G. McD. JOHNS.

MATERIAL FEEDING MECHANISM.

APPLICATION FILED DEC. 6, 1920.

1,426,648.

Patented Aug. 22, 1922.

2 SHEETS—SHEET 1.

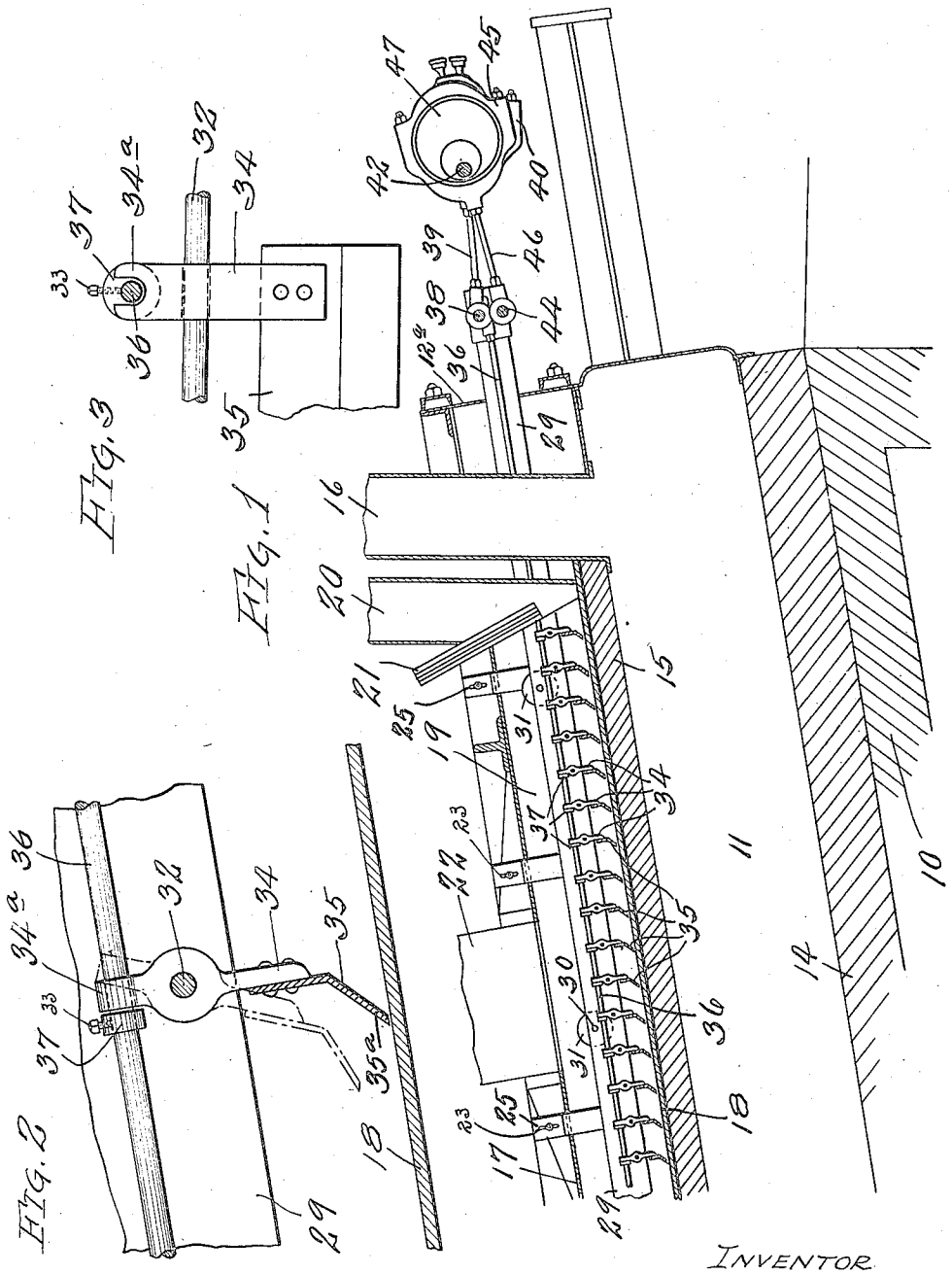


FIG. 1

FIG. 3

FIG. 2

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FIG. 4

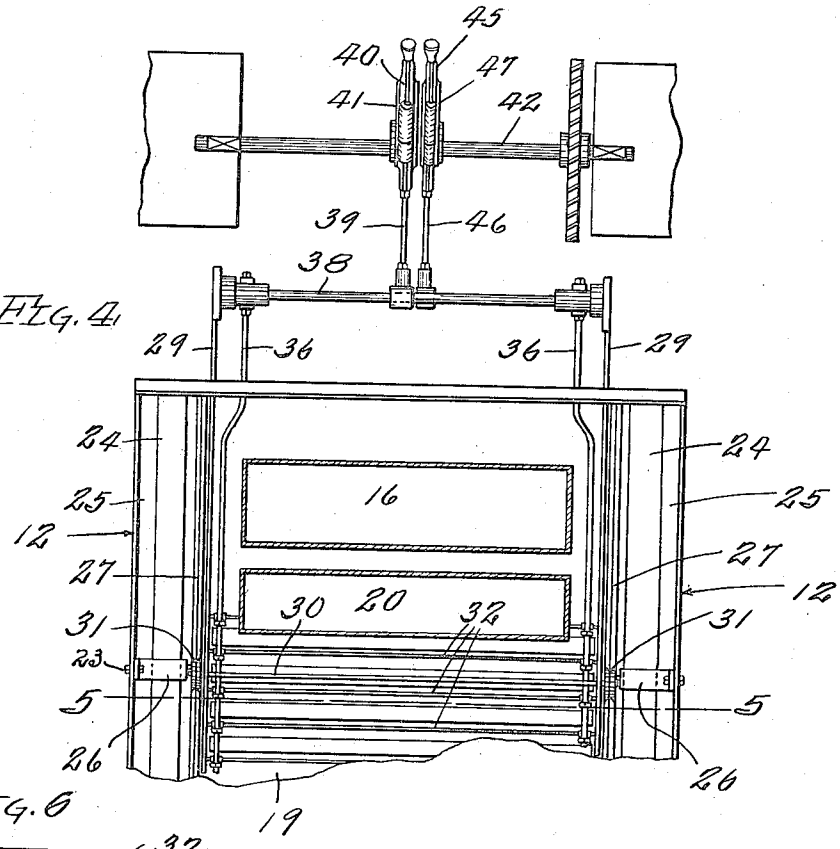
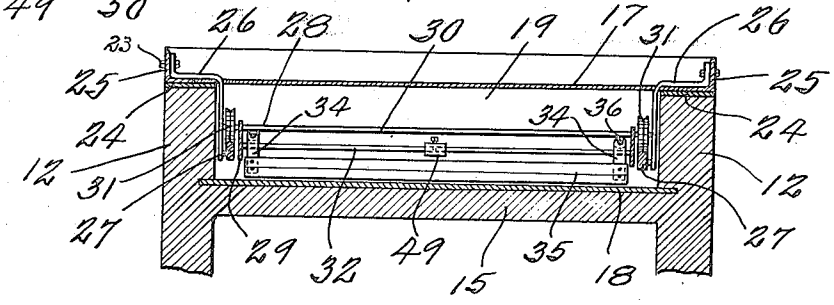


FIG. 6



FIG. 5



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GEORGE McD. JOHNS, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE INDUSTRIAL PROCESS ENGINEERING COMPANY, A CORPORATION OF DELAWARE.

MATERIAL-FEEDING MECHANISM.

1,426,648. Specification of Letters Patent. Patented Aug. 22, 1922.

Application filed December 6, 1920. Serial No. 428,592.

