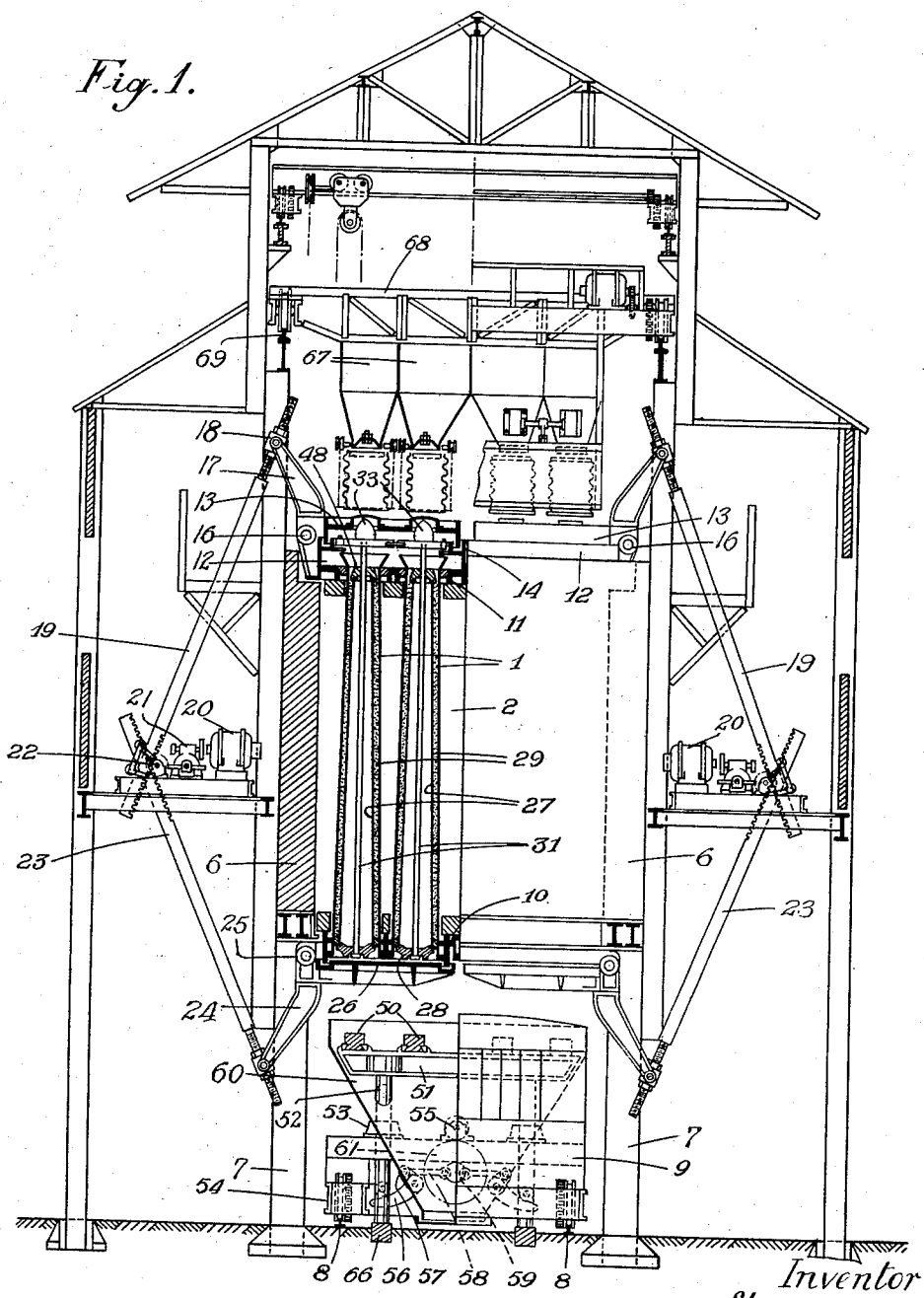
Aug. 7, 1934. J. MAGE 1,968,896

RETORT OVEN

Filed Jan. 17, 1931 3 Sheets-Sheet 1

Fig. 1.



