4 Sheets—Sheet 1.

T. F. ROWLAND.

GAS RAKING APPARATUS.

No. 192,290. Patented June 19, 1877.

Fig. 2.

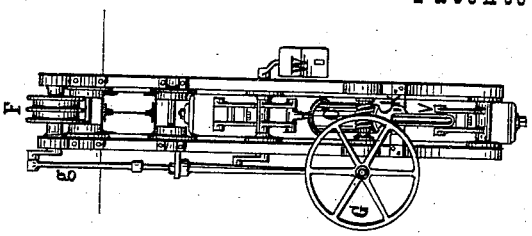

Fig. 1.

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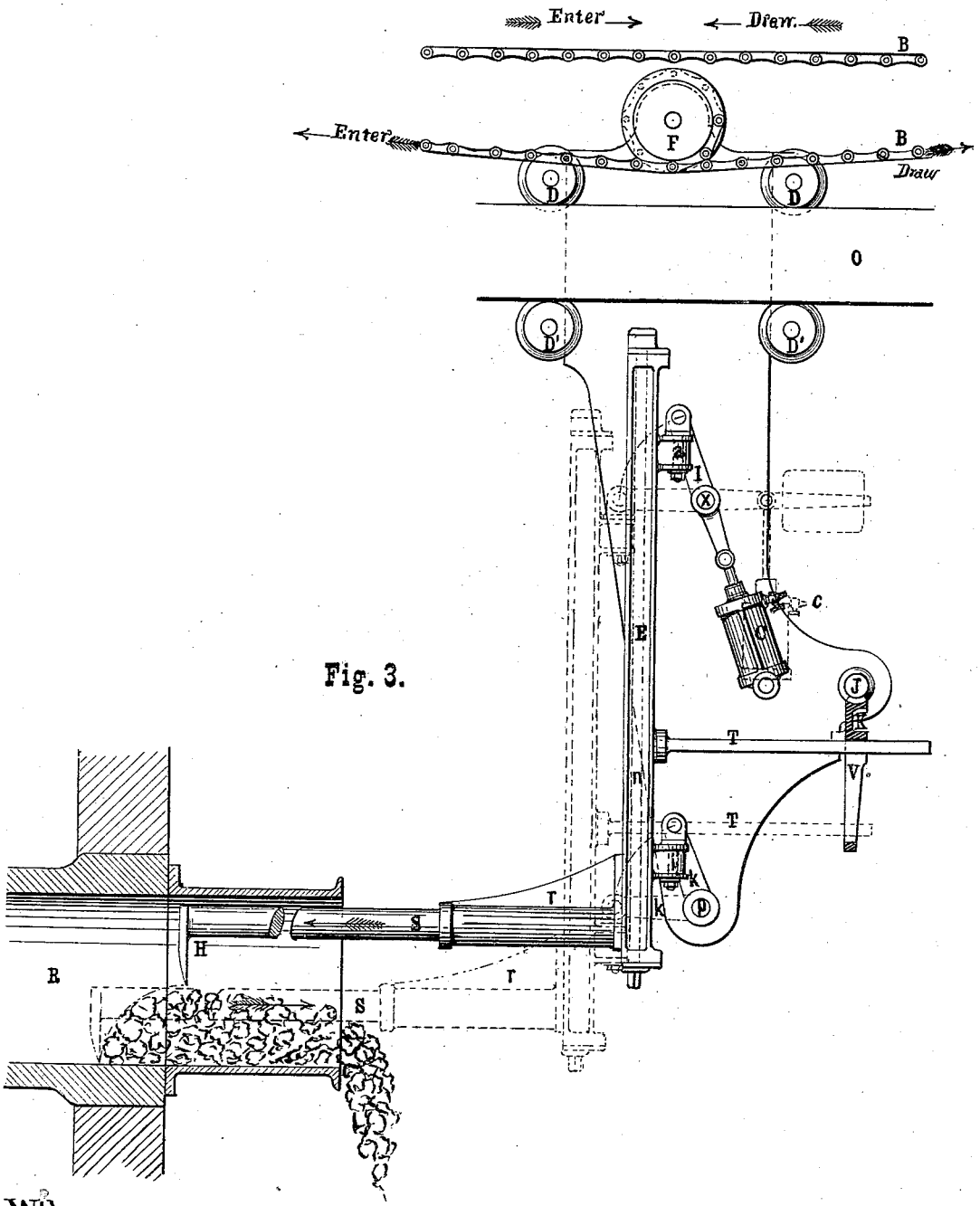

Fig. 3.

