J. C. CROMWELL.

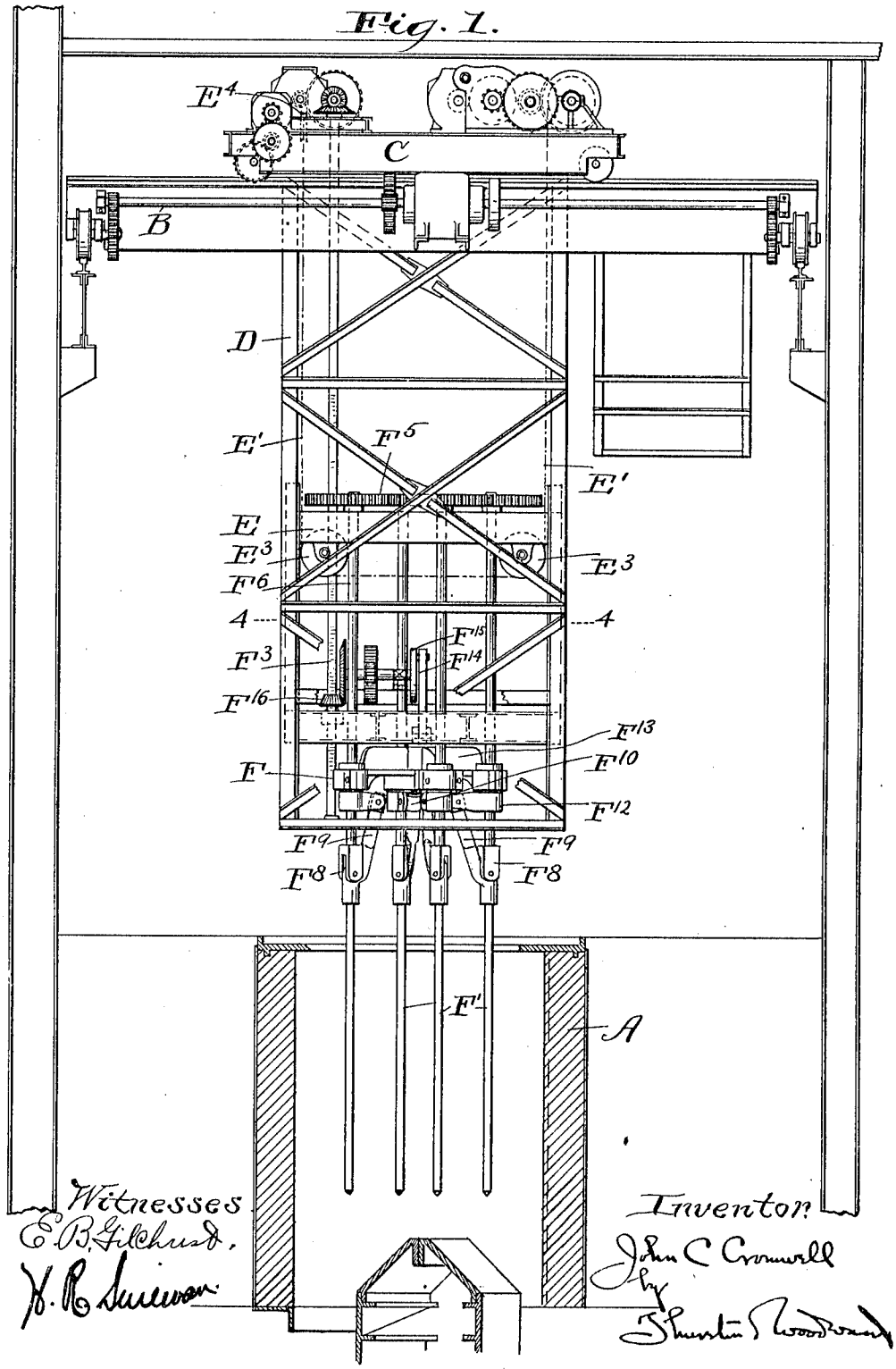
STIRRER FOR GAS PRODUCERS.

APPLICATION FILED MAY 22, 1907.