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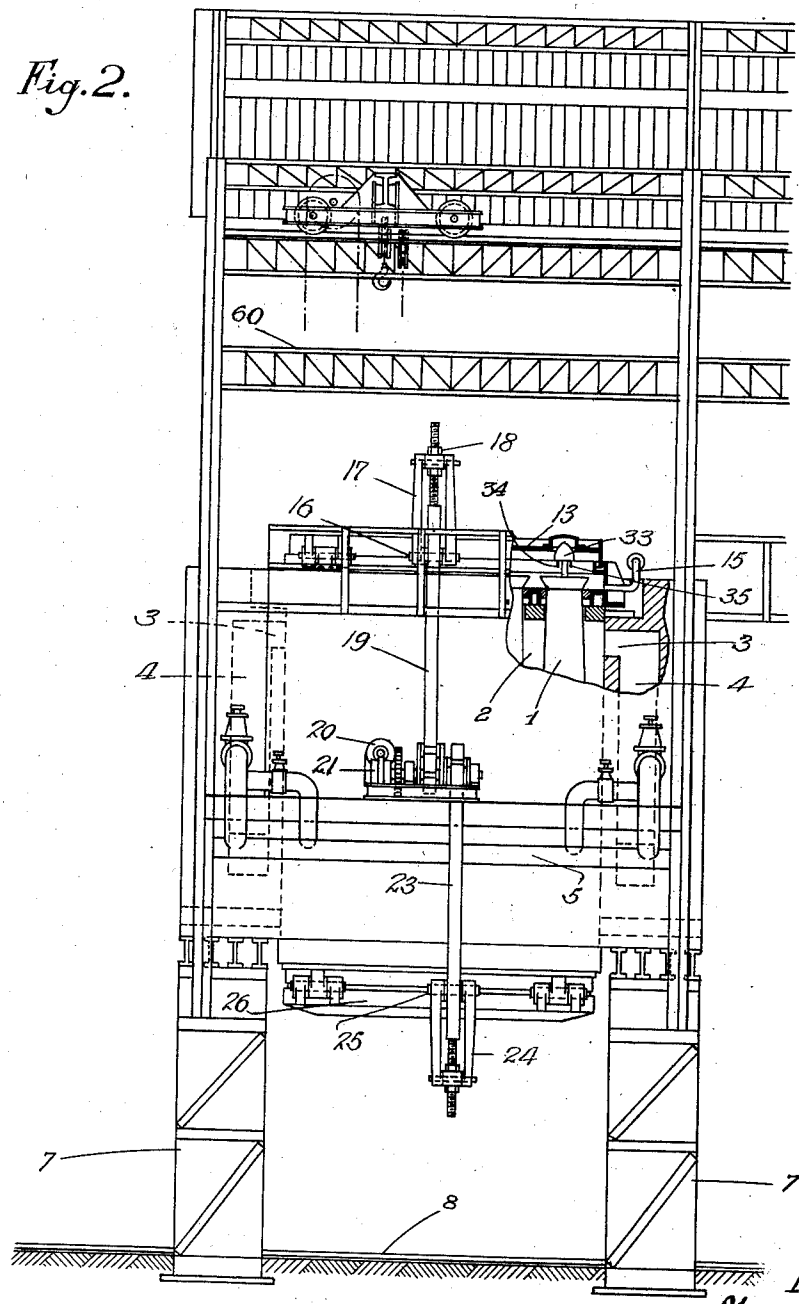
Filed Jan. 17, 1931 3 Sheets-Sheet 2

Fig. 2.



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Filed Jan. 17, 1931 3 Sheets-Sheet 3

Fig. 3.

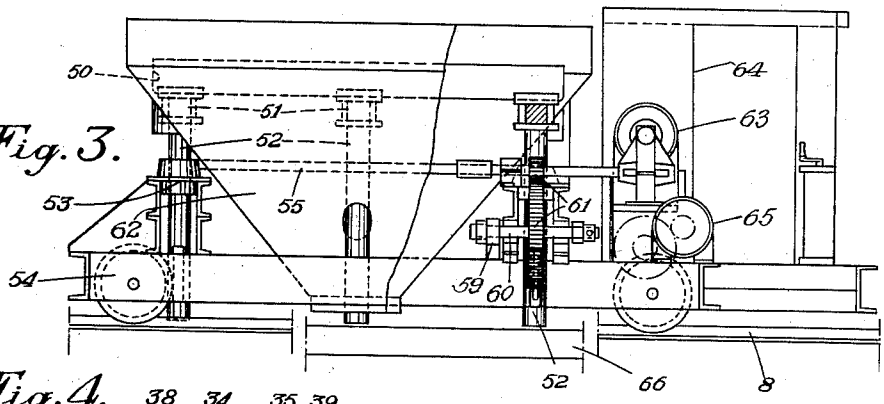


Fig. 4.

