

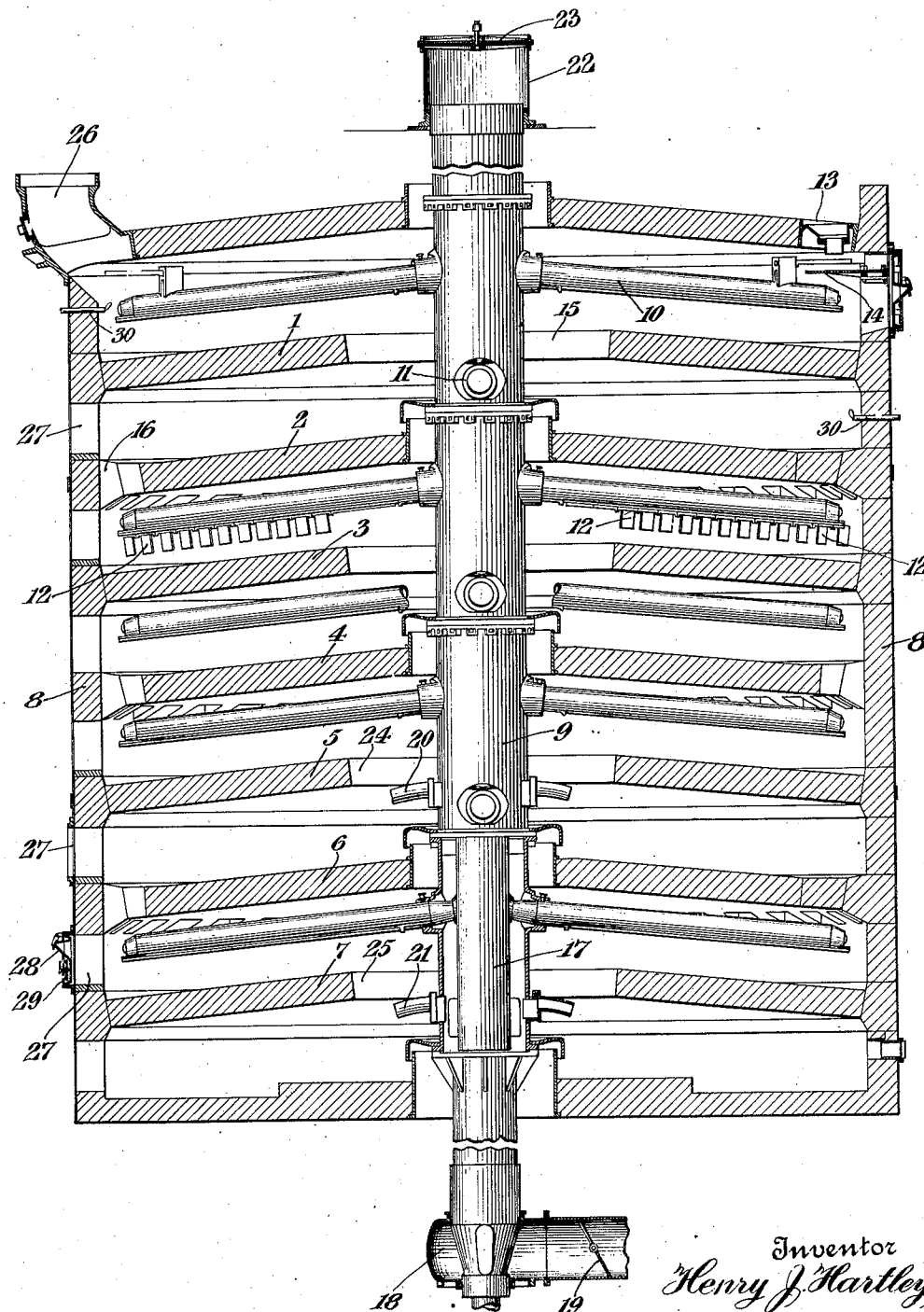
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PROCESS OF TREATING FULLER'S EARTH AND THE LIKE

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UNITED STATES PATENT OFFICE

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PROCESS OF TREATING FULLER'S EARTH AND THE LIKE

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This invention relates to methods or processes for improving or revivifying fuller's earth, or other earths as used for the filtration, purification, decolorization, etc., of fluids such as oils and syrups.

