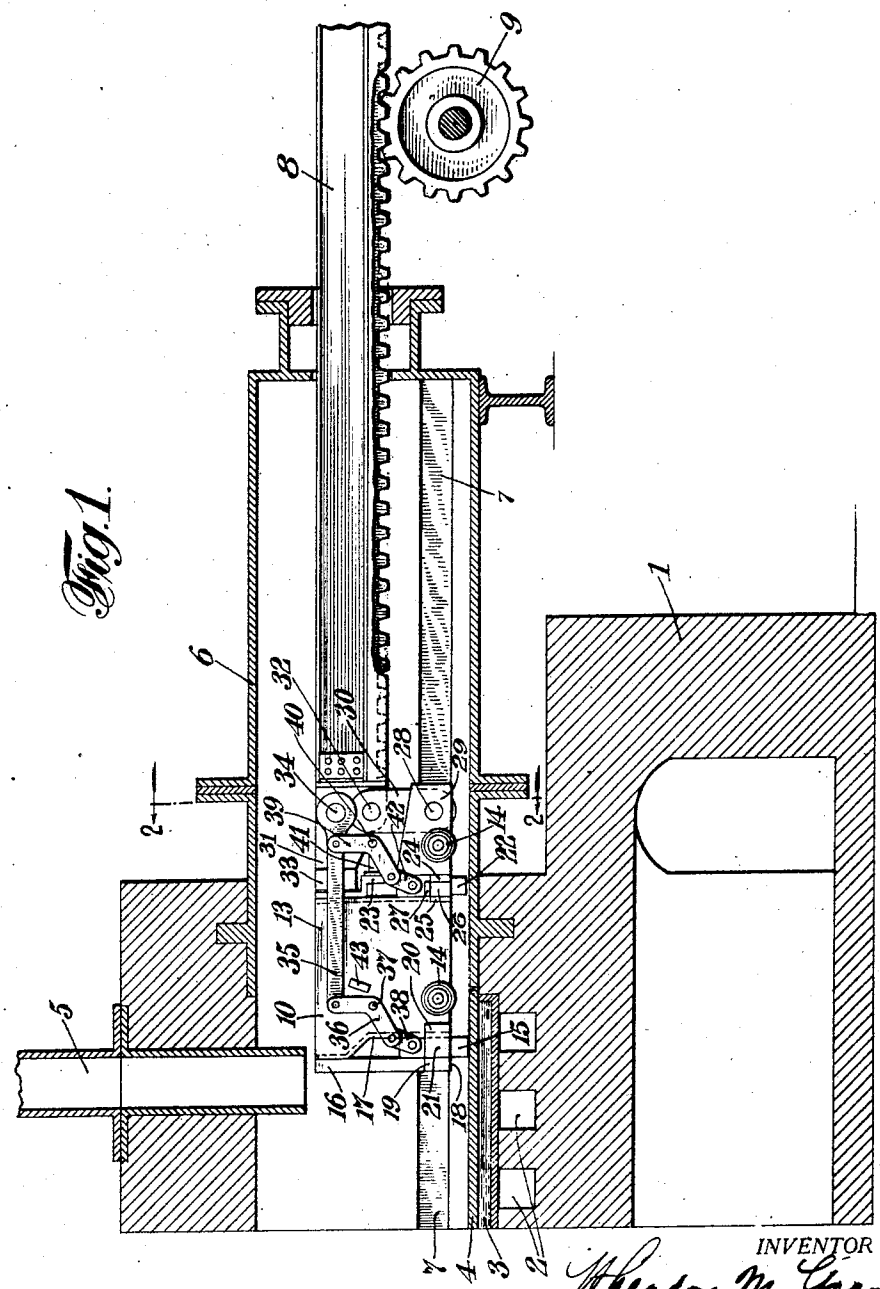
Jan. 12, 1926. 1,569,478

W. M. GRANT

COMBINED SPREADING AND SCRAPING MECHANISM FOR DISTILLATION APPARATUS

Filed Nov. 8, 1923 2 Sheets-Sheet 1

Fig. 1.