To all whom it may concern:

Be it known that I, GEORGE McD. JOHNS, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Material-Feeding Mechanism, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates generally to retorts adapted especially for the dry distillation of any materals carrying volatile and condensible matter, such as, for instance, gas or vapor, and, more particularly, to a certain new and useful improvement in means or apparatus for mechanically feeding the materal being treated through the retort.

In the dry distillation of oil-bearing shale for the extraction of its hydro-carbon content, I have found that the shale is most advantageously, thoroughly, and economically treated when in a pulverized condition, especially when properly handled and fed through the retort in a substantially continuous bed of approximately uniform depth throughout.

In application Serial No. 396748, there is described a retort adapted especially for the distillation of pulverized shale for the extraction of its hydro-carbon content, and in connection with such retort is described means for continuously feeding the pulverized shale through the retort.

The principal objects of my present invention are to improve generally upon such shale feeding-means, and, more specifically, to provide means or mechanism whereby the material being treated will be positively distributed and fed forwardly through the retort at a proper speed and in a substantially continuous bed of approximately uniform depth throughout, and to provide an apparatus of the kind and for the purpose stated of comparatively simple construction, which is capable of a relatively wide range of adjustments to accommodate elevations or depressions in the floor of the retort, which may be readily repaired in case of breakage or desired replacement of any of its parts, which may be conveniently and economically operated, and which is efficient in operation.

With the above and other objects in view, my present invention resides in the novel features of form, construction, arrangement, and combination of parts hereinafter described and afterwards pointed out in the claims.

In the accompanying drawings,

Figure 1 is a fragmental longitudinal sectional view through a retort equipped with a material feeding means or mechanism constructed in accordance with and embodying my present invention;

Figure 2 is an enlarged fragmental view of the feeding means showing one of the feeding members partly in section;

Figure 3 is an enlarged fragmental rear elevational view of one of the feeding members;

Figure 4 is a horizontal sectional view through the retort shown in Figure 1;

Figure 5 is a transverse sectional view of the retort, taken approximately on the line 5—5, Figure 4; and

Figure 6 is an enlarged fragmental view of one of the cross-rods of the feeding apparatus, showing in detail its collapsible joint utilized for facilitating repairs.

Referring now more in detail to the said drawings, which illustrate a practical embodiment of my present invention, and in which like reference characters refer to like parts throughout the several views, I have, for purposes of description, shown but fragmentally a retort equipped with a material feeding apparatus of my invention. In this retort, 10 indicates the base, which may be of frame-work, concrete, earth or the like, and on which base is supported the furnace proper 11, the latter comprising side-walls 12, a bottom wall 14, and a top wall 15. It may be here stated that the furnace proper is preferably constructed of fire-brick or other suitable refractory material and is preferably so constructed that the retort, to facilitate the feeding of the material being treated, occupies as a whole an angle of approximately 10° to 15° with respect to a horizontal plane, the body of the retort thus inclining or sloping downwardly from its inlet or charging end towards its opposite or discharging end. Opening into the furnace-chamber and providing an exhaust for the products of combustion, is a suitable chimney or flue 16.

The furnace side walls 12, in the present instance, are preferably continued or extended upwardly above the plane of the furnace top wall 15 and also thus provide the side walls of the body of the retort proper. Disposed upon the upper ends of the so up-

wardly extended side walls 12, is a plate 17 preferably of metal, and disposed flatwise upon the upper surface of the furnace top wall 15 is a flat plate 18, also preferably of metal, the plates 17 and 18 providing or constituting, respectively, the top-wall and floor of the retort proper 19.

Leading into, and communicating with, the upper or receiving end of the chamber of the retort 19, is a suitable chute or hopper 20 through which the material to be treated, pulverized shale in the present instance, is fed into the retort, a gate or the like 21 being preferably arranged for movement or operation at the lower end of the chute 20 to regulate or control the feeding of the material into the chamber of the retort. Having communication with the chamber of the retort, and forming substantially a part of the roof or top wall thereof, is a vapor take-off box 22, the roof of the present retort being more fully described in a companion application Serial No. 428593.

