Oct. 25, 1932. F. L. TENNEY 1,884,379

CARBONIZATION DEVICE

Filed May 3, 1930 3 Sheets-Sheet 1

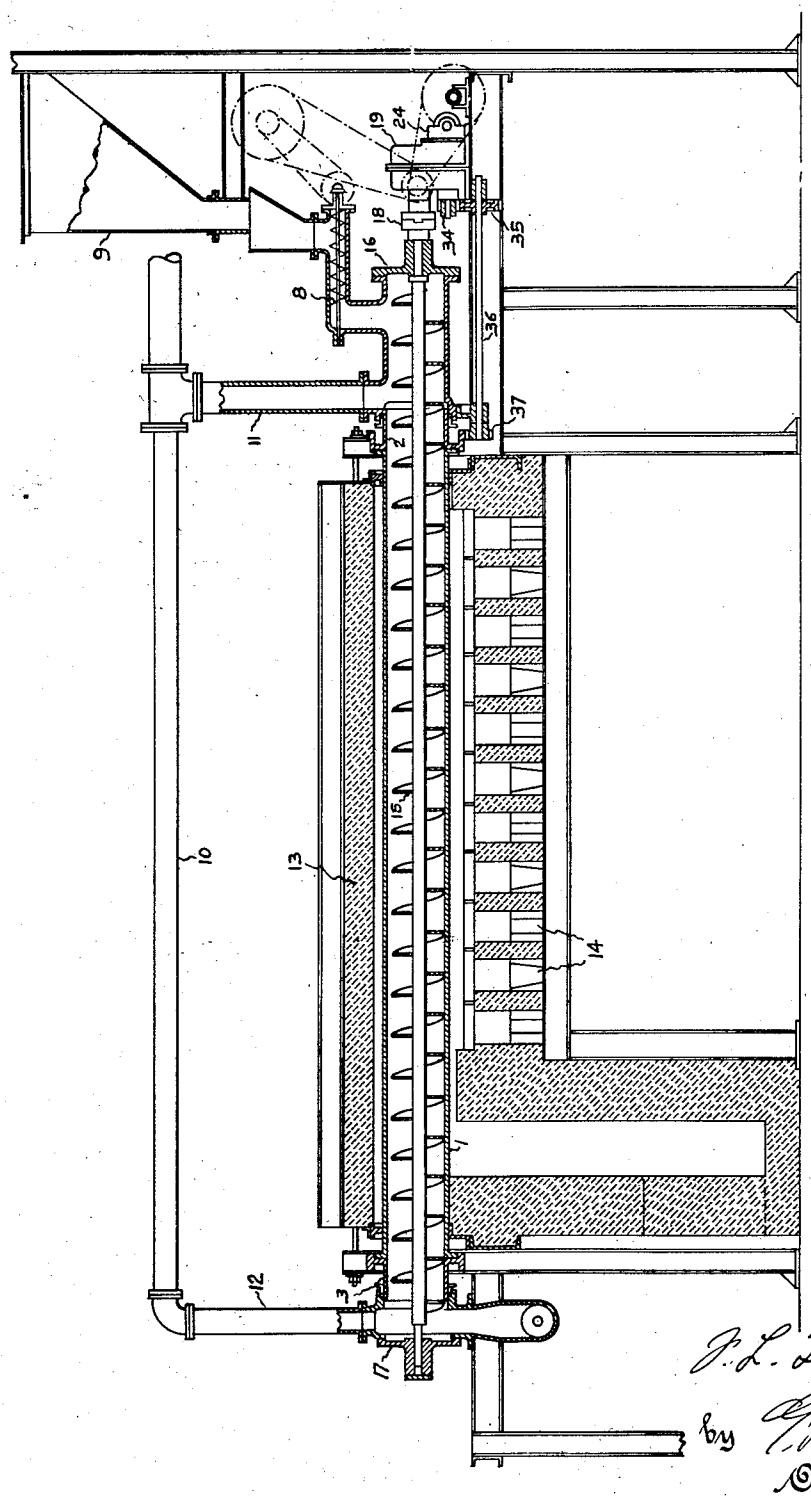


Fig. 1

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CARBONIZATION DEVICE

Filed May 3, 1930 3 Sheets-Sheet 2

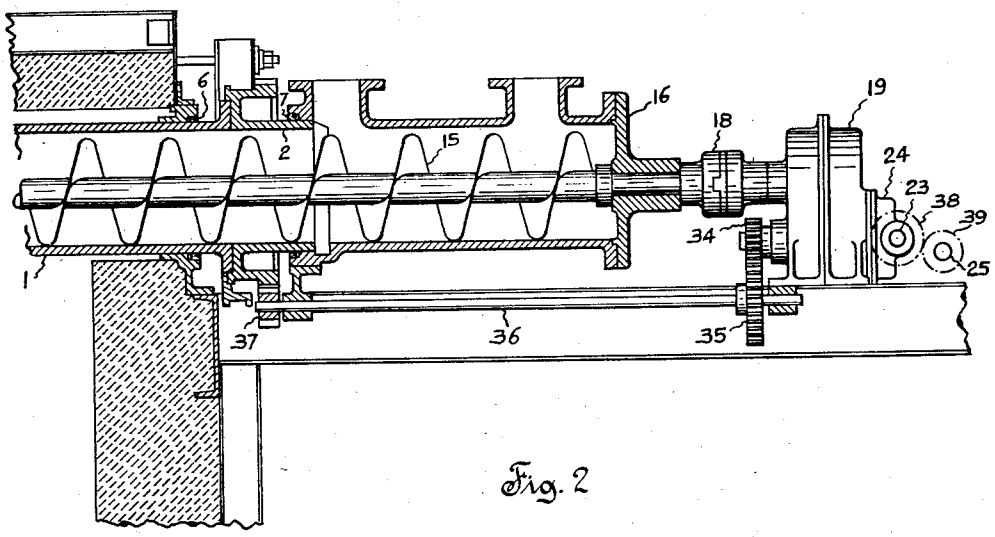


Fig. 2

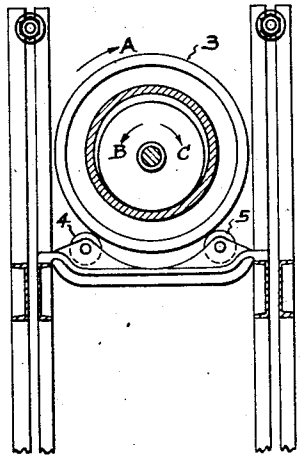


Fig. 4

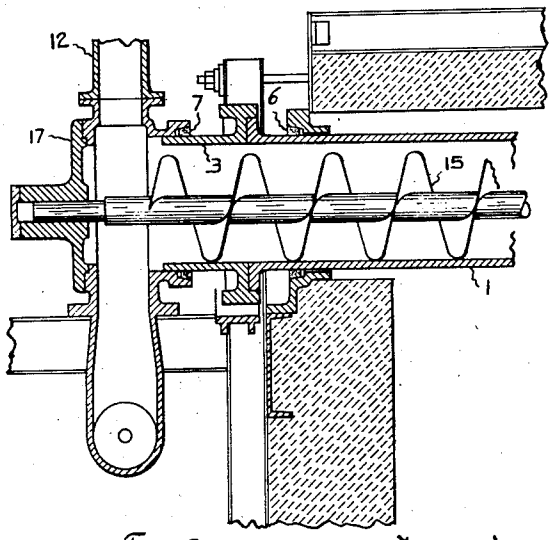


Fig. 3

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CARBONIZATION DEVICE

Filed May 3, 1930 3 Sheets-Sheet 3

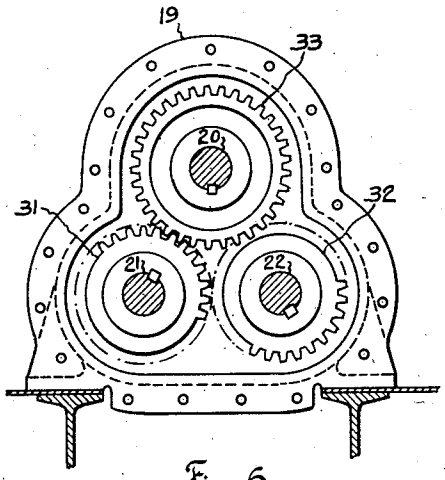


Fig. 6

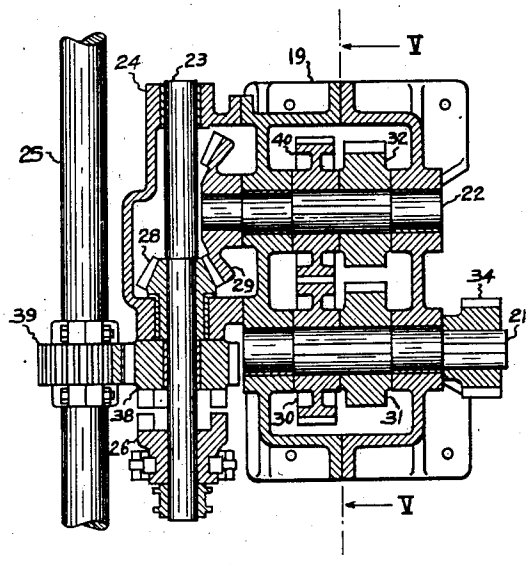