Materials such as fuller's earth when used in filtering operations, etc., rapidly become charged with impurities which greatly reduce their effectiveness. However, it has been found that if such impurities are properly removed, the earth is thereupon restored or revivified and is suitable for further use. Such revivification if it may be carried out inexpensively, entails a great saving by way of eliminating a substantial part of the expense of new earth and the transportation charges thereon. However, in many instances the revivification of such earths has been unsatisfactory because of their lack of uniformity and the uncertainty as to the quality of the reclaimed product, and also because of the expense of the fuel necessary to carry on the revivification process. Furthermore, difficulties have occurred by reason of variations in the quantities and character of impurities present, rendering the proper operation of the process uncertain.

It is the aim of this invention to provide a revivification process which is economical, convenient and dependable in practice and which may be used with several varieties of earth containing impurities of various kinds and amounts.

The invention consists in the process and steps of the process which are herein described according to a preferred manner of practicing the same, and the invention will be particularly pointed out in the appended claims.

In the drawing the figure represents a central sectional view through a multiple hearth rotary shaft furnace. This furnace is shown merely by way of example as illustrative of one form of furnace in which the process may be carried out and it will be understood that the invention is not limited to the use of this particular furnace.

In the furnace shown, a plurality of vertically spaced or superposed circular hearths are designated by the numerals 1 to 7 in-

clusive. These hearths may be surrounded and supported in the usual manner by a cylindrical masonry furnace wall 8. The usual rotatable and internally cooled shaft 9 extends vertically up through the furnace substantially along the central axis thereof. This shaft is provided with a series of rabble arms as at 10 and 11 extending radially into the space between succeeding hearths. Suitable rabble teeth 12 are provided on the rabble arms for advancing the material being treated successively over each of the hearths. A hopper is indicated at 13 for discharging the material to be treated into the furnace through an ore-luted feeding device as at 14.

The rabble teeth on several of the rabble arms have been omitted for clearness in the drawing. The material being treated falls from the feeding device 14 and passes down through the furnace over the successive superposed hearths in the usual manner, alternate hearths being provided respectively with central and peripheral discharge openings so that the ore or other material is gradually advanced inwardly of one hearth toward the central opening and outwardly over the next hearth toward the peripheral openings. For example, in the furnace shown, hearth No. 1 may be provided with an annular space or central opening 15 around the central shaft. The rabble teeth over this hearth are directed at an angle for advancing the material toward such opening. Hearth No. 2 is provided with numerous peripheral openings as at 16 and the rabble teeth which cooperate with this hearth are arranged at an angle for deflecting the material outwardly of the hearth where it is made to fall through the openings 16. The material under treatment thus passes down through the furnace.

The central shaft 9 which, as here shown, is air cooled, may have a central conduit as at 17 communicating at its base with an air supply conduit 18, the quantity of air being adjustable as by a damper 19. Air from the central conduit 17 is allowed to flow into the rabble arms and back into the space between the inner and outer shafts

17 and 9 in the conventional manner. This air in passing through the rabble arms is heated to a comparatively high temperature, and at least a part of such heated air, according to the process of this invention, is brought into contact with the earth being treated in the furnace by permitting the air to flow out of the shaft 9 through hot air outlet openings as at 20 and 21. The heated air which is not discharged through these hot air outlets may be discharged at the top of the shaft, for example through a stack 22 provided with a suitable butterfly valve or damper 23 of a conventional type. By regulating the damper 23 the portion of the hot air which is admitted to the furnace may be accurately adjusted, and the amount of air necessary to properly cool the rabble arms and shaft may be readily adjusted by operation of the damper 19 in the cold air intake conduit.

It will be noted that the hot air outlets 20 and 21 respectively are located at the regions where the earth is allowed to drop through openings 24 and 25 in the hearths 5 and 7 respectively. The earth after being heated and rabbled over the upper hearths, will drop through these openings 24 and 25 in a finely divided condition and will be there subjected to sufficient hot air discharged from the hot air outlets so that the impurities therein will be substantially completely oxidized and will pass off from the furnace as gases through a gas outlet or a plurality of outlets as at 26.

The usual practice as followed in the design of furnaces of this general type may be followed as to constructional details which are not specifically referred to herein.