Resting upon the side walls 12 of the retort-chamber 19, are plates 24, and supported, in turn, upon the plates 24 and extending lengthwise with the walls 12, with a flange presented upwardly with its outer face substantially flush with the outer face of the walls 12, are angle-members or irons 25. Disposed for adjustment upon, and having adjustable slot and bolt connection, as at 23, with the vertical or upwardly presented flanges of, the angles 25, as best seen in Figures 1 and 5, are angle-brackets 26, portions of which depend into the chamber of the retort through suitable apertures provided therefor in the roof plate 17. Carried and supported at the lower ends of the depending portions of the brackets 26, and extending in spaced parallel relation longitudinally within the chamber of the retort 19 adjacent its opposite side walls 12, as best seen in Figures 4 and 5, is a pair of elongated tracks 27, and arranged for movement within the retort-chamber on the tracks 27, is a carriage 28 comprising elongated longitudinal side members or rails 29 connected transversely of the retort by a plurality of suitably spaced cross-members or bars 30, on the projecting ends of which are journaled for rotation suitable wheels or rollers 31 bearing upon the tracks 27. The treads of the wheels 31, as here shown, are preferably grooved to facilitate engagement with the tracks 27 and movement or travel of the carriage 28 within the chamber of the retort. The rear ends of the carriage side-members or rails 29 project through a plate 12^a that closes the charging end of the retort-chamber, and joining said projecting ends of the rails 29 is a transversely disposed rod 44, to which is pivotally connected a pitman 46 having engagement with the strap 45 of an eccentric 47 carried by a rotatable shaft 42 adapted to be driven in any suitable manner.

Extending transversely of the retort and supported by the carriage 28 with their opposite ends suitably seated in the carriage side members or rails 29, is a series of shafts or rods 32 spaced longitudinally of the retort chamber; and pivotally mounted for swinging movement on each of the transverse shafts 32, is a material-feeding member comprising a pair of spaced elements, preferably castings, 34 pivotally suspended on the shaft 32 and a blade 35 disposed transversely of the retort and suitably fastened to the lower end portions of the pair of castings 34, the blade 35 having an angular extension 35^a presented forwardly towards the discharge end of the retort-chamber, as best seen in Figures 1 and 2.

Each casting 34 has preferably the shape or form best seen in side and rear elevation in Figures 2 and 3, each casting including a bifurcated or yoke-shaped upper end portion 34^a, and the several castings 34 being arranged in aligning series preferably adjacent the carriage side-rails 29, as best seen in Figure 4.

Extending longitudinally of the retort-chamber through the bifurcated ends 34^a of each series of the aligning castings 34 and suitably supported for lengthwise movement in the retort-chamber, is a pair of elongated rods 36, and fastened for adjustment, as by set screws 33, upon the rods 36 for rocking engagement with the several respective castings 34, are collars 37.

The rear ends of the rods 36 also project through the retort end-plate 12^a, and joining said projecting ends of the rods 36, is a transversely disposed bar 38, to which is pivotally connected a pitman 39 having engagement with the strap 40 of a second eccentric 41 also carried by the operating shaft 42.

By means of the individual or separate eccentrics 41 and 47, the pair of connected rods 36 and the carriage 28 are both caused to travel forwardly and rearwardly or reciprocatorily within the retort-chamber; the eccentric 41, however, relatively to the other eccentric 47, is so set on shaft 42 that the rods 36 begin both their rearward and forward travel in advance, respectively, of the rearward and forward travel of the carriage 28 and its several carried material-feeding members.