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COMBINED SPREADING AND SCRAPING MECHANISM FOR DISTILLATION APPARATUS

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Fig. 2

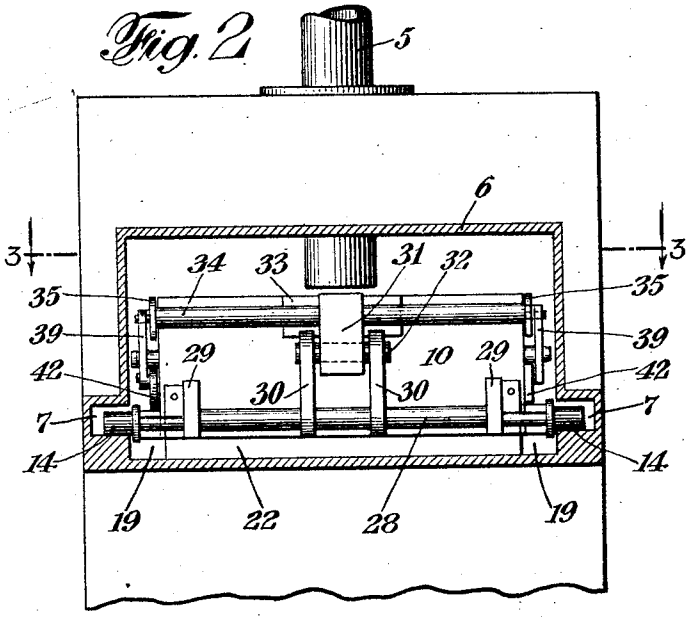
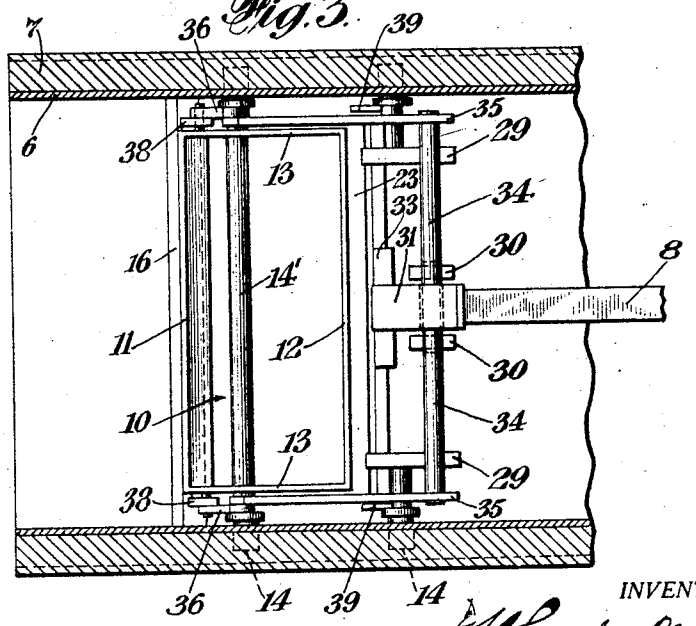


Fig. 3.



INVENTOR

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Patented Jan. 12, 1926. 1,569,478

UNITED STATES PATENT OFFICE.

WHEADON M. GRANT, OF BIRMINGHAM, ALABAMA, ASSIGNOR TO ILLINOIS ANTHRACITE CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

COMBINED SPREADING AND SCRAPING MECHANISM FOR DISTILLATION APPARATUS.

Application filed November 8, 1923. Serial No. 673,424.

To all whom it may concern:

Be it known that I, WHEADON M. GRANT, a citizen of the United States, a resident of Birmingham, in the county of Jefferson and State of Alabama, have invented a certain new and useful Combined Spreading and Scraping Mechanism for Distillation Apparatus, of which the following is a specification.

This invention relates to improvements in the coke oven or retort art, particularly designed for the distillation of coal, shale, and other material, to produce light oils, coke, and the other by-products, and the apparatus forming the subject of this invention is designed to carry out the process disclosed in a copending application for patent on process of distilling coal, shale, and the like, filed by Clarence S. Lomax and Wheadon M. Grant, filed the 19th day of September, 1923, Serial No. 663,551.