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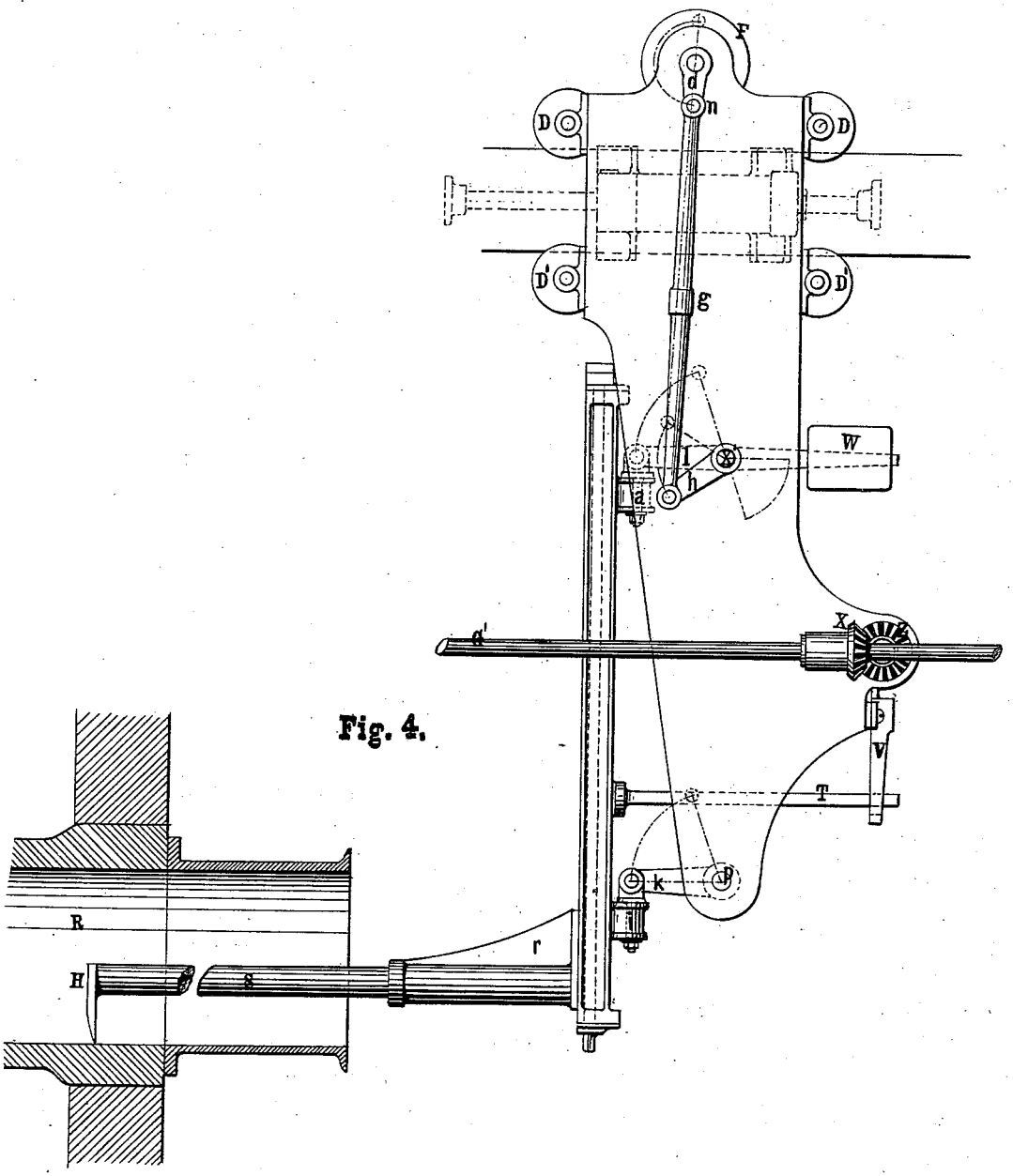

Fig. 4.