In operation, shaft 42 is rotatably driven at a proper speed, and as shaft 42 is thus rotated, eccentric 41 and its co-operating strap 40 and pitman 39 will be effective in first causing the bars 36 to lengthwise move rearwardly or towards the charging end of the retort-chamber. In such movement of the bars 36, the several collars 37 will engage with and rock their respective adjacent cast-

ings 34 and thereby elevate or raise the feeding-blades 35 (as indicated by dotted lines in Figure 2) from their normal feeding position, the several blades 35 being maintained by the collars 37 in such elevated position throughout the rearward travel of the rods 36.

In proper sequence on the rotation of shaft 42, the second-eccentric 47 and its co-operating strap 45 and pitman 46 will next be similarly effective in causing the carriage 28 and its several carried material feeding members to likewise move rearwardly or towards the charging end of the retort-chamber, the feeding-blades 35, in such rearward movement of the carriage 28 being positively maintained by the bars 36 and their carried collars 37 in such elevated position relatively to the retort floor 18 as to level off the material being treated and retard or check a too rapid flow or travel thereof on the inclined or sloping surface of the retort-floor 18.

Shaft 42 continuing to rotate and the rearward travel of both the bars 36 and carriage 28 being completed, the first eccentric 41 will now cause the bars 36 to travel forwardly in the retort towards its discharge-end. In such travel, the several collars 37 will be moved away from and out of engagement with the several castings 34, when the castings 34 and their carried blades 35 will swing downwardly, under the pull of gravity, into normal material-feeding position.

The blades being now in material feeding position, the second eccentric 47, shaft 42 continuing to rotate, will now cause the carriage 28 to likewise move forwardly in the retort-chamber; in such movement of the carriage 28, the several blades 35 will enter the pulverized material being treated and push said material, with the expenditure of very little power, downwardly over the inclined surface for a short distance, and this action, combined with the checking or retarding action of the blades upon the material on their rearward stroke, is effective in maintaining a substantially even depth of material without spaces or breaks throughout the entire length of the inclined surface 18 over which the material passes while traveling through the retort.

Thus, throughout the operation of the retort, the bars 36 and carriage 28 with its carried material feeding-members are caused to reciprocate in proper sequence in the retort-chamber, with the result that the pulverized material supplied to the retort is fed through the retort, so as to enable its most advantageous, thorough, and economical distillation, at the proper speed and in a substantially continuous stream, without spaces, breaks, or ridges, of approximately uniform depth throughout. I have found that, to obtain best results, should pulverized shale be the material under treatment, the speed of reciprocation of the bars 36 and carriage 28 should be comparatively slow, approximately two complete strokes per minute, and that, to avoid any piling up of, or spaces or breaks in, the shale, the blades 35 should be arranged relatively close together and each have a stroke of approximately only four and a half inches.

By means of its set or fastening screw 33, each collar 37 is independently adjustable on the shaft 36 to or from its respective casting 34, whereby the amount of rocking movement or throw of a particular blade 35 may be regulated to compensate for a more or less local depression or elevation in the retort-floor 18 and it will be noted that by means of the collars 37 the normal feeding position of the several material feeding members relatively to the floor of the retort may be conveniently regulated to vary the depth of the material and the penetration of the feeding members into the material as the same is being fed forwardly through the retort; and to compensate for a more extended elevation or depression in the retort-floor 18, and at the same time obviate independent adjustment of several of the collars 37, portions of the tracks 27 may be elevated or lowered relatively to the retort floor 18 by proper manipulation of the supporting angles 26 at their slot-and-bolt connections 23 with the supporting angles 25. And, in order to facilitate the removal and replacement of worn or broken feeding-plates 35, each rod 32 is provided within its length with a toggle-joint or hinge, as at 32^a, whereby the rod may be "broken" and then conveniently lifted from the carriage without a dismantling of the entire feeding-means or necessitating an extended "shut-down" of the retort.

Each rod 32 is provided with a sleeve 49, which normally is removably secured, as by a set-screw 50, over the hinge or joint 32^a to hold the rod from "breaking".

