

July 27, 1926.

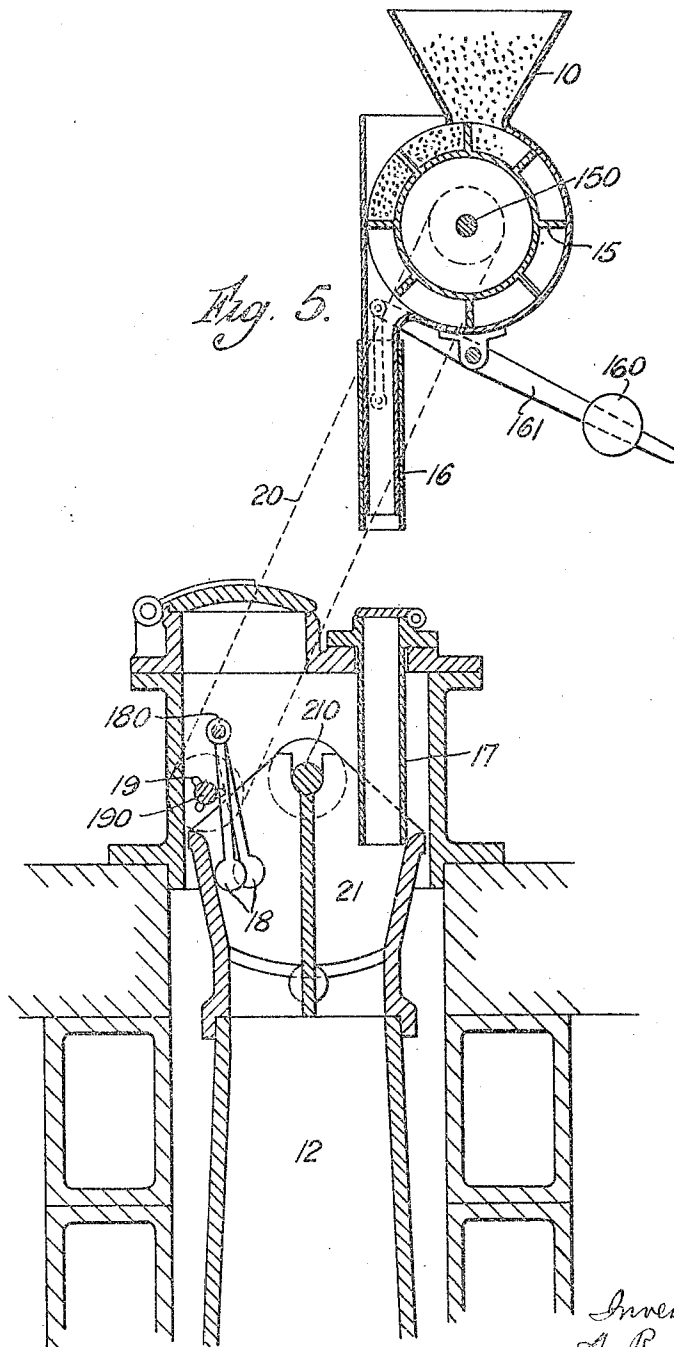
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S. R. ILLINGWORTH