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GAS RAKING APPARATUS.

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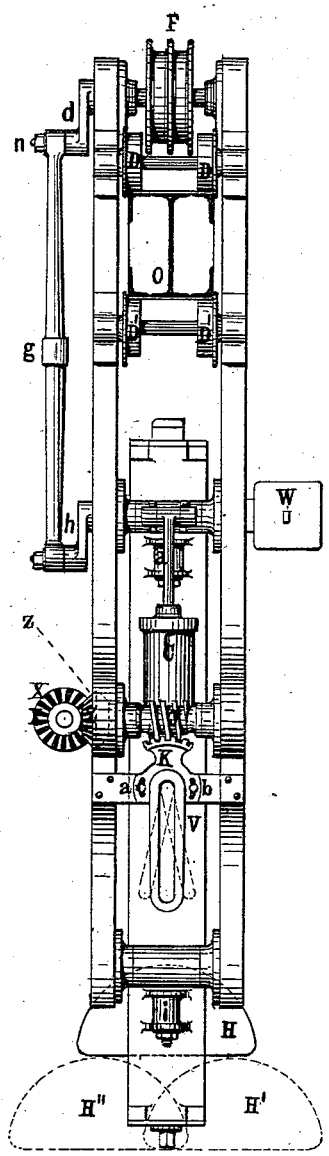
Fig. 5.



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UNITED STATES PATENT OFFICE.

THOMAS F. ROWLAND, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN GAS-RAKING APPARATUS.

Specification forming part of Letters Patent No. **192,290**, dated June 19, 1877; application filed January 20, 1877.

To all whom it may concern:

Be it known that I, THOMAS F. ROWLAND, of the city of Brooklyn, county of Kings, and State of New York, have invented a new and useful Improvement in Raking Apparatus, which improvement is fully set forth in the following specification.

My invention relates to improvements in drawing or discharging apparatus, especially such as is designed to be used in the working of gas-retorts.

Many attempts have before now been made to discharge or draw automatically or by mechanical means the coke lett in the gas-retorts after the hydrocarbon has been driven off; but none of the numerous inventions have proved successful, principally for the reason that some of the moving parts of the apparatus were introduced into the retort, and were consequently destroyed in a very short time. In my apparatus, as will be seen, only the hoe and hoe-handle are introduced into the retort, while all the moving parts of the apparatus are kept outside and away from the intense heat of the retort.

In 1873 I took out a patent for an apparatus designed to accomplish this result. In that apparatus there were three hoes introduced into three retorts standing one over the other. These hoes were entered and withdrawn simultaneously; consequently three of the retorts in a bench were open at the same time, which was found to be a disadvantage, owing to the great cooling of the entire bench necessarily resulting from the exposure of so large a surface to the cooling effects of the atmosphere. My present apparatus employs but one hoe, which is adjustable to the different heights of the retorts. In my old apparatus, likewise, the entire frame or support of the hoe was raised and lowered, making that machine very cumbrous and expensive, and increasing the liability to fracture from sudden jar. These difficulties have been to a great extent overcome in my present machine, which is very light, comparatively inexpensive, and easy to handle.

It is obviously necessary that the hoe should have a certain amount of lateral motion or adjustment independent of the motion of the entire apparatus, so that all the coke in a retort can be withdrawn by dropping the hoe in different positions onto the bottom of the retort; for it is obviously impossible to enter a hoe into a retort which shall be as wide as the bottom of a **D**-shaped retort, owing to the presence of the coke in the bottom of such retort. Therefore, after the hoe has been entered and lowered, it is necessary to adjust it to the desired position on the bottom of the retort. It is also obviously necessary that when the hoe enters a **D**-shaped retort it must enter at the center, in order to enter the highest point, and so to pass in free of the coke lying in such retort; for if it were swung to either side of the central position when the hoe was forced forward it would bring up against the side of the **D**, which is lower than the central position or vertical axis, and the machine might be destroyed or injured. This I consider to be a very important part of my present invention.

