March 25, 1924. 1,487,849

E. GRAUERT

SEALING MEANS

Filed Jan. 24, 1922

Fig. 2.

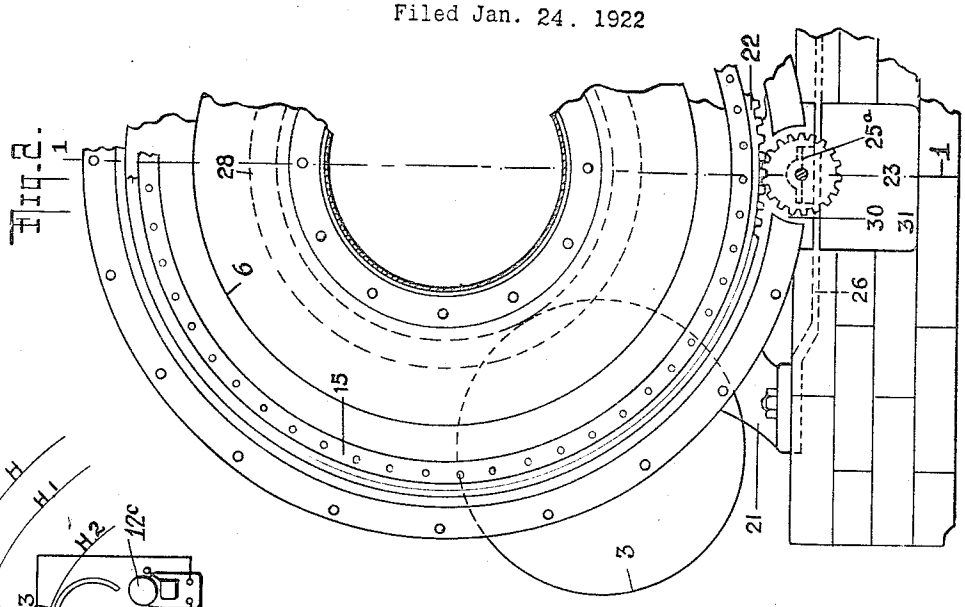


Fig. 3.

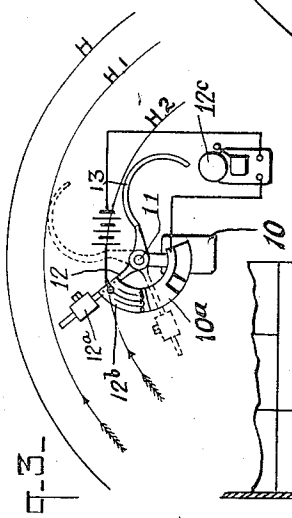
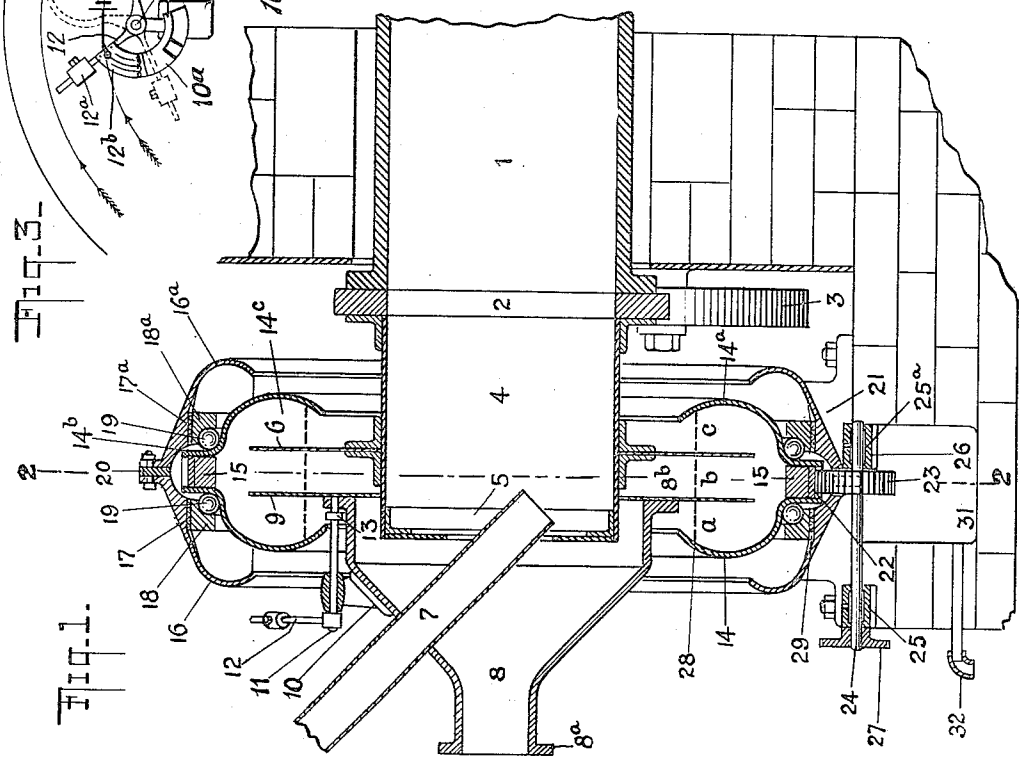