Fig. 7

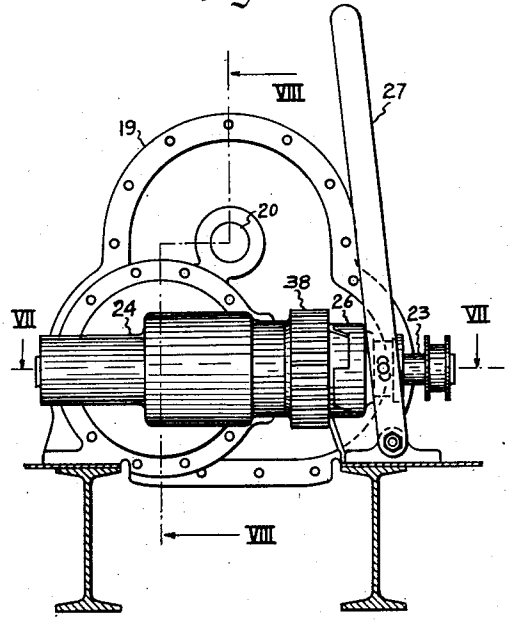


Fig. 5

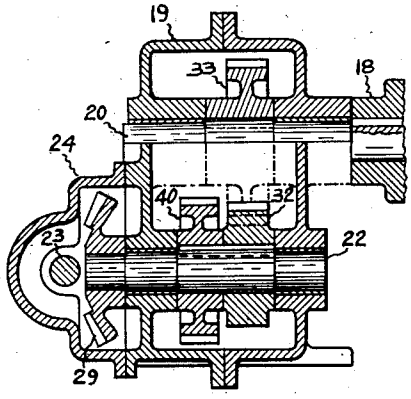


Fig. 8

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UNITED STATES PATENT OFFICE

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CARBONIZATION DEVICE

Application filed May 3, 1930. Serial No. 449,509.

This invention relates to carbonization devices of the type in which a conveyer is used to advance carbonaceous material through a heated retort, and relates more particularly to a mechanism in which rotary movements are imparted to the retort and to the conveyer within said retort.

An object of the invention is to provide an improved retort which is simple and compact in construction and efficient in operation.

Another object of the invention is to provide an improved driving mechanism for a conveyer or the like.

A further object of the invention is to increase the efficiency of the heating process and to effect greater agitation of the material within a retort and also to prevent warping of the retort.

With these and other objects hereinafter explained in detail the invention consists in the combination and construction of elements hereinafter described and claimed.