1,001,509. **Patented Aug. 22, 1911.**

4 SHEETS—SHEET 1.

Fig. 1.



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4 SHEETS—SHEET 2.

Fig. 2.

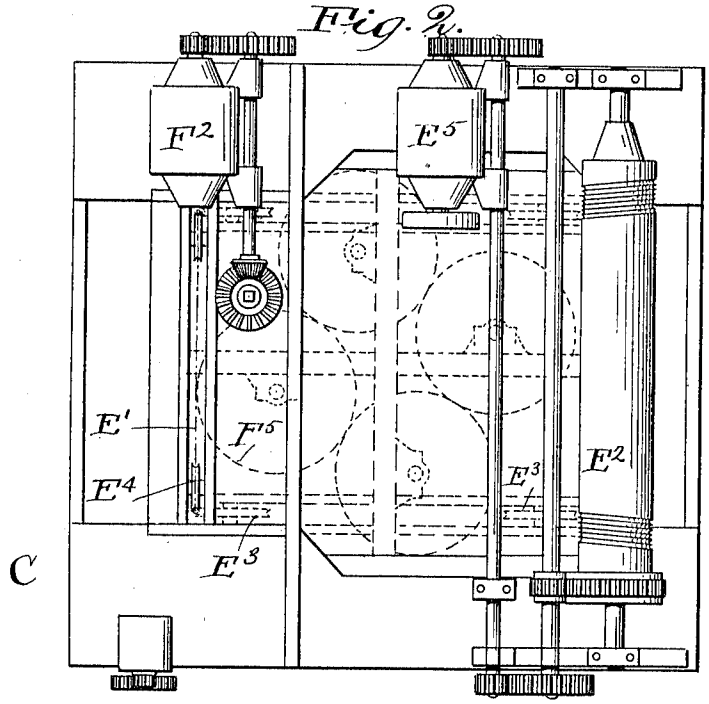
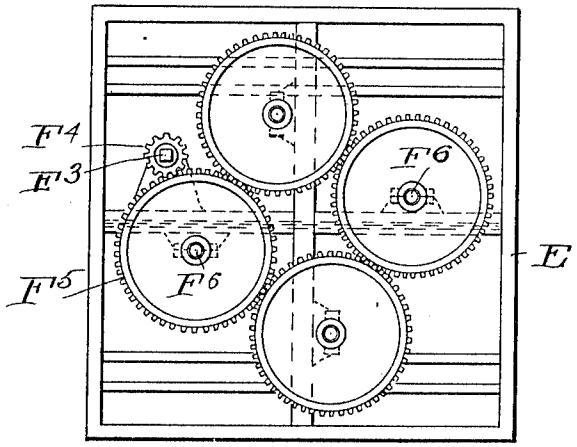


Fig. 3.



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4 SHEETS—SHEET 3.

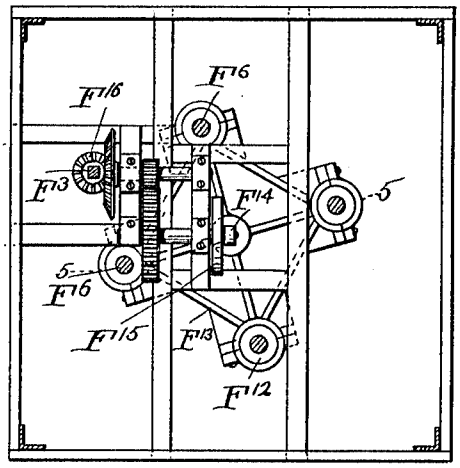

Fig. 4.