CARBONIZATION OF COAL

Filed May 22, 1926

6 Sheets-Sheet 2



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6 Sheets-Sheet 3

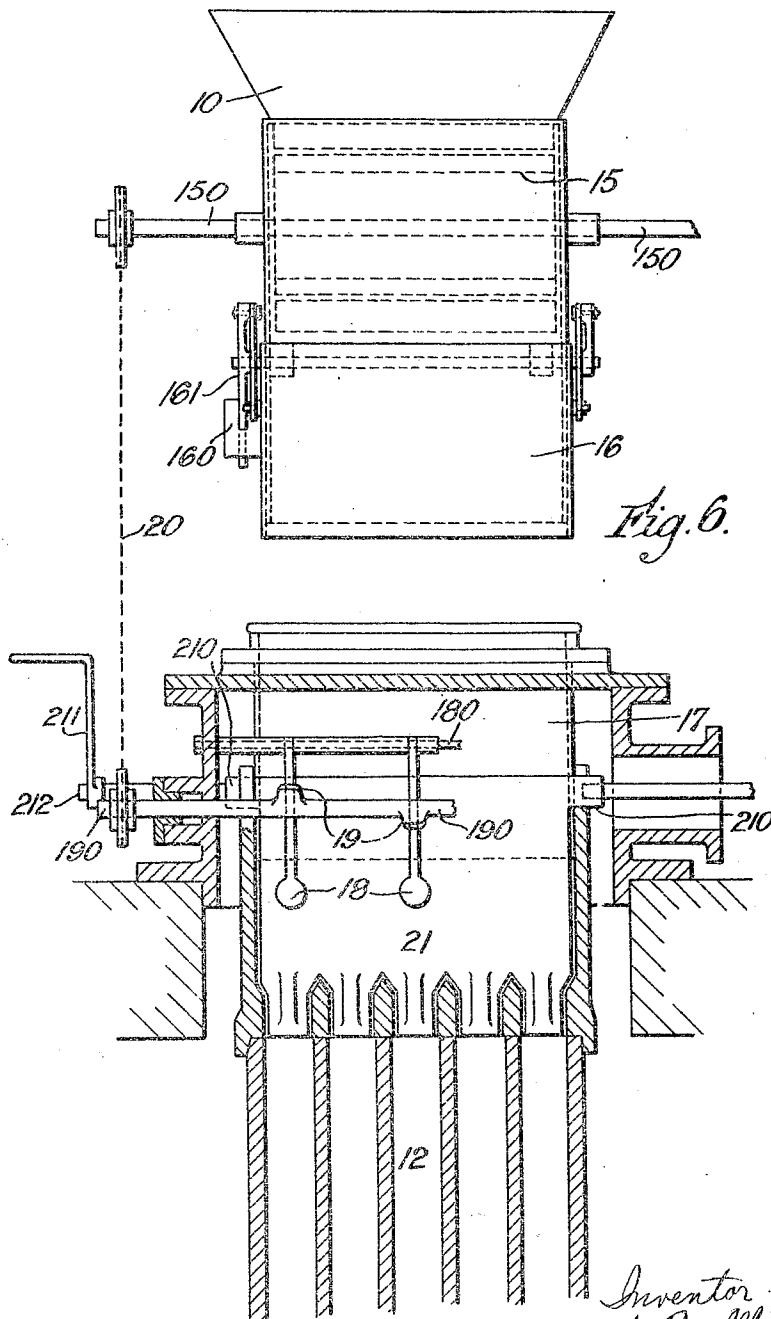


Fig. 6.

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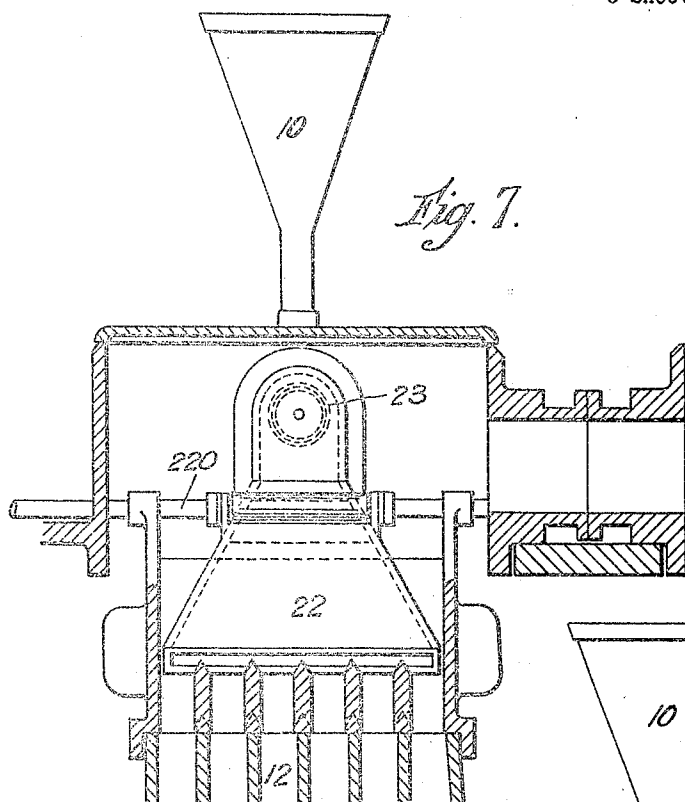