In that process the coal, shale, or other material to be distilled is spread in a thin and even layer upon the heated bottom plate or plates of a coke oven or retort, so that it is immediately raised in temperature to a point at or above that at which simultaneous distillation and cracking occur, which results in most efficient production of light oils.

This invention relates to the apparatus for spreading the material to be distilled in a thin, even layer upon the hot bottom plate or plates of the oven or retort and at the same time scraping up and discharging the previous layer of material which has been subjected to the process.

The principal object of the invention is a mechanism including a suitable feed box or hopper adapted to contain a proper quantity or charge of material and having a movable scraping plate located in the front thereof and a movable leveling or smoothing plate in the rear thereof, the latter plate being arranged so that normally its lower edge is spaced a short distance from the hot bottom plate of the oven or retort, this space depending upon the depth of the layer of material desired. Mechanism is provided for moving said feed box or hopper and attached plates through the oven and in so doing the front plate scrapes up the treated layer of material and the rear plate smooths off and levels the new charge of material which is discharged from the feed box or hopper in its travel through the oven. At the end of this movement the mechanism is reversed to draw the feed box or hopper back to its initial or starting position, but before this return movement is started, both of said plates, that is, the front plate and the rear plate, are lifted so as not to interfere with or disturb the layer of material just discharged upon the bottom of the oven or retort.

In order to accomplish these major purposes, the invention also includes various improvements in details of construction and arrangement, whereby a simple and effective mechanism of this character is provided.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, this invention consists in the construction, combination, and arrangement of parts hereinafter described and then sought to be defined in the appended claims, reference being had to the accompanying drawings forming a part hereof and which show for the purpose of illustrative disclosure a preferred embodiment of this invention, it being expressly understood, however, that various changes may be made in practice within the scope of the claims without digressing from the inventive idea.

In the drawings,—

Figure 1 represents a vertical, longitudinal cross section through the front or charging part of a coke oven or retort, with the apparatus of this invention shown near its initial or starting position preparatory to starting its forward or scraping and spreading movement, sufficient of the coke oven being indicated to make a proper disclosure.

Figure 2 is an end elevation of the apparatus shown in Figure 1, looking from and in the direction of the arrow 2 of Figure 1.

Figure 3 is a top plan view of the combined spreading and scraping apparatus, this view being taken substantially along line 3—3 of Figure 2.

In the structure illustrated in the drawings, a coke oven or retort proper 1 has suitable heating flues 2 which preferably heat a lead bath 3 on which rest a plurality of bottom or floor plates 4 of the oven or retort. It is upon these plates that the material to be treated is discharged. A material inlet 5 is shown at the charging end of the oven and a feeding mechanism is preferably connected therewith so as to feed material in

measured quantities; this feeding mechanism forms no part of this invention. Casing 6 extends out from the front of the oven or retort to provide for complete withdrawal and removal of the combined spreader and scraping mechanism from the oven and to properly support it and its operating mechanism. The side walls of the oven and of this casing 6 are provided with longitudinally arranged guideways 7, which guideways extend the full length of the oven.

A combined spreading and scraping mechanism takes the place of the usual ram or other discharge mechanism used in connection with coke ovens for the purpose of discharging the coke therefrom and it has an elongated operating bar 8 which is provided with a rack underneath the same in mesh with a driving gear or pinion 9. Suitable mechanism is provided for driving the pinion 9 and the bar 8 in either direction at the will of the operator.

The combined spreading and scraping mechanism itself includes a hopper or box 10 which is of substantial rectangular shape having a front wall 11 and a rear wall 12 and side or end walls 13. The box itself is less in width than the full width of the oven and is supported above the bottom thereof by means of wheels or rollers 14 suitably connected thereto and fitting within guideways 7 in the sides of the oven. In other words, there is a space between the bottom of the box 10 and the bottom plates 4 of the oven or retort and there is also a space between the side walls of the oven and the side or end walls 13 of the box 10.