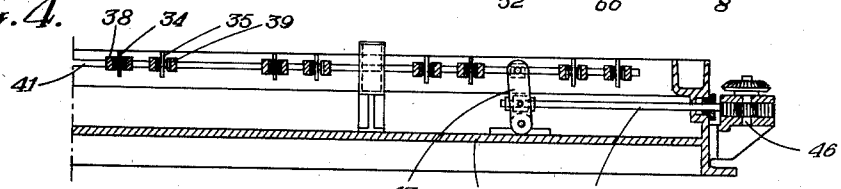


Fig. 5.

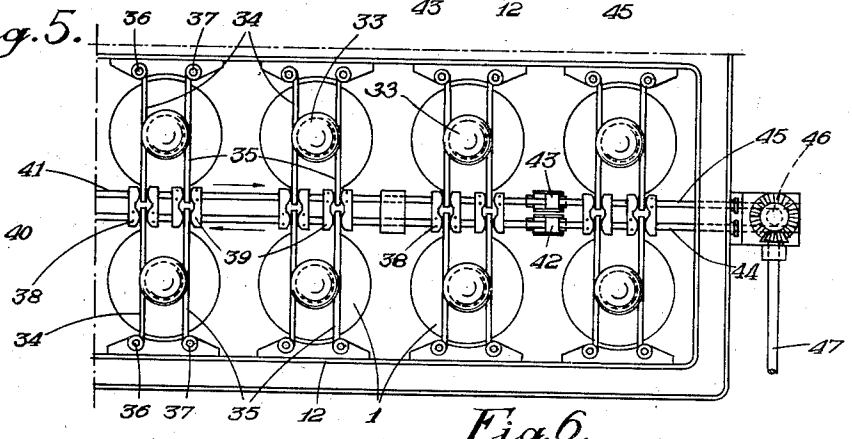


Fig. 6.

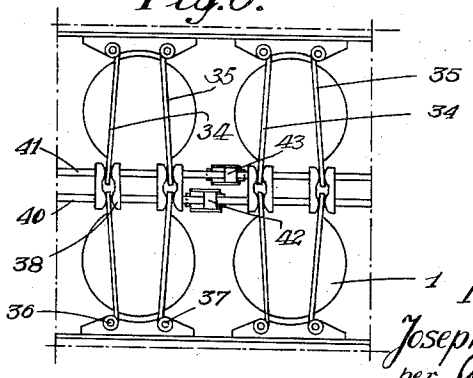
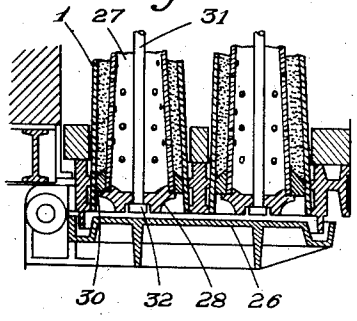


Fig. 7.



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UNITED STATES PATENT OFFICE

1,968,896

RETORT OVEN

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Application January 17, 1931, Serial No. 509,311
In Belgium January 24, 1930

6 Claims. (Cl. 202—114)

This invention concerns retort ovens for the low temperature carbonization of coal, lignite and the like. It is well known that in ovens of this kind and especially in those intended for low temperature carbonization, retorts may be provided with a removable bottom and in some cases with a central tube for taking off volatile matter and constituting a removable member with said bottom, to allow of unloading the charge into a suitable space, provided below the oven. This invention aims at simplifying and accelerating the discharge process which, even in the case of movable bottom retorts, usually necessitates the use of complicated devices, the operation of which calls for considerable labour and takes up much time.

According to this invention, unloading is effected after release of the movable retort member, by imparting to the carbonized charge two successive shocks or blows, the first of which detaches the charge from the retort walls and makes it fall together with the movable retort bottom, whilst the second shock is caused by sudden stop in the movement of said movable bottom. It has been found that, under such circumstances, the first shock causes the charge to fall in a single block, whilst the effect of the second shock is to break it up, its fragments then dropping freely so that they can be collected in a truck or like suitable container. Instead of two shocks only, a plurality of shocks or blows may be applied. In practice however two shocks are usually sufficient, the first shock preferably being imparted in a downward direction by the fall of a mass upon the retort, whilst the second shock is imparted in an upward direction by the impact of the bottom against a stop. It then is only necessary to raise said stop to restore the movable member of the retort to its original position, such raising motion being conveniently used to lift back to its original position the mass previously used for imparting the first shock.