Fig. 7.

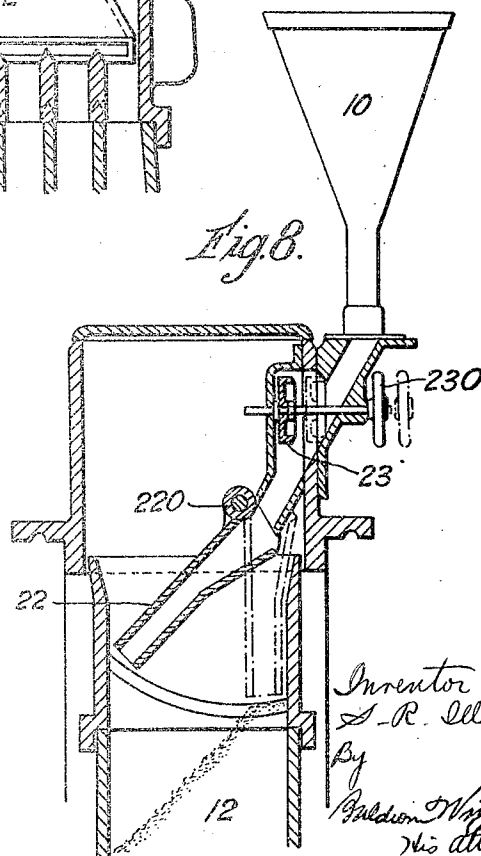


Fig. 8.

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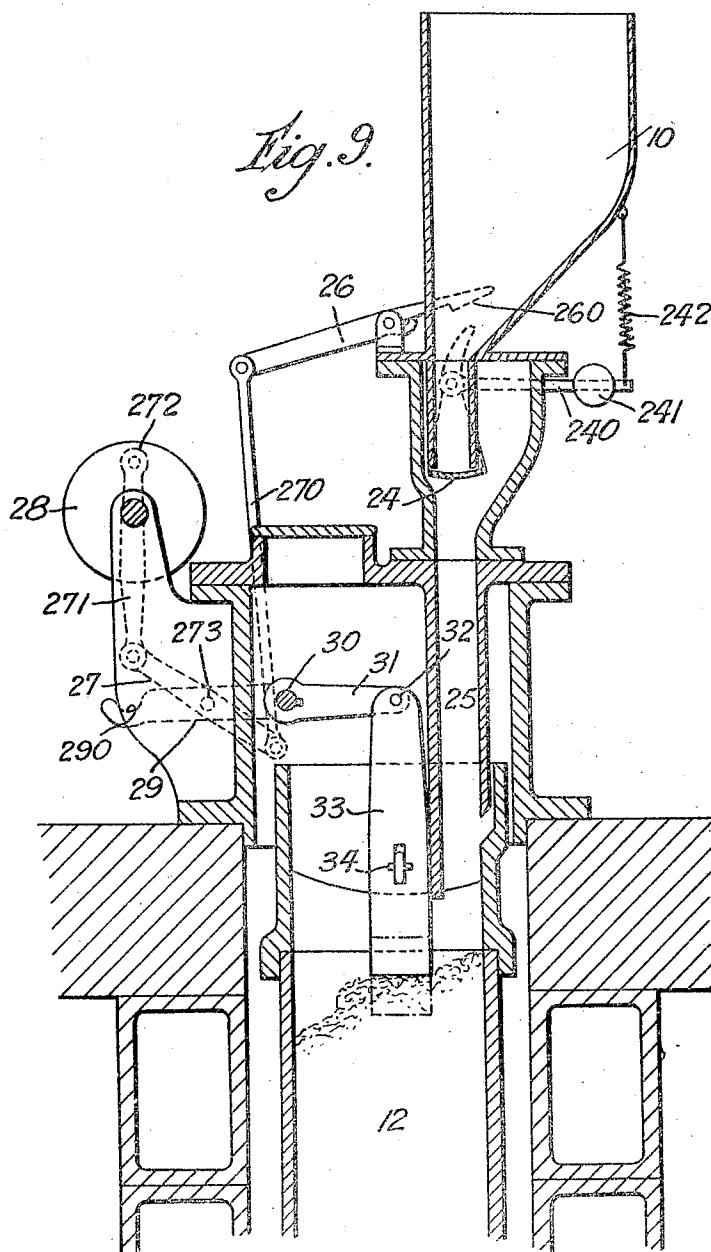
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6 Sheets-Sheet 5