A front or scraping plate 15 is mounted for vertical movement between a stationary plate 16, which is fastened to the front wall 11, and an offset part 17 of said front wall 11, as clearly shown in Figure 1 of the drawing. In other words, the offset part 17 of the front wall 11 is spaced from the stationary plate 16 and provides a space to slidably receive the front or scraping plate 15. The stationary plate 16 extends the full width of the oven and therefore will scrape the sides of the oven and assist in guiding the device in its passage through the oven. The lower edge 18 of the stationary plate 16 is spaced from the bottom plate 4 and on each side thereof is provided a laterally extending lug 19, which lugs correspond to lugs 20 extending laterally from each side of the side or end plates 13 of the box 10. Between each of these opposed pairs of lugs 19 and 20 is positioned a filler block 21, whereby a solid guiding wing or lug is provided which extends within each guideway 7 of the oven and assists in guiding the apparatus in its movement and also operates to keep these guideways clean and clear of coke or other substances.

A rear and spreading plate 22 is supported for vertical movement between the rear wall 12 of box 10 and an offset stationary plate 23, which is secured to said rear wall 12 and provides a guideway to slidably receive said rear or spreading plate. Lugs 24 and 25 and filler block 26, corresponding to lugs 19 and 20 and filler block 21, are provided in connection with the rear wall 12 and its stationary plate 23 and form a rear wing or lug on each side of the box or hopper 10 fitting within the guideways 7 in the walls of the oven. In addition to the other functions specified for these guiding wings or lugs, they also serve to hold the front and scraping plate and the rear and spreading plate in proper position and prevent lateral displacement of the same. The rear plate 22 is normally maintained a slight distance above the bottom plates 4 of the oven so as to spread and smooth the material in the form of a thin layer thereover, and this plate is therefore limited in its downward movement by means of the engagement of a stop 27 which engages the laterally extending wing or lug just described.

The two plates 15 and 22 are adapted to be raised and lowered by the operation of the operating bar 8 and the parts are therefore connected in the following manner to accomplish this result. Shaft 28 is suitably mounted in brackets 29 which are secured to and extend from the rear wall 12 of the box. Links 30 are pivotally connected to said shaft 28 and spaced apart to receive head 31 of the operating bar 8. The head 31 is provided with an aperture to receive a pin or stud shaft 32 which pivotally connects the head 31 to the links 30, whereby the weight of the operating bar and its head is supported. The engaging end 33 of the head 31 extends toward the upper part of the rear offset plate 23 and is normally spaced therefrom, as indicated in Figure 1, but when the operating bar 8 is moved to the left as in Figure 1, it will swing on the shaft 28 as a pivot, and after a movement sufficient for the designed purposes hereinafter described, will engage the upper part of the rear offset plate 23 and directly push the box or hopper 10 and its attached mechanism through the oven.

A shaft 34 is loosely mounted in said head 31 of the operating bar 8 and extends transversely of the apparatus and has an operating bar 35 secured to each end thereof, these operating bars being positioned on the outside of the side or end walls 13 of the box or hopper 10. The forward end of each bar 35 is pivotally connected to a bell crank 36 which is pivoted, as at 37, to the outside of the side or end wall 13 of the box or hopper 10, the lower end of the bell crank lever 36 being pivotally connected to a link 38, which is in turn pivotally connect-

ed to the front plate or scraping member 15. A similar bell crank lever 39 is pivotally connected to each bar 35 near the rear end thereof, said bell crank 39 being pivoted, as at 40, to a bracket or other suitable supporting means 41 extending rearwardly from the box or hopper 10 and having its lower end pivotally connected to link 42, which in turn is pivotally connected to the rear or spreading plate 22. On the outside of each of the side or end walls 13 I provide a stop or abutment 43 located slightly in the rear of the bell crank lever 36 so as to limit the rearward or pulling movement of the same. The purpose of this will appear later.

The forward wheels 14 for supporting the box or hopper are preferably mounted on a shaft 14′ which extends through the hopper and turns with the wheels so as to provide a means for disturbing or stirring the material in the box or hopper, and the rear wheels 14 are suitably mounted upon the rearwardly extending brackets 29.