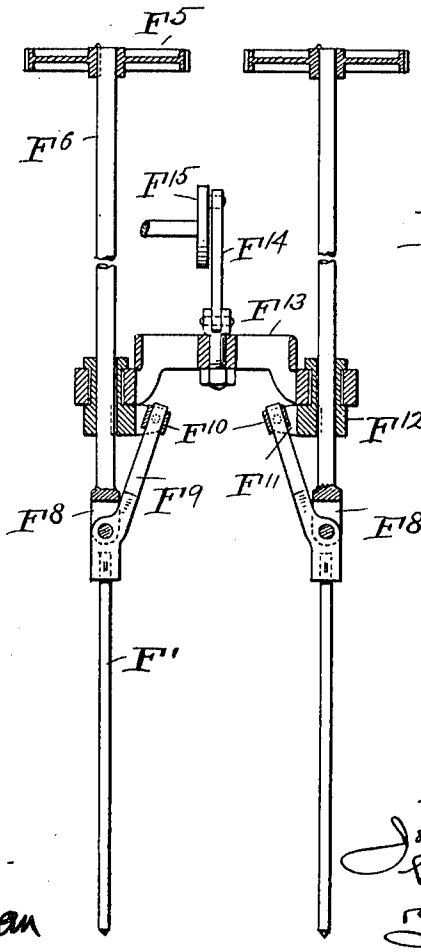

Fig. 5.

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4 SHEETS—SHEET 4.

Fig. 6.

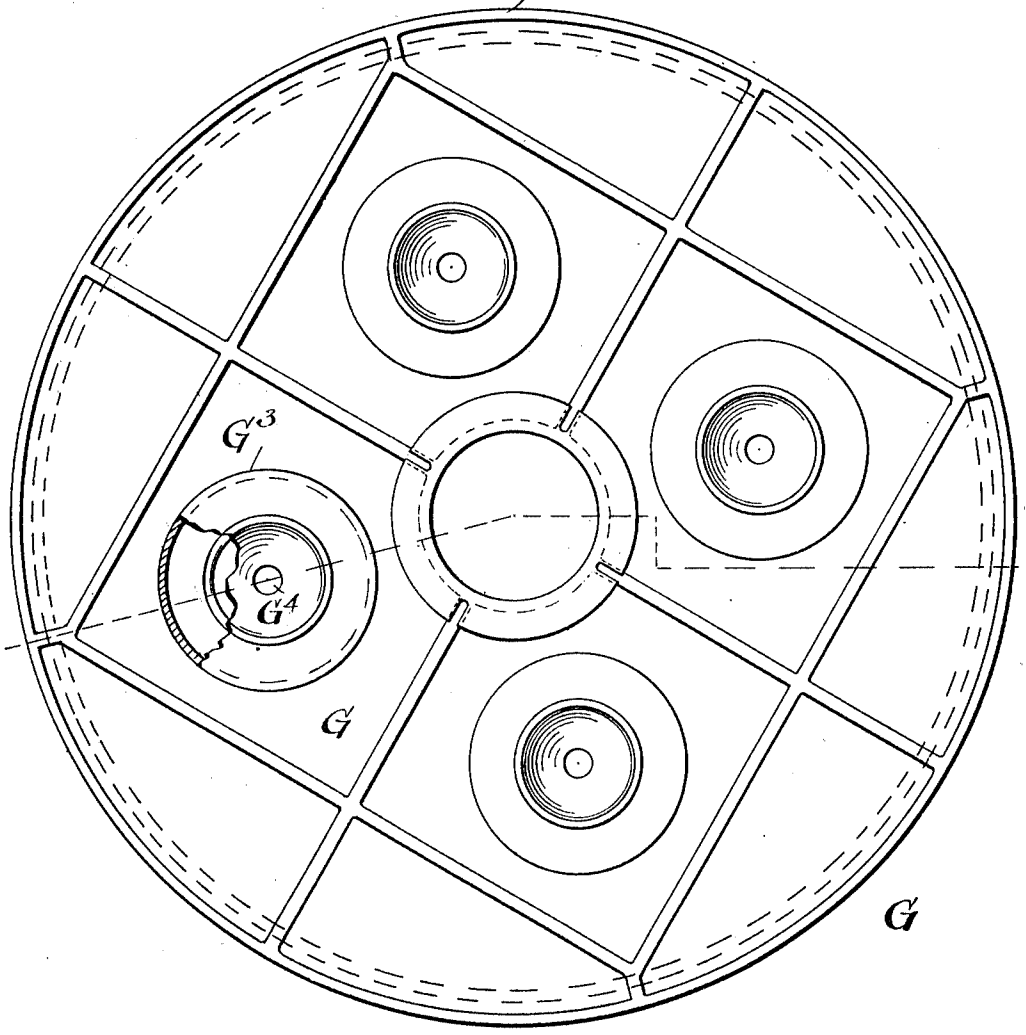
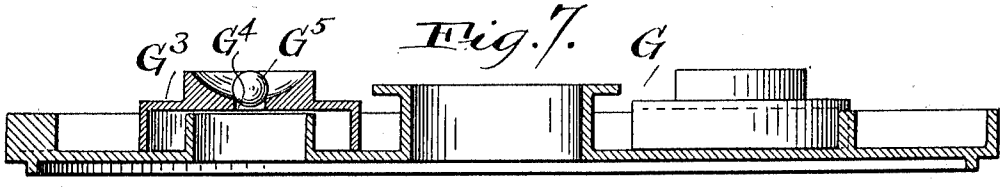