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Fig. 10.

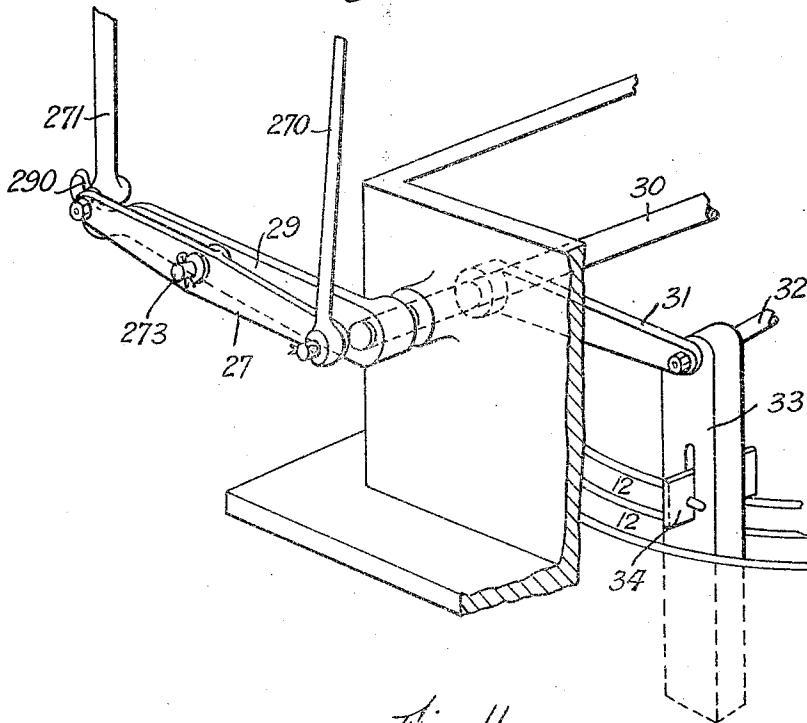
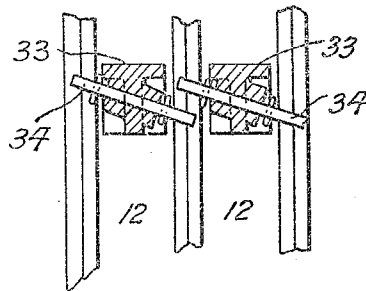


Fig. 11.



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UNITED STATES PATENT OFFICE.

STEWART ROY ILLINGWORTH, OF BRYNFEDWEN, RADYR, WALES, ASSIGNOR TO THE ILLINGWORTH CARBONIZATION COMPANY, LIMITED, OF MANCHESTER, ENGLAND.