Fig. 1.



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UNITED STATES PATENT OFFICE.

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SEALING MEANS.

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To all whom it may concern:

Be it known that I, EDGAR GRAUERT, a citizen of Germany, and resident of the borough of Middlesex, county of Middlesex, and State of New Jersey, have invented certain new and useful Improvements in Sealing Means, of which the following is a specification.

My invention relates to sealing means and more particularly to means for providing an efficient seal between stationary and moving bodies, as exemplified, for instance, by housings and rotatable retorts comprising parts of apparatus utilized generally for roasting, calcining, burning, disintegrating and reducing materials and for other processes in which gases are eliminated or developed. In many instances it may be desirable to retain these gases as useful products and it may be necessary, in order to successfully carry out the particular process, to absolutely exclude air from the apparatus or, because of the poisonous or other harmful characteristics of the gases to absolutely prevent the same from escaping from the apparatus into the surrounding atmosphere.

During the operation of processes of the kind under discussion, the particular materials may be subjected to vacuum equilibrium or pressure. Up to the present time, in carrying out such processes, particularly those which require material to be subjected to higher temperatures, such materials have been treated in stationary vertical retorts for the reason that horizontal retorts, under these circumstances, are not efficient. This is particularly so with the horizontal retort which is charged and discharged at intervals and which accordingly requires the furnace and retort to be cooled down. Some of the existing vertical retorts are of the type known as continuous feed and discharge retorts and provide a considerably prolonged period of usefulness and a higher degree of economy in production. All of the devices mentioned hereinbefore, however, have the great defect that they all operate on the principle that the material treated therein must convey the heat through the material itself and not by contact with the retort itself. In such cases, the effect of radiant heat from the retort on such material is substantially eliminated. As these materials are more or less poor conductors of heat, the conduction of heat therethrough is greatly delayed and if the mass in the retort consists of a greater percentage of fine material, the action of heat conductivity is still further hampered, thus in each case greatly prolonging the time required to produce the finished product. Furthermore, the latter, no matter whether it originally consisted of clear pieces, coarse and fine mixed, or fine alone, will not come out of the retort uniform in shape for the reason that certain portions of the material which have been in contact with the retort may be overdone, other portions may be perfectly treated, while the material at the centre may be underdone.

The object of my invention is to overcome the recited defects by providing a simple and efficient seal which permits the utilization of a rotatable retort whereby all parts of the material contained therein may be evenly and uniformly subjected to the heat radiated by said retort in a minimum period of time. Other more specific objects of my invention will appear from the description hereinafter and the features of novelty will be pointed out in the appended claims.

In the accompanying drawings, which illustrate an example of my invention without defining its limits, Figure 1 is a fragmentary longitudinal section of an apparatus illustrating my improved seal taken on the line 1—1 of Fig. 2; Fig. 2 is a cross section thereof on the line 2—2 of Fig. 1, and Fig. 3 is a detail view illustrating a controlling device forming part of my invention.