In operation, the device is normally in the position shown in Figure 1 and immediately after its forward movement begins a suitable charge of material is discharged into the box or hopper. The application of power to bar 8 results in a slight swing on shaft 28 as a pivot and forces the bars 35 forward and the plates 15 and 22 downward to the limit of their downward motion. At this time the front end 33 of the head 31 of the bar engages the rear offset plate 23 which takes up the stress of operation from then on during the forward movement of the apparatus. The front plate 15 scrapes up the material from the bottom of the oven in its passage therealong and eventually will discharge said material from the coke side of the oven. During this movement the rear plate 22 is spreading and smoothing and leveling a thin, even layer of material on the bottom plates 4 of the oven, whereby the material is immediately subjected to the heat therefrom and immediately raised in temperature to the desired point. When the forward movement of the apparatus is completed, the driving mechanism is reversed and the bar 8 is pulled, which immediately results in a rearwardly swing on shaft 28 as a pivot, with a consequent rearward movement of the operating bars 35 and the lifting of the front plate 15 and the rear plate 22. When these plates have been sufficiently lifted to avoid contact with any of the material which has just been placed upon the bottom plates of the oven, the bell crank lever 36 engages the stop or abutment 32, preventing a further lifting movement and establishing a connection between the operating bar 8 and the box or hopper 10, whereby the latter is moved backward through the oven to its initial or starting position. During all of this movement the plates 15 and 22 are lifted so that the layer of material is not disturbed in any particular.

Referring again to the casing 6, attention is called to the fact that it provides means whereby the feeding hopper may be entirely withdrawn from the oven or retort for examination, repair, and other purposes and to that end this casing is provided with a pair of opposed flanges 6′ with suitable filling means interposed therebetween, so that when it is desired to withdraw the feeding hopper from the oven and close the oven, a suitable partition plate is inserted between and secured to said pair of flanges 6′. This is of importance in the practical operation of the oven or retort.

I claim:

1. In combination with a retort or oven, a combined feeding and scraping mechanism, including a feeding hopper adapted to receive a charge of material and to feed the same along the bottom heating surface of the retort or oven, means for moving said hopper from one end of the retort or oven to the other and return, and means associated with the hopper for leveling and smoothing the charge of material as it is fed in the form of an even layer during the feeding movement of the hopper.

2. In combination with a retort or oven, a combined feeding and scraping mechanism including a feeding hopper adapted to receive a charge of material and to feed the same along the bottom heating surface of the retort or oven, means for moving said hopper from one end of the retort or oven to the other and return, means associated with the hopper for leveling and smoothing the charge of material as it is fed in the form of an even layer during the feeding movement of the hopper, and means associated with the hopper for scraping the material of the previously treated layer from the bottom of the retort or oven as the next succeeding layer is being fed thereon.

3. In combination with a retort or oven, a combined feeding and scraping mechanism, including a feeding hopper adapted to receive a charge of material and to feed the same along the bottom heating surface of the retort or oven, means for moving said hopper from one end of the retort or oven to the other and return, means associated with the hopper for leveling and smoothing the charge of material in the form of an even layer as it is fed, means associated with the hopper for scraping the material of the previously treated layer from the bottom of the retort or oven as the next succeeding layer is being fed thereon, and means for raising said smoothing means on the return trip of the hopper.

4. In combination with a retort or oven, a combined feeding and scraping mech-

anism, including a feeding hopper adapted to receive a charge of material and to feed the same along the bottom heating surface of the retort or oven, means for moving said hopper from one end of the retort or oven to the other and return, means associated with the hopper for leveling and smoothing the charge of material as it is fed in the form of an even layer during the feeding movement of the hopper, means associated with the hopper for scraping the material of the previously treated layer from the bottom of the retort or oven as the next succeeding layer is being fed thereon, and means for raising said scraping means on the return trip of the hopper.