CARBONIZATION OF COAL.

Application filed May 22, 1926, Serial No. 111,045, and in Great Britain November 27, 1924.

This invention relates to the carbonization of coal. The invention relates more particularly to the charging of retorts whereby a larger charge can be dealt with at one time and which results in that the product produced is of increased density and hardness and that coals of lower caking quality can be employed in the manufacture of coke.

According to this invention I impart vibration to the retort during the period of charging.

The retorts which are preferably circular and of metal may be vibrated by means of blows in any part of the retort or extension thereof but preferably blows in a vertical direction at the top of the retort are employed.

It is preferred to vibrate the retort whilst the coal is being fed and it is preferable that the time of feeding should be not less than 2 minutes, but should the feed be more rapid it is advisable to vibrate after the period of charging for upwards of a minute longer.

The effect of the vibration is greatly increased if pressure is applied to the top of the fuel when the retort is being tapped.

We have found that blows with a 2 lb. hammer moving over about 4 inches or are of a 9 inch circle produce good effects. The maximum effect produced with dry coal which could all pass through a 1/4 inch mesh is to give a density of 60 lbs. per cubic foot of the coal.

Results of tapping a loose filled retort.

Retort 12 ft. high metal conductors.

Tapping done by a 2 lb. hammer with 4 inch blow.

Dry coal used, all of which passed a 1/4 to 1/100 mesh.

Total No. of Blows.	Lbs. per cub. ft. dry coal.	Effect achieved based on final effect.	Per cent increase over loose filling.
100	56.6	94	13.1
200	57.6	97	15.2
300	58.0	98	15.9
400	58.2	98.2	16.3
500	58.4	98.7	
700	59.2	100	18.4
800			

With wet coal the amount of dry coal per cubic foot is decreased by the percentage of water present and it is preferred to use dry coal.

The effect of the denser charges produced by vibration of the retorts is to give rise to a fuel or coke of increased density, the effect varying with the percentage of volatile matter in the coal used. For example coal containing 22% volatile matter carbonized at 600° C. produced a fuel of apparent density equal to 1.09 when the retort was vibrated against a fuel of apparent density equal to 0.832 when there was no vibration.

The accompanying drawings show apparatus made in accordance with this invention. Figures 1, 2, 3 and 4 show one form of apparatus in which feed tubes enter the retorts. Figure 1 is a longitudinal section of the hopper and feed tubes, Figure 2 is a transverse section of the same, Figure 3 shows a method of operating the doors of the hopper and Figure 4 is a detail cross section to a larger scale of a feed tube. Figures 5 and 6 are sections at right angles showing another form of apparatus. Figures 7 and 8 are sections at right angles of another form of apparatus. Figure 9 is a section of another method of feeding and tapping a retort. Figure 10 is a perspective view of part of the apparatus shown in Figure 9 and on a larger scale. Figure 11 is a part horizontal section on a larger scale of Figure 10.

Referring to Figures 1 to 4, 10 is a hopper from which fuel passes to tubes 11 each of which enters a retort 12 (see Figure 2). The tubes 11 are swaged into a saddle 13 keyed to a horizontal shaft 130 which may be rocked to and fro in any convenient manner causing the tubes 11 to strike first one side and then the other side of the retort 12 thereby causing vibration of the retort. On the shaft 130 are radial rods 131 which agitate the charge in the hopper 10. The outlets of the hopper may be controlled by a sliding door 14 operated by a lever 140 (see Figure 3). Usually a number of hoppers is provided, the different sets of tubes being all connected to one shaft 130 and the doors operated by one lever 140. The tubes 11 may be strengthened by collars 110 at their ends fixed to them by rivets 111 as shown in Figure 4.