In my drawings, Figure 1, Sheet 1, represents a general view of my apparatus in two positions—advanced and retired. Fig. 2, Sheet 1, represents a rear elevation of my drawing apparatus, showing part of the detail. Sheet 2, Fig. 3, shows part of the frame and guiding apparatus of my mechanism, showing the hoe in its raised and depressed condition. (The nearer side of the frame-work is cut away.) Fig. 4, Sheet 3, represents an external view of part of my apparatus, showing the hoe in a depressed condition, and showing clearly the apparatus outside of the frame-work which was cut away in Sheet 2. Fig. 5, Sheet 4, represents a rear elevation of the traveling part of my apparatus, showing clearly the detail of the hoe-guiding apparatus.

Similar letters of reference indicate similar parts in the drawings.

In the drawings, R represents a tier of retorts. H represents the hoe or apparatus for drawing such retorts, and S the hoe-handle. This hoe-handle and hoe are attached to a traveler, A, which travels upon a rail or pair of rails, O, and the advance and retreat of this traveler A necessarily carries the hoe forward and backward with it. This traveler is carried or guided by four wheels, D D and D′ D′. D D travel upon the upper rail; D′ D′ upon the lower rail. The purpose of D′

D′ is to prevent the upsetting of the machine or the raising of either of the wheels D D from the road-bed during any of the movements of the machine. These rails are themselves carried along another pair of rails, I, on the wheels M M. This second pair of rails are parallel with the face of the retorts. The raking apparatus is thus brought in front of the retort to be discharged. Power to drive the traveler A forward and backward is applied by means of an endless chain or belt. (Shown clearly in Fig. 3.) This chain passes over two pulleys, L and L′. To one of them, L, the driving-power is attached. The ends of the chain B unite at a wheel, F, having two channels cut in its circumference, as is clearly shown in Fig. 2. This wheel is capable of a half-revolution. Each of these chains is fastened in one of the parallel channels of the wheel F, and is carried so far around the wheel that, in whatever position the wheel may be, this chain will always be tangential to the lower extremity of the vertical diameter of the wheel. It will be seen that this will be the case when the chains are fastened at the same point of the circumference, though other suitable positions might be selected. Now, it is evident that if the lower chain be drawn to the right, in the direction of the arrow marked "draw" in Fig. 3, the wheel F will be revolved in the direction opposite to that of the hands of a clock for a semi-revolution, when it brings up against a stop, as will be hereinafter shown. The continued movement of the chain in the direction of the draw will now cause the traveler A, to which the wheel F is attached, to move backward, and with it the hoe H is withdrawn.

Upon the reversal of the pulley L it is evident that the wheel F will be revolved in the contrary direction as far as its stop will permit. After that the entire traveler will begin to move forward on its rails and into the retort. The movement of this wheel F determines the position either of elevation or depression of the hoe H.

This traveler A consists of a double frame, upon which the different parts are carried. The hoe-handle S is not directly attached to the frame of the machine, but is fastened to a vertical pivoted rod, E, pivoted at *a* and *i*. These pivots are not fastened directly to the frame of the traveler, but are connected to two short vibrating levers, which I call *l* and *k*. The distance from the pivot X of the upper lever *l* to the pivot *a* is the same as the distance from the pivot *i* of the lower lever *k* to the pivot *p*. Consequently the carrier E moves constantly parallel to itself, which is likewise true of the hoe-handle S. Now, it is evident that if the upper end of the lever *l* be swung to the right the carrier E and hoe H will be depressed. The hoe H, in dropping, travels in a short arc of a circle, as is shown in Fig. 3. The weight of the hoe H is counterbalanced by means of the weight W, and likewise by means of a cylinder, C. This cylinder is an air-cylinder, and is pivoted at *f*, so as to allow the piston-rod *m* to vibrate in a small arc as the lever *l* vibrates around its pivot.