In the drawings, 1 represents the free end section of a retort of conventional form, provided with annular metallic tires 2, of which one is illustrated, said tires being adapted to frictionally engage wheels 3 rotatably mounted upon suitable portions of the apparatus. Any customary means may be provided for rotating the retort 1 about its axis in the conventional manner; as such driving means forms no part of the present invention, it has been omitted for the sake of clearness. The retort further includes an extension 4 which may be suitably secured to the end of said retort as by means of bolts, and may also be provided with a receiving chamber 5, which may be bolted or otherwise secured to the extension 4. In the preferred arrangement, a ring-

shaped disk 6 of sheet steel or other metal is secured between the contiguous ends of the extension 4 and the chamber 5 of the retort and projects radially outward from the latter, as shown in Fig. 1. The material to be treated, which may, for instance, consist of magnesite ore, may be fed to the receiving chamber 5 of the retort through a pipe 7, which extends through a converging hood 8 having a flange 8^a at its small end adapted for connection with a suitable pipe line whereby such gases as may be generated in the apparatus are conveyed to their destination. The large end of the hood carries an annular flange 8^b, to which a sheet steel or other metallic ring-shaped disk 9 is bolted, said disk 9 being similar to the disk 6 and surrounding the chamber 5 of the retort. A bearing 10 is located upon the hood 8 and serves as a journal for a shaft 11 which has its inner end journalled in the flange 8^b of the hood but does not penetrate the disk 9, said shaft carrying two levers 12 and 13, the former of which carries, preferably in an adjustable manner, a counterweight 12^a, while the latter is of curved form, as shown in detail in Fig. 3. The elements 11, 12^a and 13 comprise what may be termed a controlling device, the purpose and operation of which will appear more fully hereinafter. The apparatus further consists of complemental sections 14 and 14^a of annular form and provided with peripheral flanges 14^b between which a ring 15 is securely clamped, said members 14, 14^a and ring 15 together forming an annular closed chamber 14^c which surrounds the enlarged end of the hood 8 and the extension 4 of the retort and into the interior of which the disks 6 and 9 project, as illustrated in Fig. 1. A housing consisting of complemental sections 16 and 16^a bolted together at their peripheries surrounds the members 14 and 14^a, and is provided upon its interior at opposite sides of the flanges 14^b, with corrugated seats 17, 17^a, upon which annular ball races 18 and 18^a are bolted or otherwise secured. Between these ball races and the members 14 and 14^a which, in proximity to said races, are curved to form co-operating ball races, a plurality of ball bearings 19 are located. Any necessary adjustment of the ball races and sections 14 and 14^a may be secured by means of different flange liners 20 located between the peripheral flanges of the sections 16 and 16^a; the housing consisting of the sections 16 and 16^a may be firmly fastened to the masonry by means of suitable braces or supports 21. With the arrangement so far described, it will be obvious that the annular chamber 14^c formed by the sections 14 and 14^a may be rotated within the housing formed by the members 16 and 16^a upon the ball bearings 19 with a minimum of friction. Any suitable means may be provided for bringing about such rotation; for instance, the flanges 14^b of the sections 14 and 14^a may project slightly beyond the ring 15 to form an annular space or recess in which a ring gear 22 is fixed in any suitable manner, said ring gear being in mesh with a pinion 23, as illustrated in Figs. 1 and 2. The pinion may be mounted upon a shaft 24 which is journalled in bearings 25 and 25^a anchored, for instance, on iron bars 26 embedded in the masonry, as shown in Fig. 2, and further being fixed in the brackets 21, so that the housing, shaft pinion and ring gear form a self-contained machine. The shaft 24 may, for instance, be equipped with a positive clutch 27 adapting it for connection with a suitable driving mechanism, or it may be otherwise connected in any conventional manner with a source of power.

