rotating tubular shaft likewise shown in that figure; and,

Fig. 8 is a detail fragmentary transverse enlarged sectional view, taken upon the line x^8—x^8, Fig. 1, and looking in the direction of the appended arrows, and indicating the mode and means of connection of one end of the heating coil with the supporting rotating shaft.

Figs. 3 to 8 inclusive are all upon an enlarged scale.

Corresponding parts in all the figures are designated by the same reference characters.

Referring to the drawings with particular reference to the parts shown therein, 10 designates the working chamber of the concentrator, which may be constructed in any desired and suitable design and form, the lower portion 10^a thereof being in the form of a hollow hemisphere, communicating with an upwardly elongated open neck portion 10^b. This chamber may be mounted upon standards as at 11 and is provided with a valved drain outlet 12 at its lower side. A detachable closure or cover 13 is provided at the top of a contracted portion 13^a of the open neck 10^b of the chamber, the removal of which provides for introducing material to be concentrated within the chamber 10. An outlet opening 13^b is provided at one side of this contracted portion 13^a, and through this opening the concentrated material, in vapor form, passes to a suitable condenser or the open air.

The heating and cooking or concentrating element A is rotatably disposed within the chamber, and in the form shown in the drawings it comprises an approximately spherical pipe coil 14, the convolutions or turns or loops 14^a of which are preferably equi-distantly spaced from the inside walls of the lower portion 10^a of the chamber. To support the coil 14, and rotate it, I provide a tubular horizontal shaft 15 ranging through the chamber 10 at its widest part and journaled in upright bearings 16 disposed at opposite sides of the chamber 10, stuffing boxes 17 being provided at opposite sides of the chamber to prevent leakage from the chamber where the shaft passes through the walls of the same. The ends of the coil 14 are secured to and communicate with the shaft 15 at 18 and 19, being clamped and bolted thereto. The tubular shaft 15 communicates with a steam or other heating medium supply source, which is not shown in the drawings, the direction of travel of the live steam introduced at such shaft being indicated by the arrow at the right-hand side of Fig. 1. The spent or partially spent steam escapes from the opposite end of the shaft shown in Fig. 1 after traversing the coil 14 and a flash manifold a, a leading feature of the present invention, and which manifold consists of a pipe or tubular connection extending from convolution 14^a to convolution 14^a, as clearly shown in Fig. 1, and disposed within such convolutions, radially.

It will be understood that the shaft 15 may be rotated by a belt and pulley or in any suitable manner, such pulley being indicated at 20 at the left-hand end of the shaft 15.

Suitable means B are provided for preventing scale and material treated in the chamber from forming or accumulating upon or adhering to the inside wall of the chamber 10. This means B is rotated within the chamber conjointly with the coil 14, and in contact with those portions of the inner wall of the chamber portion 10^a with which the material to be concentrated has contact, thus keeping such portions clean and clear by a scraping action. Such means B may consist of scraping elements 21 mounted in connection with the coil 14 and adjustable through the agency of the means B, consisting of turn-buckles 22 incorporated in radius rods 23 springing from threaded sockets 24 in a hub device 25 bolted about the shaft 15 centrally within the chamber 10, such rods likewise taking into threaded sockets 26 bolted as at 27 about the respective turns 14^a of the coil 14. Thus, by turning the turnbuckles b, a proper and accurate working and scraping contact of the scrapers with the bottom surface of the chamber 10 is maintained. The scraping elements 21 are clamped as at 28, in connection with the sockets 26, above mentioned, and the coil 14, and the several convolutions 14^a with the

mountings of the scrapers are joined together in a series by adjustable ball and socket joints 29.

The particular construction and formation of this scraping means B and the means of mounting and adjusting the same, are not features of the present invention, being particularly dealt with in the prior application initially herein referred to.

Now, let us assume that the heating or concentrating element A is rotating pursuant to rotation of the shaft 15, and live steam is passing through the turns 14^a of the coil 14 and through the flash manifold *a* through the agency of which such convolutions communicate. If the liquid or fluid or mobile mass to be concentrated is present within the lower portion 10^a of the chamber 10, such material is thoroughly stirred or worked by the rotating coil 14 and subjected to a high degree of heat which efficiency concentrates such material, producing gases and vapors which pass out through the opening 13^b to a suitable condensing means or the air. The scraping blades 21 keep the surface of the working chamber clean and clear and free of accumulations and remove any scale or other adhesions. The condensed material, either in vapor or gaseous form, or in fluid or semi-fluid form, are removed from the chamber, either passing out through the opening 13^b or being withdrawn through the valved discharge outlet 12.

It will be evident that without the flash manifold *a* variations in temperature, pressure and other important factors would occur and obtain as between the several turns or convolutions 14^a. Such flash manifold, however, connects up all of these convolutions into a series in which equality of such working conditions, all as pointed out in the early part of this specification, are maintained, with the resultant advantages likewise mentioned. As soon as the live steam traverses the first turn 14^a to the end of the manifold *a*, it traverses such manifold and keeps each convolution 14^a equally supplied with live steam, so that no change or variant is encountered as among any of the coils. The condensate of the steam is centrifugally scavenged from the manifold into the convolutions and finally is forced out from the coil into the tubular shaft 15, and thence to a point of discharge. Pressure and temperature conditions are maintained constant throughout the coil and co-efficiency of heat transmission and evenness of heat transmission are maintained, all without variation, respective of the quantity or pressure or temperature of the steam or other heating medium. The entire coil is equally effective, in the concentrating action, at all points, and the concentrating action is therefore carried on with a high efficiency, and the maintenance of perfect working conditions.

It is manifest that many changes and variations may be made from the foregoing description and the disclosure of the drawings, in adapting the invention to varying conditions of use and service, all without departing from the true spirit of the invention.

Having thus disclosed my invention, I claim and desire to secure by Letters Patent:

1. In a concentrator having a working chamber, a rotary agitator mounted within the working chamber and comprising a coil having a plurality of convolutions, means for circulating a heating medium throughout the convolutions of the coil, and means of communication likewise being provided among the several convolutions of the coil.

2. In a concentrator having a working chamber, a rotary agitator mounted within the working chamber and comprising a coil having a plurality of convolutions, means for circulating a heating medium throughout the convolutions of the coil, and means of communication likewise being provided among the several convolutions of the coil; means likewise being provided for rotating the coil.

3. In a concentrator having a working chamber, a rotary agitator mounted within the working chamber and comprising a coil having a plurality of convolutions, means for circulating a heating medium throughout the convolutions of the coil, and means of communication likewise being provided among the several convolutions of the coil; said means of communication between the several convolutions of the coil being disposed between such convolutions and the axis of rotation of the coil.

4. In a concentrator having a working chamber, a rotary agitator mounted within the working chamber and comprising a coil having a plurality of convolutions, means for circulating a heating medium throughout the convolutions of the coil, and means of communication likewise being provided among the several convolutions of the coil; said means of communication between the several convolutions of the coil being disposed between such convolutions and the axis of rotation of the coil and comprising a tubular manifold mounted in connection with the said coil convolutions.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERNST E. HORSTMANN.

Witnesses:
F. A. McALLISTER,
EDNA TURNER.