Now, it is evident (Fig. 3) that, as the hoe H is thrown down into its depressed condition, as shown by the dotted lines, the piston and piston-rod are drawn upward by the motion of the lever *l*, and consequently the air which is contained in the upper part of the cylinder C will be compressed, and the amount of resistance which it will offer to the upward throw of the arm *l* will depend upon the amount of air contained in it. This amount of air is regulated by means of the stop cock *c*. Therefore the weight of H can be exactly counterbalanced by means of the weight W and cylinder C, and all jar which might be occasioned by the sudden drop of H will be taken off by reason of the compression of the air in the cylinder C. The shaft X of the lever *l* is connected to the crank *h*, to the pin of which the link *g* is connected, which link is pivoted to the crank of the wheel F at *n*.

Now, it is obvious that the movement of the wheel F will alter the position of the lever *l* by moving the crank *h* through its arc of vibration, as is clearly shown in Fig. 4. The wheel F is, as we have before shown, capable of a semi-revolution. In the lower position of *n* the crank *h* and the lever *l*, carrier E and hoe H, are all thrown down, which is the case upon the return of the traveler A. Upon the forward motion of the traveler A, the wheel F being revolved in the direction of the hands of the watch, link *g* is thrown up, vibrating the arm *h* and the lever *l*, and raising the hoe H into such a position that it can enter the retort above the coke.

As has been shown, the carrier E is pivoted at *i* and *a*, and could, therefore, move freely around its center of rotation, were it not for the controlling-arm T. This controlling-arm, Fig. 3, being firmly fastened to the carrier E, on the opposite side from the hoe-handle S, rests in a slot in the guide V. This guide, Fig. 5, can vibrate around a center which is at the upper end of the slot. Its two sides are cut in the arc of a circle, and these arcs are embraced in corresponding arcs, as shown at *a* and *b*, Fig. 5, which allow the guide to vibrate around the center of the circle of which *a* and *b* are arcs. This vibration is limited by two stops, which bring up against the ends of the corresponding slots of the vibrating guide.

This mode of construction allows the swinging of this guide around its center of support, so that the upper end of the guide maintains a constant position, while its lower end may be swung to any desired extent either to the right or to the left, as shown by the dotted lines. The position of this guide V is determined by the worm-screw J, which acts in

a segmental gear, K. The revolution of J evidently throws K to the right or to the left, and V to the left or to the right. The screw J is turned by means of a miter or bevel-gear, Z. This bevel-gear gears into another bevel-gear, X, as is shown in Figs. 1 and 4. The bevel-gear X travels with the traveler along a grooved rod, G′, which is rotated by means of the wheel G. The bevel-gear X has a pin or feather, which slides along the groove of G′; consequently the revolution of the wheel G revolves the miter-gears X and Z, turns the worm J, and throws the guide V to the right or to the left.

The object of this movement of the guide will now be explained. The end of the controlling-arm T rests in the guide V. Now, let us suppose that the guide be vertical, as shown in Fig. 5. The carrier E and controlling-arm T are, as we have seen, raised and lowered by the forward and backward movement of the machine through a certain distance, which distance is nearly equal to the length of the slot in V. Now, when the slot is vertical the position of the hoe will be in the same vertical line, whether in its upward or lowered position; but if the guide is thrown to the right, then it is obvious that the upper position of the hoe will be the same as it was when V was vertical, but the controlling-arm will be swung to the right as it descends in the guide V, and the hoe will be swung to the left, and will rest on the bottom of the retort in the position shown at H^2, Fig. 5, while, if V was swung to the left, the hoe would fall into the position shown at H^1.