An arrangement specially suited to the application of this means of discharge to multiple retort ovens is to suspend the movable bottom closure member of each retort core from a weighted rod passing loosely through said bottom and normally held up by a withdrawable support, said rod being fitted with a shoulder to strike the retort core when the rod is released by its support. When the retort core comprises a central tube, said rod preferably extends freely through said tube and ends in a solid head gripped between jaws, above the retort. Upon said jaws being opened, the rod falls and the head, acting as a ram, impinges against the tube which transmits the shock to the charge and to the movable bottom closure member of the retort core. In multiple retort ovens all of said jaws may be opened by a common controlling device, to bring about the simultaneous fall of all charges and the separation, fall and breaking-up of all retort charges of the same chamber.

The stops for interrupting the fall of the movable retort parts may consist of girders bearing upon bed plates by means of strong supports, upon which a lifting mechanism may act in order to restore the movable members to their position in the retorts.

Said girders, supports and lifting devices may conveniently be mounted in the truck used to collect the retort charge, the supports being raised from the ground when the truck is under way and being lowered upon the bed plates when positioned under the oven, so that the undercarriage of the truck is safeguarded against the shocks.

With these devices, the discharging operation can be effected in a few minutes. It is reduced to the release of the weights which bring about the fall of the charges, followed by the raising of the girders to re-position the members.

Cooling of the oven during discharge is considerably reduced, since the retorts may be recharged and heating resumed as soon as the movable parts of the same have again been raised.

The accompanying drawings illustrate by way of example an embodiment of the invention as applied to a retort furnace for the low temperature carbonization of coal and lignite.

Fig. 1 is an end elevation, partly in section, of one oven chamber, showing the discharge means and a truck according to the invention.

Fig. 2 is a side elevation of said chamber, with some details in sectional view.

Fig. 3 is a side view of a truck, partly in section.

Fig. 4 is a detail view, showing an elevation of the holding mechanism for the movable retort parts.

Fig. 5 is a plan view of said mechanism and Fig. 6 is a fragmental plan view, showing said mechanism in another position.

Fig. 7 shows in axial section, upon a larger scale, the construction of the retort and core bottoms.

Fig. 1 shows a battery of frustoconical retorts 1 mounted in a chamber 2, heated by combustion gases fed through flues 3, from combustion chambers 4 (Fig. 2) situated on either side of chamber 2 and fed from a gaspipe 5. The walls 6 of

chamber 2 rest on pillars 7, between which are arranged rails 8, for trucks 9 adapted to receive the discharged coke.

The retorts 1 are immovably mounted in chamber 2 and their walls form lower gastight joints with the hearth 10 and upper gastight joints with the ceiling 11 of the chamber. At the top, the retorts 1 open into a gas collector consisting of a fixed case 12 closed by a movable lid 13, the edge of which forms a gastight point in a slot 14, provided at the edge of the collector. In the example shown, two collectors 12 are shown into each of which open one half of the retorts of chamber 2. From each collector extends a pipe 15 to convey the distillates to the condensation and separation apparatuses, not shown. Each lid 13 is pivoted on an axis 16 and fitted with an operating arm 17, jointed to an adjustable sleeve 18 mounted on the threaded end of a rack member 19, operated by a motor 20 by means of a reducing gear 21 and a toothed wheel 22. By means of a second rack 23 and an arm 24 pivotally mounted on a shaft 25, each motor 20 controls likewise the opening of a door 26 beneath the retorts. Lids 13 and doors 26, which are normally closed during the operation of the oven, may thus be opened simultaneously for discharging and loading. The arrangement illustrated is such that the weights of the lids and doors mutually balance each other during the opening and closing movements.

Within each retort 1 is a perforated, preferably conical tube or core member 27 which rests upon the retort bottom, or more specifically the core bottom closure member 28 (Figs. 1 and 7). The charge 29 surrounds this tube 27 and rests upon a ring 30, which is set upon tube 27 and seals the retort base. The bottom members 28 form direct closures for the bottoms of the cores 27 while rings 30 which are supported upon the edges of bottom members 28 form the actual closure means for the spaces between the walls of the retorts 1 and cores 27. Said rings 30 may readily form enlargements or reinforcing ends upon the walls of cores 27. The unit consisting of tube or core 27, ring 30 and bottom closure member 28 is independent of the retort wall and is held in place by a central rod or suspension means 31, the lower end of which carries a button or enlargement 32. Rod 31 passes loosely through the bottom 28 and tube 27 and at the top it ends, some distance above the latter, in a solid impact head 33.