One example of the manner in which the invention may be satisfactorily carried out in connection with the furnace above described is as follows: The fuller's earth or like material as above described is substantially continuously supplied to the hopper 13 and allowed to pass down through the furnace. To initiate the process suitable oil torches or other sources of extraneous heat may be applied over the various hearths through openings as at 27. In this manner the temperature within the furnace may be brought up to and maintained at a suitable heat for causing substantially complete combustion of the impurities of the earth material but without destroying the same by excessive heating. The desirable temperature will vary with the nature of the materials under treatment and the impurities therein, but will generally be at some value between 700 and 1600° F. The treatment of filtering mediums made from volcanic ash, such as that commercially known as "Filtrol", generally requires temperatures approaching the higher limit, whereas ordinary fuller's earth will

usually require temperatures more nearly approaching the lower limit. Under the usual operating conditions and with furnaces of ordinary commercial size, the initial heating by extraneous means need be continued only for a time, in the neighborhood of, say, one-half hour. Then after the process is initially established and in operation, the oil torches and other sources of extraneous heat may be removed and each of the openings 27 may be closed with doors, for example as shown at 28. Such doors may be provided with adjustable dampers 29 in order to permit an adjustable supply of air to be admitted over each hearth to supplement the hot air provided from the outlets 20 and 21. The heating on each hearth may be further controlled if desired, particularly if the temperature should rise excessively on certain hearths, by introducing steam, by discharging greater amounts of the cooling air, or by introducing a "blanketing" supply of gas. The "blanketing" gas may take the form of relatively cooled gaseous products of combustion bypassed from the stack of the furnace or in some instances it may be convenient to utilize steam for the "blanketing" effect. However, except where the material under treatment embodies an abnormal supply of combustible material, it will be generally unnecessary to check the rise in temperature by such methods. The fuller's earth may be ordinarily progressed through the furnace, according to this invention, at the usual rate.

Gas pilots as at 30 may be provided at the top hearth of the furnace for example, to insure ignition of combustible gases formed in the furnace, preventing the possibility of explosive accumulations.

Although hot air outlets are indicated only at the hearth openings 24 and 25, it will be understood that the central shaft if desired may be provided with more or fewer of such openings at the various hearths depending upon the combustion necessary and temperatures desired at such hearths. By regulating the hot air supply with the dampers 19 and 23, as well as cold air supplied through the door dampers 29, the temperature and combustion conditions at each hearth may be readily adjusted by trial so as to maintain the process once it has started, without the use of additional fuel other than is obtained by the combustion of the impurities. Furthermore, the air supply and temperature conditions may be adjusted to accommodate materials lacking uniformity in the quantity and nature of the impurities, by merely adjusting the various air dampers while the process is continued. For example, if the temperature rises, at any particular hearth, so high as to endanger the product, the air admitted to such

hearth may be decreased by adjustment of one of the dampers 29, or if the temperature cannot be sufficiently reduced by such adjustment, the temperature over certain hearths or within the entire furnace may be lowered by adjusting the "blanketing" gas or by increasing the supply of cold air through the dampers 29 as compared with the supply of heated air from the central shaft. After the process has been tried for short intervals with a particular product, the air supply may be so regulated as to maintain the temperature conditions substantially at the desired equilibrium with the use of little or no fuel other than comprised in the impurities.

with sufficient rabbling action or agitation to maintain the material in loose finely divided condition, supplying sufficient air to the material in the furnace and initially heating the same to a temperature causing combustion of said residue, and thereafter controlling the air supply and preheating the same with heat of said oxidizing process, and utilizing substantially solely the heat of combustion of the residue to supply the heat necessary to substantially completely oxidize the residue and to maintain the process.

In testimony whereof I have signed my name to this specification.

HENRY J. HARTLEY.

According to this process, the earth may be very efficiently revived and since the use of extraneous heat is eliminated or substantially done away with, the danger of destroying or injuring the earth is greatly lessened. Since the heat supplied to the furnace is substantially limited by the combustion of the impurities, and since the impurities provide the necessary fuel, the heat available will be roughly proportional to the quantity of material being treated at a given time. Therefore, variations in the rate at which the materials pass through the furnace will be accompanied by substantially directly corresponding variations in the fuel supply, which in general tends to maintain highly desirable roasting conditions. Fuller's earth of various forms may be treated, such as the granular form and the pulverized earth as used in so-called "contact" or "vapor phase" process of refining oil.

As above indicated, it will be understood that the invention according to certain of its phases is applicable to the treatment of materials other than fuller's earth, for example, kieselguhr and other infusorial or diatomaceous and siliceous earths, and clays which may embody various types of impurities such as mineral, animal or vegetable oils, impurities from the manufacture of sugar and syrups, and other oxidizable substances offering suitable fuel values.

While I have described my invention according to a preferred method of practicing the same, it will be obvious to those skilled in the art after understanding the invention that various alterations, modifications and substitutions may be made without departing from the scope of the invention and I aim in the appended claims to cover all such modifications.

What I claim as new and desire to secure by Letters Patent of the United States is:

The continuous process of revivifying spent fuller's earth or the like materials charged with the residue from oil filtration, which comprises oxidizing such residue by substantially continuously passing the material through a multiple hearth furnace