Referring to the drawings:

Fig. 1 is a longitudinal sectional view of a general arrangement of a distillation plant embodying the invention.

Fig. 2 is a view, partly in section, of the charge end of the retort and the driving mechanism.

Fig. 3 is a sectional side view of the discharge end of the retort.

Fig. 4 is an end view of a supporting bracket at the discharge end of the retort, a similar bracket being arranged at the charge end.

Fig. 5 is an end elevation of the driving mechanism.

Fig. 6 is an elevation similar to Fig. 5, but showing the opposite end of the driving mechanism with one half of the housing removed.

Fig. 7 is a section on line VII—VII of Fig. 5.

Fig. 8 is a section on line VIII—VIII of Fig. 5.

In the drawings 1 indicates a retort consisting of a cylindrical tube of considerable length relative to its diameter, each end of this cylinder being formed with a flange to which extensions 2 and 3 are secured by suitable means. A tire adapted to cooperate with supporting rollers 4 and 5 is formed on each of the extensions 2 and 3 thus allowing the retort to rotate about its longitudinal axis. The joints between the cylinder and the adjoining stationary parts, are sealed by means of glands 6 and 7 respectively.

8 indicates a feed screw which discharges the material from a hopper 9 into the charge end of the retort. A pipe line 10 with connections 11 and 12 serves to draw off the volatiles from the retort. 13 indicates the furnace for heating the retort, suitable openings 14 being arranged in the masonry to admit the heat to the retort. A screw conveyer 15 inside the retort, extends from the charge end to the discharge end, and is supported by suitable bearings in the end covers 16 and 17 located in such a position that the circumferential portions on the lower side of the screw touch the inside surface of the retort while clearance is left between the upper portions of the screw and the inside surface of the retort. This is more clearly shown in Fig. 4. The shaft of the screw conveyer 15 extends through the end cover 16 at the charge end of the retort and is connected to the driving mechanism by means of a coupling 18.

The driving mechanism consists of a split housing 19 containing a main shaft 20 which is connected by means of the coupling 18 to the shaft of the screw conveyer. A counter-shaft 23 is arranged at right angles to and in front of two auxiliary shafts 21 and 22, and is supported by suitable bearings in a cap 24 attached to the housing 19. The counter-shaft 23 carries an idler gear 38 which is in mesh with a corresponding gear 39 firmly secured to a power shaft 25. The idler gear 38 has axially extending projections adapted to be engaged by a clutch member 26 which is secured to the counter-shaft 23 by means of a key (not shown) and can be shifted by operating the handle lever 27. A bevel gear 28 firmly secured to the counter-shaft 23 meshes with a corresponding bevel gear 29 which is fastened to the auxiliary shaft 22. Spur gears 30 and 40 are secured to the auxiliary shafts 21 and 22

respectively, and mesh with each other. In addition to the spur gears 30 and 40 which are of conventional design, the auxiliary shafts 21 and 22 carry mutilated gears 31 and 32, respectively, which have teeth on a certain arc of the circumference only. For reasons which will be explained later, the number of teeth on one of these mutilated gears is greater than the number of teeth on the other gear. In the driving mechanism here described by way of example, the mutilated gear 31 has twelve teeth while the mutilated gear 32 has ten teeth only. The mutilated gears 31 and 32 are adapted to cooperate with a gear 33 which has a full set of teeth and is fastened to the main shaft 20. The auxiliary shaft 21 extends through the housing 19 and carries outside of it, a spur gear 34 which is in mesh with a spur gear 35 on the retort driving shaft 36. This shaft carries on its other end a pinion 37 which cooperates with a gear shaped portion of the tire on the cylinder extension 2.