5. In combination with a retort or oven, a combined feeding and scraping mechanism, including a feeding hopper adapted to receive a charge of material and to feed the same along the bottom heating surface of the retort or oven, means for moving said hopper from one end of the retort or oven to the other and return, means associated with the hopper for leveling and smoothing the charge of material in the form of an even layer as it is fed, means associated with the hopper for scraping the material of the previously treated layer from the bottom of the retort or oven as the next succeeding layer is being fed thereon, and means for raising said smoothing means and said scraping means on the return trip of the hopper.

6. In combination with a retort or oven, a combined feeding and scraping mechanism, including a feeding hopper adapted to receive a charge of material and to feed the same along the bottom heating surface of the retort or oven, means for moving said hopper from one end of the retort or oven to the other and return, means associated with the hopper for leveling and smoothing the charge of material in the form of an even layer as it is fed, means associated with the hopper for scraping the material of the previously treated layer from the bottom of the retort or oven as the next succeeding layer is being fed thereon, said smoothing means and said scraping means being operatively connected together, means for forcing them downward upon the forward and feeding movement of the hopper and means for lifting them during the return movement of the hopper.

7. An apparatus of the character described, including, in combination, a feeding hopper, a front scraping plate slidably mounted and associated with said hopper, a rear leveling and smoothing plate slidably mounted and associated with said hopper.

8. An apparatus of the character described, including, in combination, a feeding hopper, a front scraping plate slidably mounted and associated with said hopper, a rear leveling and smoothing plate slidably mounted and associated with said hopper, said last mentioned plate being maintained at a different level from the first mentioned plate during the feeding movement so as to spread the material fed in the form of an even layer.

9. An apparatus of the character described, including, in combination, a feeding hopper, a front scraping plate slidably mounted and associated with said hopper, a rear leveling and smoothing plate slidably mounted and associated with said hopper, said two plates being operatively connected together, means for moving said hopper forwardly for feeding and returning the same to its initial position, same moving means also having operative connection with said two plates whereby said two plates will be held downward during the feeding movement and will be held lifted during the return movement.

10. An apparatus of the character described, including, in combination, a hopper adapted to be moved for feeding, means for moving said hopper and returning the same to its initial position, a front scraping plate slidably mounted and associated with said hopper, a rear leveling and smoothing plate slidably mounted and associated with said hopper, and connections between said two plates and said moving means whereby the plates will be forced and held downwardly during the feeding movement of the hopper and lifted and held in raised position during the return movement of the hopper.

11. An apparatus of the character described, including, in combination, a hopper adapted to be moved for feeding, means for moving said hopper and returning the same to its initial position, a front scraping plate slidably mounted and associated with said hopper, a rear leveling and smoothing plate slidably mounted and associated with said hopper, said two plates being operatively connected whereby they move together and also having operative connection with said moving means whereby the plates will be forced and held downwardly during the feeding movement of the hopper and lifted and held in raised position during the return movement of the hopper.

12. An apparatus of the character described, including, in combination, a feeding hopper, a front scraping plate slidably mounted and associated therewith, a rear leveling and smoothing plate slidably mounted and associated therewith, moving means for moving said hopper for feeding and returning the same to its initial position and connections between said plates and said moving means, said connections each including a bell-crank lever whereby the plates will be forced downwardly during the initial stages of the feeding movement and forced

upwardly during the initial stages of the return movement.

13. An apparatus of the character described, including, in combination, a hopper, means for moving said hopper, operative connections between said moving means and said hopper, including a pivotal connection whereby the moving means may have an independent movement relative to the hopper, a scraping means associated with the hopper, a smoothing and leveling means associated with the hopper, said scraping means and said smoothing and leveling means having operative connections with said moving means arranged so that at the beginning of the feeding movement said scraping means and smoothing and leveling means will be moved to an operative position before movement of the hopper and so that said scraping means and said smoothing and leveling means will be moved to an inoperative position at the beginning of the return movement of the moving means and before the beginning of the return movement of the hopper.