Each rod 31 is suspended by its head 33 between two jaws 34, 35 (Figs. 4 to 6) pivotally mounted at 36 and 37 on the walls of case 12. The ends of jaws 34, 35 engage in forks 38, 39 respectively secured to two rods 40, 41. Rods 40, 41 are respectively connected by bell crank levers 42, 43 with racks 44, 45 engaged by a common pinion 46. The actuation of a driving shaft 47 therefore causes the rods 40, 41 to move axially in opposite directions and to separate the jaws 34, 35 (Fig. 6), whereby heads 33 are released. No longer being held, the rods 31 instantly fall and the shock of impact of heads 33 upon the top members 48 of tubes or core members 27 detaches the charges 29 from the walls of the retorts 1. The charges with the movable members 27, 28, 30, 31, 33 then bodily fall out of the retorts.

The fall may be arrested by arranging stops above the trackway for the trucks intended to receive and carry away the finished charge. To reduce the height of the free space to be provided beneath the oven, it is proposed to mount said stops upon the trucks themselves but in such manner that the undercarriages of the same shall be safeguarded from shocks. To this end the stops herein formed by girders 50 rest, indirectly through cross-girders 51, upon post 52 vertically movable in guides 53 carried by the frame 54 of the truck (Figs. 1 and 3). These posts 52 are arranged on either side of a shaft 55 in the axial plane of the truck, and they may be raised or lowered simultaneously by means of sets of levers 56, 57, 58 which are controlled two by two by crank wheels 59, whose axles 60 are driven from shaft 55 by means of gearing 61. In the example shown the shaft 55 extends through the body 62 of the truck and is actuated by a motor 63 situated in a control cabin 64, in which a motor 65 for actuating the truck is also located.

Normally the posts 52 are slightly raised from the ground in order not to impede the running of the truck. When said truck is positioned beneath the oven for the purpose of charging the retorts, the posts 52 are lowered and come to rest upon heavy bed-plates 66, embedded in the ground for this purpose. This is the position in which the posts 52 receive the shock of impact of the retort bottoms 28, when the movable retort members fall together with their charges. Whereas the coke broken up by the shock collapses into the body 62, the movable retort parts remain at rest on the girders 50. In order to re-position said parts, it is only required to raise the girders by means of shaft 55 and afterwards to bring together the jaws 34, 35 by means of shaft 47, when rods 31 are again held up by their heads 33. The retorts may then be charged by means of hoppers 67, carried by a travelling overhead crane 68, which runs upon a track 69 arranged above the oven. The travelling crane and the truck having been shunted out of the way, the lids 13 and doors 26 are closed by means of motors 20 and heating may begin immediately.

Discharging operations are therefore limited to the working of the lids and doors, of jaws 34, 35 and posts 52, all of which requires very little time.

Obviously, in apparatus of this character where the operative parts such as the bottom closure members 28, suspension rods 31, cores 27 and top members 48 for said cores are all exposed to a considerable degree of heat, said parts can not have as close fitting relations as would be true in a machine which always remains approximately at room temperature, wherein bearings and parts in actual contact may be lubricated and accurately formed to fit within very close limits. Hence, although not shown in the drawings, it is quite evident that the rods 31 pass more or less loosely through the top members 48 as well as the bottom members, so that while said top members fit with sufficient accuracy upon the cores 27 to generally center the tops of the cores within the retorts 1, yet one advantage of having said top members somewhat loosely fitting about the suspension rods is to allow at least a portion of the gases generated within perforated cores 27 to rise up past said rods into the gas collecting chamber 12. Some of the gases also seep upward from the hollow cores 27 out through the uppermost perforations therein into the upper layer of the charge even if the latter is filled all the way to the top, whence said gases pass upward about top members 48 and proceed upward through the upper

open ends of the retorts 1 into chamber 12 beneath cover 13.

Various changes may naturally be made in the construction and form of the devices and parts illustrated, without departing from the scope of the invention:

I claim:

1. In a retort oven for low temperature carbonization, the combination, with a vertical retort, of a vertical hollow core member within said retort horizontally spaced from the sides thereof and provided with a top member for reinforcing and centering the top of said core member and a bottom closure member for said core member, a rod extending through said core member and projecting slidably through openings in said top member and in said bottom closure member for said core, which rod is provided at the bottom end thereof with an enlargement below said bottom closure member for said core and at the upper end thereof with a weighted head, means for suspending said rod by its head to maintain said core in said retort and said head spaced above said top member, and means for releasing said rod from its suspended position in order to allow the same to freely drop and cause said weighted head to impart a sharp blow to said top member and jar said core member.