In practice, a suitable liquid is introduced into the chamber 14^b formed by the members 14 and 14^a, it being understood that such liquid is always of a character to have no injurious effect upon the material being treated in the retort; in the present case, it may be assumed that such material consists of magnesite ore and that the liquid is water. If such liquid is poured into the circular chamber 14^c and the latter is set in motion, then said liquid will be distributed evenly; in other words, if the chamber 14^c stands still and enough liquid is poured into it to fill it to overflowing, and said chamber is then set in motion, it soon will appear as though there were no liquid in the same. If, however, after said chamber has attained its proper speed and it is again filled, and such filling is continued until the liquid has reached a level indicated by the line 28 in Fig. 1, and then discontinued, this level will be maintained as long as the chamber is in motion. Should the speed of the chamber reduce, the surplus amount of liquid will begin to run out at the deepest point of the ring and will run over the inwardly curved sides of the sections 14 and 14^a of the revolving chamber. The liquid will cling to these sides until it has reached the outermost points thereof and will then be thrown off violently by centrifugal force only to be caught in the housing. As the chamber continues to revolve, it will not be visibly apparent that the liquid actually oozes out from the bottom, but coming over the sides at the bottom, will slightly cling to the inwardly curved parts thereof, and as long as said chamber is in motion will appear in the form of rain all about the housing. The oozing out of the liquid at the bottom is created by the phenomenon that the level of the liquid which was concentrical to the vessel in the first condition has, under the second condition, become eccentric, so that if the speed of the chamber

gradually decreases, all of the liquid will gradually leave the chamber until it reaches the original amount contained in said chamber when standing still. Should, however, the chamber be suddenly stopped, then all the surplus liquid will pour out at once from all parts thereof. When the liquid is caught in the housing formed by the sections 16 and 16^a, it runs toward the lowest part thereof and passes through the openings formed by the corrugations of the seats 17 and 17^a and into a circular channel 29 from which it passes through openings 30 into a vessel 31, from which it may be removed through a convenient pipe line 32.

If, while the circular chamber 14^c is in motion, it is filled with suitable liquid to the level indicated by the line 28, it will be found that the two disks 6 and 9 are evenly immersed in said liquid, the only difference being that the disk 9 is stationary, while the disk 6 is slowly moving with the retort in the same direction as the liquid, it being understood that the retort is being rotatably actuated when the apparatus is in operation. Under the effects of centrifugal force, the level of the liquid in the three spaces *a*, *b* and *c* created by the disks 6 and 9 in the chamber 14^c, stands at the level indicated by the line 28, whereby the outside atmosphere at *a* and *c* is completely cut off from *b* and communication between the interior of the apparatus and the spaces *a* and *c* is similarly cut off. Should more or less of a vacuum be created in the retort, the level in *b* will advance inwardly toward the centre of the retort while the level in *a* and *c* would move outwardly to a corresponding extent and the difference between the two levels would be in conformity with the difference between the vacuum pressure and that of the outside atmosphere. If the chamber 14^c is rotated at a speed at which the liquid attains its normal level 28 when an equilibrium exists between the retort and the outside atmosphere and the vacuum is now created, then *b* will travel inwardly and *a*—*c* will move outwardly, as previously described. If the speed of the chamber 14^c is now slowly increased, the difference between *a*—*c* and *b* will become less because of the increased centrifugal force, so that it is absolutely in the power of the operator to adjust this condition, that is the difference between the levels of the liquid in *a*, *b* and *c*, in accordance with the requirements or needs of the particular process in hand. The same condition prevails if pressure occurs in the retort, excepting that in such case the levels in *a* and *c* will travel inwardly and the level in *b* will move outwardly, this condition being controlled by the graduated speed of the chamber 14^c.