This accomplishes a very important result, for the hoe is automatically forced to take a central position with reference to the vertical axis of the D-retort when entering that retort, because the controlling-arm T is obliged to take a central position in the guide V; while, when the hoe H drops, its position in the retort is determined by the position of the lower end of the slot in V, and, consequently, either side of the retort can be cleared, or the hoe can be drawn out through the center of the retort, as may be desired. If it were not for this automatic determination of the entering position of the hoe, it might be possible for an unskillful or careless man to force the hoe H against the side of the D-shaped retort in its upward and advancing position.

The elevation of the hoe-handle S in carrier E is determined by means of the vertical screw N, which acts in a thread cut in the end of the hoe-handle *r*, and the elevation of the hoe can thus be adjusted to the elevation of any retort of the series. This hoe-handle *r* slides vertically in the guides in carrier E.

The operation of my machine is as follows: The entire apparatus is first brought, by means of the rails I and wheels M, exactly opposite the retort to be discharged. The hoe H is then adjusted, by means of the adjusting-screw *w*, so that its height, when depressed, is equal to the height of the bottom of the D-shaped retort to be discharged. Power is then communicated, by means of the pulley L, to the chain B in the direction of "enter." This automatically raises the hoe above the surface of the coke, and it passes into the retort, by means of the forward motion of the traveler, as far as may be desired. Then the reversal of the movement of the pulley L drops the hoe into the retort, and then, by means of the return of the traveler, draws it back over the bottom of the retort, and by this movement clears the retort of the coke therein.

The forward and backward movement of the traveling frame A is limited by means of buffers, which bring up against the fixed frame of the apparatus. These buffers may be either air-cylinders or rubber or other springs, and may be attached either to the traveling frame or to the fixed part of the machine.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A rake and rake-handle combined with mechanism, substantially as described, whereby the rake is swung laterally upon a pivot, so as to rest upon any portion of the bottom of a retort, and thereby entirely clear the retort of the deposited coke.

2. A rake and rake-handle combined with mechanism, substantially as described, whereby the rake is automatically adjusted and compelled to enter the retort at its center, and whereby it is shifted over any portion of the bottom of the retort at the will of the operator.

3. A rake and rake-handle combined with mechanism, substantially as described, whereby the downward position of the rake upon the bottom of the retort is regulated or altered at any point of its travel, while the rake and rake-supporting mechanism advance and retire in the same line, as distinguished from a rake which is laterally adjustable by the lateral movement of its entire supporting mechanism.

4. A rake and rake-handle carried upon a traveling frame, and supported upon two sets of pivots, one of which allows the rake to be swung in a vertical direction, while the other allows it to be swung in a lateral or horizontal direction, substantially as described.

5. The combination of a rake, a vertical screw supporting it, and an advancing and retiring traveler, whereby the vertical position of the rake is altered so as to correspond with the retort to be discharged, substantially as described.

6. A rake, a rake-carrier, and a power-chain, combined with mechanism, substantially as described, whereby the power is first directly applied to elevating the rake, and is then employed in advancing the carrier.

7. The combination of a rake, a rake-carrier, and an air-cylinder, whereby the jar aris-

ing from the sudden stopping of the vertical movement of the rake is avoided, substantially as described.

8. The combination of a rake and rake-carrier with spring-buffers, whereby the motion of the carrier may be arrested, substantially as described.

9. The combination of a rake, H, a rake-handle, S, a vertically-pivoted rake-carrier, E, and a controlling-arm, T, whereby the lateral position of the rake can be altered and controlled, substantially as described.

10. The combination of a rake, H, rake-handle S, vertically-pivoted rake-carrier E, controlling-arm T, and guide V, substantially as described.

11. A rake and rake-handle firmly attached to each other, and combined and connected with mechanism, substantially as described, whereby the rake, on its withdrawal from the retort, is forced downward by a positive automatic motion through the coke and against the bottom of the retort, whereby the retort is effectually cleared of the deposited coke, as distinguished from a rake which is allowed to drop by its own weight.

12. A rake-carrier, E, supported on two pivoted links, *k* and *l*, of equal length, whereby the carrier is maintained constantly parallel with itself, substantially as described.

13. The combination of the channeled rod G′, the miter-gears X and Z, the worm-gear J R, and the guide V, substantially as and for the purposes described.

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