From the foregoing description of the driving mechanism it will be apparent that the conveyer shaft will not revolve continuously in one direction, but will be rotated through a predetermined angle in one direction and then will be reversely rotated through a lesser angle, whereupon a movement in the first mentioned direction will again be effected. As long as the teeth of the mutilated gear 31 are in mesh with the gear 33 the screw conveyer 15 will be rotated in such a direction that the material within the retort will be moved toward the discharge end, and when the last tooth of the gear 31 has left the gear 33, the first tooth of the mutilated gear 32 which is rotated by the spur gears 30 and 40 in an opposite direction, will come in mesh with the gear 33. The mutilated gear 32 will now drive the gear 33 and the conveyer 15 in such a direction that the material in the retort will be moved in a backward direction from the discharge and to the charge end. Owing to the fact, however, that the number of teeth on the mutilated gear 32, is less than that of the mutilated gear 31 the conveyer shaft 15 will be rotated by the gear 32 through a lesser angle than by the gear 31 and the distance through which the material in the retort is moved in a forward direction will be greater than that of the backward movement. Thus, the material in the retort will be brought slowly and step by step from the charge end to the discharge end of the retort.

It will be further apparent that while the back and forth movements of the material in the retort take place the retort itself will be rotated continuously around its axis by means of the retort driving shaft 36 which is connected by gears with one of the auxiliary shafts in the housing 19. The retort may revolve in the same direction in which the conveyer revolves when it pushes the material forward or, the driving mechanism may be arranged in such a manner that the continuous rotation of the retort has the same direction as the screw when it pushes the material in the retort backward, the latter being the preferred arrangement shown in the drawings.

The arrow A in Fig. 4 indicates the direction of continuous rotation of the retort while the arrow B indicates the direction in which the screw conveyer revolves on its long stroke, that is, the stroke which urges the material in the retort from the charge end to the discharge end. The arrow C indicates the direction in which the screw conveyer revolves on its short stroke in order to move the material in the retort backwards.

It has been found that in carbonizing coal with a device embodying the principles of the invention as set forth, satisfactory results are obtained if the ratio between the gears of the driving mechanism is such that the conveyer shaft is given one complete revolution for each sixteen and one-half ($16\frac{1}{2}$) revolutions of the mutilated gears. A suitable speed for the conveyer shaft is one complete revolution per minute and the retort may also complete one revolution per minute.

By giving a rotating motion to the retort, uniform heating of the outer surface about the entire circumference is obtained, thereby preventing distortion or warping, and consequent binding of the running parts. It is obvious that the scraping action of the screw conveyer along the bottom of the retort will remove any particles of coal which might stick to the wall of the retort and, as the retort is continuously revolving, its entire inner surface will be kept clean. In a uniformly heated and continuously revolving retort the inner surface of the retort will always stay close to the lower portion of the conveyer and there is no liability of formation of a crust which would prevent efficient transfer of heat to the loose material in the retort. Improved distillation will result from the greater area of hot retort surface upon which the coal will travel and, on the other hand, the wearing surface inside of the retort is increased thus increasing the life of the retort.

While the invention is chiefly intended for use in carbonization of coal it will of course be understood that the term carbonaceous material should include any material capable of heat treatment to drive off volatiles.

It should be understood that it is not intended to limit the invention to the exact details of construction herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination, a rotatable retort, a ro-

tatable screw conveyer within said retort, and a driving mechanism comprising oppositely revolving mutilated gears cooperating intermittently with a gear driving the shaft of said conveyer, for reversibly rotating said screw conveyer.

2. In combination, a rotatable retort, a rotatable screw conveyer within said retort, and a driving mechanism comprising two oppositely revolving mutilated gears cooperating alternately with a gear driving the shaft of said screw conveyer, the number of teeth on one of the mutilated gears being greater than the number of teeth on the other mutilated gear, for reversibly rotating said screw conveyer.

3. In combination, a rotatable retort, a rotatable screw conveyer within said retort, and a driving mechanism comprising two mutilated, oppositely revolving gears cooperating alternately with a gear driving the shaft of said screw conveyer, and further comprising a continuously revolving gear driving said retort, for continuously rotating said retort and simultaneously reversibly rotating said conveyer.

In testimony whereof, the signature of the inventor is affixed hereto.

FRANK L. TENNEY.