2. In a retort oven for low temperature carbonization, the combination, with a vertical retort, of a vertical hollow core member within said retort horizontally spaced from the sides thereof and provided with a top member for reinforcing and centering the top of said core member and with a bottom closure member for said core member, a vertical rod longer than said core member extending through the same and passing slidably through openings in said top member and said bottom closure member for said core member, which rod is provided at its lower end with a supporting portion beneath said bottom closure member for said core member and upon its upper end with a head fixed thereon, means for suspending said vertical rod in order to retain said core member in said retort and said head spaced above said top member, and means for releasing said vertical rod, at will, from its suspended position in order to allow the same to drop and cause the head thereof to impart a sharp blow to said top member and jar said core member.

3. In a retort oven for low temperature carbonization, the combination, with a vertical retort, of a vertical hollow core member within said retort horizontally spaced from the sides thereof and provided with a top member for reinforcing and centering the top of said core member and a bottom closure member for said core member, which core member is adapted to cooperate with said retort in retaining a charge of solid material in the retort, a suspension means vertically and longitudinally movable with respect to said core member and being adapted to support said core member and said bottom closure member for the same and including an impact member in the form of a head, releasable means for supporting said suspension means in raised position to maintain said core within said retort and said head spaced above said top member, and operable means for actuating said releasable means so as to allow said head to drop by gravity and cause the same to impart a sharp blow to said top member and thereby jar said core member and to simultaneously release said bottom closure member and said core member in order to allow said core member to drop and suddenly shed a charge of material from said retort.

4. In a retort oven for low temperature carbonization, the combination, with a vertical retort, of a vertical hollow core member within said retort horizontally spaced from the sides thereof and provided with a top member for reinforcing and centering the top of said core member and with a bottom closure member for said core member, a vertical rod longer than said core member extending through the same and passing slidably through openings in said top member and said bottom closure member for said core member, which rod is provided at its lower end with a supporting portion beneath said bottom closure member for said core member and upon its upper end with a head fixed thereon, means for suspending said vertical rod in order to retain said core member in said retort and said head spaced above said top member, comprising a pair of movable jaws which are adapted to engage said head and are each pivoted at one end so that the other end is swingable, and operable means for acting upon the swingable ends of said jaws so as to swing said jaws apart in order to release said head and consequently also said rod from suspended position and thereby allow the same to drop freely and cause said head to impart a sharp blow to said top member and jar said core.

5. In a retort oven for low temperature carbonization, the combination, with a vertical retort, of a vertical hollow core member within said retort horizontally spaced from the sides thereof and provided with a top member for reinforcing and centering the top of said core member, a ring upon the bottom of said core member forming a bottom closure for the space between said member and the interior walls of said retort, a bottom closure member for said core member supporting said ring and said core member, a suspension rod extending through said core member and projecting slidably through openings in said top member and in said bottom closure member for said core, which rod is provided at the bottom end thereof with an enlargement below said bottom closure member for said core and at the upper end thereof with a weighted head, means for suspending said rod by its head to maintain said core in said retort and said head spaced above said top member, and means for releasing said rod from its suspended position in order to allow the same to freely drop and cause said weighted head to impart a sharp blow to said top member and jar said core member.

6. In a retort oven for low temperature carbonization, the combination, of a heating chamber having an open bottom, a removable closure for the bottom of said heating chamber and a vertical retort in said heating chamber, said retort being open at the top thereof to a gas collecting chamber, a vertically movable and hollow core within said retort having perforated side walls and both horizontally spaced from the sides of the retort and provided with a bottom closure member as well as a top member spaced from the walls within the open top of said retort for reinforcing and centering the top of said core, a suspension rod extending through said core and projecting slidably through openings in said top member and in said bottom closure member for said core, which rod is provided at the bottom end thereof with an enlargement below said bottom closure member for said core and at the upper end thereof with a weighted head,

means for suspending said rod by its head to maintain said core in said retort and said head spaced above said top member, and means for releasing said rod from its suspended position in order to allow the same to freely drop and cause said weighted head to impart a sharp blow to said top member and jar said core member, which core cooperates with said retort for holding a charge of solid material between said core and the sides of the retort and also is adapted to serve as a gas offtake tube for discharging gases, received through the perforations therein from a charge about the same, upwardly past said top member into said gas collecting chamber.

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