In Figures 5 and 6 a fuel hopper 10 has a rotary valve 15 by which definite amounts of fuel are supplied to a retort 12 through a sleeve 16 which passes into the retort, the feed tube 17 being removed. The weight

of the sleeve 16 is balanced by a weight 160 on a lever 161. The coal hopper 10 and valve 15 may travel over a series of retorts or a sleeve 16 may be fixed to the top of each
 5 retort. In the retort 12 are hammers 18 mounted on a shaft 180 which are actuated by snugs 19 so arranged that the hammers 18 strike the retort 12 several blows at different times on each revolution of the shaft 190.
 10 The shaft 190 is driven by a chain 20 from the shaft 150 of the feed valve 15, so that the number of blows of the hammers can be regulated according to the rate of feed. As an alternative or in addition to the ham-
 15 mers 18 a plate 21 swinging on bosses 210 may be provided, the plate 21 being caused to strike the walls of the retort 12 by means of a crank handle 211 engaging a prolongation 212 of one of the bosses 210.
 20 In Figures 7 and 8 the fuel hopper 10 supplies fuel to a swinging chute 22 mounted on a shaft 220, the chute striking the walls of the retort 12 as it swings from one side to the other. The fuel hopper 10 is provided
 25 with a valve 23 operated by a handle 230. When the chute 22 is in the position shown in full lines the fuel in it is at the natural angle of repose but is delivered into the retort 12 when the chute is swung.
 30 In Figure 9 the hopper 10 is provided with a valve 24 to which is fixed a rod 240 having a counter balance weight 241. 242 is a cushioning spring attached to the rod 240 and the hopper 10. When the coal is
 35 fed to the retort 12 through the tube 25 the valve 24 is held open and engaged by the end 260 of the lever 26, the other end of the lever being connected to one end of another lever 27 by a link 270. The other
 40 end of the lever 27 is connected by a link 271 to a pin 272 on a revolving disk 28. The lever 27 is mounted on a pin 273 upon another lever 29 mounted on a shaft 30. At the left hand end of the lever 29 is a recess 290
 45 adapted to receive the end of the link 271. On the shaft 30 are carried arms 31 carrying a rod 32 from which are hung weights or hammers 33. Slots are made in the weights 33 in which are loosely carried bars
 50 or cotters 34 which impart blows to the tops of the retorts in a vertical direction and are arranged diagonally as shown in Figure 11.

The position of the slots is arranged so that the cotters strike the top of the partitions of the retort towards the end of the downward
 55 stroke of the hammers. The excess width of the cotter holes is sufficient to permit the hammers completing the down stroke unrestricted by the cotters.

It will be seen that when the retorts are
 60 empty the weights or hammers 33 will cause the end 290 of the lever 29 to make contact with the end of the link 271, the point of connection of the lever 27 and link 270 lying
 65 in the same line as the centre of the shaft 30, so that the link 270 will have no motion of translation imparted to it (see Figure 10). When, however, the movement of the ham-
 70 mers is restricted as in Figure 9, the lever 29 will not follow the entire upward movement of the end of the link 271, so that movement will be imparted to the link 270
 owing to the movement of the lever 27 about its pivot 273.

In operation the valve 24 is opened and
 75 held in this position by engagement with the catch on the lever 26, so that while charging the hammers have a maximum movement. However, as soon as the change
 80 has reached a level such that it prevents the downward motion of the hammers the lever 27 causes the release of the valve 24 owing to the disengagement of the catch on the lever 26, thereby cutting off the feed of the
 85 charge.

What I claim is:—

1. A process of charging a coking retort, which comprises imparting vibration to the retort only while charging the same with coal, thereby rendering the charge more
 90 dense and consequently resulting in the production of a fuel of increased density.

2. A process of charging a coking retort, which comprises imparting vibration to the retort only while charging the same with coal by repeatedly striking the upper por-
 95 tion thereof, thereby rendering the charge more dense and consequently resulting in the production of a fuel of increased density.

In testimony that I claim the foregoing
 100 as my invention, I have signed my name this third day of May, 1926.

STEWART ROY ILLINGWORTH.