14. An apparatus of the character described, including, in combination, a hopper, a moving means therefor having a loose connection therewith whereby the moving means has a limited independent movement relative to the hopper both at the beginning of its feeding movement and at the beginning of its return movement, a scraping plate slidably mounted on said hopper, a smoothing and leveling plate slidably mounted on said hopper, link connections between said two plates and said moving means whereby at the beginning of the feeding movement of the moving means said two plates will be forced downwardly to the limit of their downward movement and the moving means will then operatively engage the hopper to move the same for feeding, said connections also causing the raising of the two plates at the beginning of the return movement before the moving means starts the return movement of the hopper.

15. An apparatus of the character described, including, in combination, a hopper adapted to be moved for feeding, means for moving said hopper and returning the same to its initial position, a front scraping plate slidably mounted and associated with said hopper, a rear leveling and smoothing plate slidably mounted and associated with said hopper, connections between said two plates and said moving means whereby the plates will be forced and held downwardly during the feeding movement of the hopper and lifted and held in raised position during the return movement of the hopper, and means for limiting the downward movement of said leveling and smoothing plate whereby the same will be held a slight distance above the surface over which the hopper travels.

16. An apparatus of the character described, including, in combination, a feeding hopper, a front scraping plate slidably mounted and associated therewith, a rear leveling and smoothing plate slidably mounted and associated therewith, moving means for moving said hopper for feeding and returning the same to its initial position and connections between said plates and said moving means, said connections each including a bell-crank lever whereby the plates will be forced downwardly during the initial stages of the feeding movement and forced upwardly during the initial stages of the return movement, and an abutment on said hopper adapted to be engaged by said bell-crank lever to limit the movement of the same.

17. An apparatus of the character described, including, in combination, a hopper, a moving means therefor having a loose connection therewith whereby the moving means has a limited independent movement relative to the hopper both at the beginning of its feeding movement and at the beginning of its return movement, a scraping plate slidably mounted on said hopper, a smoothing and leveling plate slidably mounted on said hopper, link connections between said two plates and said moving means whereby at the beginning of the feeding movement of the moving means said two plates will be forced downwardly to the limit of their downward movement and the moving means will then operatively engage the hopper to move the same for feeding, said connections also causing the raising of the two plates at the beginning of the return movement before the moving means starts the return movement of the hopper, and means for limiting the rearward movement of said link connections after the raising of the two plates at the beginning of the return movement of the moving means.

18. In combination with a retort or oven having a bottom heating surface and a plurality of guideways formed in the sides thereof, a feeding hopper adapted to receive a charge of material, roller means for supporting said hopper for movement through said retort or oven, said roller means being positioned in said guideways, moving means for moving said hopper from one end of the said retort or oven to the other and return, means associated with the hopper for scraping up a layer of material from the bottom heating surface of the oven and discharging the same therefrom, and other means associated with the hopper for leveling and smoothing the charge of material in the form of an even layer as it is fed.

19. In combination with a retort or oven having a bottom heating surface and a plurality of guideways formed in the sides

thereof, a feeding hopper adapted to receive a charge of material, roller means for supporting said hopper for movement through said retort or oven, said roller means being positioned in said guideways, moving means for moving said hopper from one end of the said retort or oven to the other and return, means associated with the hopper for scraping up a layer of material from the bottom heating surface of the oven and discharging the same therefrom, other means associated with the hopper for leveling and smoothing the charge of material in the form of an even layer as it is fed and additional scraping means provided on each side of said hopper adapted to remove the material from said guideways during the travel of the hopper through the retort or oven.

20. In combination with a retort or oven, a casing connected to the charging end of the same and extending outwardly therefrom, said casing being so constructed that a partition may be interposed therein to enclose part of the casing and separate it from communication with said oven or retort, a combined feeding hopper and discharge mechanism mounted in said oven or retort and having means for scraping up and discharging from the retort a previously treated layer of material and also having means for leveling and smoothing a layer of material to be treated during the feeding movement of the hopper, moving means for moving said hopper for feeding and returning same to its initial position, said retort or oven and said casing having aligned guideways whereby the hopper may be entirely withdrawn from said oven into said casing.

In testimony that I claim the foregoing, I have hereunto set my hand this 19th day of September, 1923.

WHEADON M. GRANT.