Referring more particularly to Fig. 3, the line H represents the outermost line which the liquid assumes in the rotating chamber 14^c while H′ represents the line which the liquid assumes before it leaves the disk and H^2 represents the highest level which the liquid reaches under normal conditions. The arrows in Fig. 3 indicate the direction in which the chamber 14^c revolves and as the liquid travels with said chamber, the surface of such liquid may be compared to a swiftly running river. The adjustable weight 12^a on the lever 12 pulls the lever 13, which is situated between the hood flange 8^b and the section 14 of the rotating chamber 14^c upwardly until it reaches the surface of the revolving liquid, whereupon said lever 13 stops, this condition being maintained as long as everything is in proper order. If, however, some of the liquid evaporates or leaks out, the lever 13 will follow the new level attained by the liquid and if a critical point is reached, will bring this fact to the attention of the operator in any convenient manner as, for instance, by causing the ringing of a bell or the sounding of an alarm to indicate that something is wrong. This may be accomplished in any suitable manner, as for instance, by providing the lever 12 with a contact 12^b in the form of a resilient segment, adapted to co-operate with a stationary metallic contact 10^a mounted upon the bearing 10 and suitably insulated therefrom. The contacts 12^b and 10^a are located in an electrical circuit which also includes the bell 12^c or its equivalent as shown diagrammatically in Fig. 3 of the drawings. That is to say, when the lever 13 moves beyond the line H^2 toward the line H′ the contact 12^b will slidably pass over the contact 10^a in engagement therewith and thus bring about an actuation of the bell 12^c; from this point on the bell 12^c keeps on ringing no matter how much nearer to the line H′ the lever 13 moves and is automatically stopped only after the contact 12^b has been moved back to its initial position out of engagement with the contact 10^a. This return of the parts is brought about by restoring the level of the liquid to the proper safety point; the contact 12^b remains out of engagement with the contact 10^a as long as the level of this liquid remains substantially constant. If the level of the liquid drops further or, in other words, until it reaches the line H′ and there is consequently danger that the gas or air may break the seal, the controlling device may be caused to automatically close the pipe line leading from the hood 8 of the retort to a gas storage vessel, if such an installation is present. It may also be utilized to stop the feed to the retort and in such cases, as there is a comparatively small amount of material in the retort at the moment, the operation will cease in a very short time.

When a new retort is set in motion, the

retort itself and the parts connected therewith will run true on the four supporting points of the running gear represented by the wheels 3, but when the casting leaves the foundry there is a certain amount of stress in said casting which, as the retort is reheated under entirely different conditions from those existing in the foundry, will cause said retort to warp, this condition being practically the same whether the retort is constructed of cast iron or steel. When the retort gets old, this warping rather increases, although the four points on the running gear are practically not affected by said distortion of the retort. From these points to the end of the retort, however, the slight difference in motion is multiplied so that at the end of the retort on both sides the deflection is considerable, which deflection is again multiplied and increased by the sheet steel disk 6. As there is, however, ample room in the seal to allow for such deflection, the apparatus is not affected in its precision of work and dependability and the efficiency of the seal is maintained intact.

The invention is extremely simple in construction and arrangement and reduces to a vast extent the period of time necessary to produce the various materials, for which apparatus of the type under discussion are designed, the production of the materials being also absolutely uniform. Furthermore, the heat to which all the particles of the material are subjected is in perfect control, so that the highest efficiency is reached in fuel consumption and the life of the horizontal retort is indefinitely prolonged even when higher temperatures are continuously used. Furthermore, the continuous feed and discharge arrangement is made possible with a horizontal rotating retort.

Various modifications in the specific form shown and described may be made within the scope of the claims without departing from the spirit of my invention.

I claim:

1. The combination of a stationary hood, a rotatable retort having one end extending into said hood, a rotatable vessel adapted to contain a liquid and rotatable about said one end of said retort, means for rotating said vessel to force said liquid outwardly therein under centrifugal force, and means carried by said hood and retort extending into said liquid whereby communication between the interior of said retort and the exterior of the hood is sealed.

2. The combination of a stationary hood, a rotatable retort having one end extending into said hood, a rotatable vessel adapted to contain a liquid and rotatable about said end of the retort, means for rotating said vessel to force said liquid outwardly therein under centrifugal force, a stationary annual disk carried by said hood and a movable disk carried by said retort, both projecting into said liquid to seal the communication between the interior of the retort and the exterior of the hood.

3. The combination of a stationary hood, a rotatable retort having one end extending into said hood, a rotatable vessel adapted to contain a liquid and rotatable about said one end of the retort, means for rotating said vessel to force said liquid outwardly therein under centrifugal force, means carried by said hood and retort extending into said liquid to seal the communication between the interior of said retort and the exterior of the hood, and a controlling device automatically operated in accordance with variations in the level of said liquid.

4. The combination of a stationary member, a rotatable member extending into the same and annularly spaced therefrom, a vessel adapted to contain a liquid and rotatable exteriorly about said two members at their common point, means for rotating said vessel to force said liquid outwardly therein under centrifugal force and annular disks projecting from said members into said liquid whereby communication through said annular space from the outside is sealed.

In testimony whereof I have hereunto set my hand.

EDGAR GRAUERT.