I am aware that minor changes in the form, construction, arrangement, and combination of the several parts of the feeding apparatus may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In combination with a retort, feeding mechanism including a carriage arranged for reciprocation in the retort, a series of spaced material feeding-members swingably carried by the carriage, means for reciprocating the carriage and its carried feeding-members within the retort, and means for swingably actuating said members after termination of the forward travel and in ad-

vance of the rearward travel of said carriage to occupy an elevated non-feeding position relatively to the retort floor during the rearward travel of the carriage.

2. In combination with a retort, feeding mechanism including a carriage arranged for reciprocation in the retort, a series of spaced material feeding-members swingably carried by the carriage, means for reciprocating the carriage and its carried feeding-members within the retort, and means for swingably elevating the feeding-members out of feeding position relatively to the floor of the retort after termination of the forward travel and in advance of the rearward travel of the carriage, said means operating to retain the feeding-members in such elevated position throughout the rearward travel of the carriage and to release the feeding-members to assume normal feeding position in advance of the forward travel of the carriage.

3. In combination with a retort, feeding mechanism including a carriage arranged for reciprocation in the retort, a series of spaced material feeding-members swingably carried by the carriage, said members comprising aligning series of bifurcated elements, means for reciprocating the carriage and its carried feeding-members within the retort, and means for swingably elevating the feeding-members out of feeding position relatively to the floor of the retort after termination of the forward travel and in advance of the rearward travel of the carriage, said last-named means comprising elongated connected bars arranged for lengthwise movement in, and adapted for rocking engagement with, the bifurcated portions of said elements and operating to retain the feeding-members in such elevated position throughout the rearward travel of the carriage and to release the feeding-members to assume normal feeding position in advance of the forward travel of the carriage.

4. In combination with a retort, feeding mechanism including a carriage arranged for reciprocation in the retort, a series of spaced material feeding-members swingably carried by the carriage, said members comprising aligning series of bifurcated elements, a pair of elongated movable bars adapted for engagement with the bifurcated elements of the feeding-members for swingably elevating said members in advance of the rearward travel of the carriage, and means for reciprocating the carriage and actuating said bars, said means comprising a main shaft, an eccentric on the shaft having engagement with the carriage, and a second eccentric mounted on the shaft in advance of the first eccentric and having engagement with the bars.

5. A retort feeding mechanism including a carriage comprising a pair of spaced side rails, and a series of spaced material feeding-members carried by the carriage, each of said members including a shaft removably seated at its ends in the carriage side rails and provided within its length with a breaking joint for facilitating the removal of the feeding member from the carriage.

6. A retort feeding mechanism including a carriage and a series of spaced material feeding-members swingably carried by the carriage, in combination with means for adjustably swinging said members, said means comprising a lengthwise movable bar, and a series of feeding member engaging collars mounted upon the bar and adjustable thereupon relatively to the respective feeding-members.

7. A retort feeding mechanism including a carriage reciprocatorily movable in the retort and a series of spaced material feeding members swingably carried by the carriage, in combination with means for reciprocating the carriage, and means for adjustably regulating the swingable throw of the feeding members relatively to the floor of the retort.

8. A retort feeding mechanism including a carriage reciprocatorily movable in the retort and a series of spaced material feeding members swingably carried by the carriage, in combination with means for adjustably regulating the swingable throw of the feeding members relatively to the floor of the retort and for holding said members in normal feeding position on the forward travel of the carriage.

9. A retort feeding mechanism including a carriage reciprocatorily movable in the retort and a series of spaced material feeding members swingably carried by the carriage, in combination with means for adjustably regulating the swingable throw of the feeding members relatively to the floor of the retort and for holding said members in normal feeding position on the forward travel of the carriage, said last named means including elongated bars movable relatively to the feeding members, and collars adjustably positioned on said bars for engagement with the respective material feeding members.

In witness whereoof, I have signed my name to this specification.

GEORGE McD. JOHNS.