Fig. 7.



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UNITED STATES PATENT OFFICE.

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STIRRER FOR GAS-PRODUCERS.

1,001,509. Specification of Letters Patent. **Patented Aug. 22, 1911.**

Application filed May 22, 1907. Serial No. 375,020.

To all whom it may concern:

Be it known that I, JOHN C. CROMWELL, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Stirrers for Gas-Producers, of which the following is a full, clear, and exact description.

The object of the present invention is to provide an improved mechanically operated stirring device.

The particular purpose is to provide a stirrer especially adapted for use with gas producers and which possesses a greater effectiveness in accomplishing its functions than stirrers commonly used in connection with such producers.

It is further my purpose to provide a stirrer which shall be independent of and separate from a furnace body so that the latter may be constructed as simply as desired without reference to the stirring action.

I also have sought to produce a stirrer of such nature that a single stirrer may be used for several separate and independent producers, being moved from one to the other as occasion may require.

Referring to the accompanying drawings which illustrate an embodiment of my invention, Figure 1 is a side elevation partly broken away and partly in section showing my improved stirring mechanism lowered into position to operate. Fig. 2 is a top plan of the carriage sustaining the stirring apparatus. Fig. 3 is a top plan of the reciprocating frame which is suspended from the carriage shown in Fig. 2. Fig. 4 is a cross section of Fig. 1 on the line 4—4. Fig. 5 is a detail vertical section showing the connection of the reciprocating yoke by means of which the individual stirrers are tilted from their axial alinement with their operating shafts. Figs. 6 and 7 are respectively plan and sectional views showing the top plate or cover which I prefer to apply to gas producers in using my stirrer.

In using the stirring device in connection with the various producers which, as above stated, may be of the simple form, A, shown in Fig. 1, I preferably use an overhead traveling crane B with a trolley carriage C having suitable motors thereon for controlling the movement of parts. From the carriage depends a guide frame D in which reciprocates the frame E carrying the stirring apparatus, a range of movement being permitted which permits the stirring apparatus to be lifted to sufficient height to clear the producer top.

For the purpose of lifting and lowering the frame E and causing it to reciprocate in its guide frame, it is suspended by means of a rope E′ attached to a drum E^2 on the trolley carriage, said rope passing down on one side and under sheaves E^3 on the stirrer frame and up over sheaves E^4 on the trolley carriage down to the other side of the stirrer frame under sheaves thereon, back up to the drum, the drum being controlled through a train of reducing gears by a motor E^5 on the trolley carriage.

For the purpose of operating the stirrers F′ which, in the present instance, are shown to be four in number, a motor F^2 mounted on the trolley carriage transmits motion to a vertical squared shaft F^3 mounted on the fixed frame D and passing through a pinion F^4 free to slide thereon, which pinion is mounted on the reciprocating stirrer frame E and meshes with a large gear F^5 fixed to one of the stirring shafts F^6. The four stirrer shafts each have attached at their upper end large gears which intermesh after the manner shown in Fig. 3 so that the rotation of the squared shaft F^3 transmits, through the pinion, F^4, rotary motion to each of the stirring shafts. Inasmuch as the stirrer frame carrying the pinion operated by the squared shaft is capable of reciprocation, taking the pinion along with it, it is plain that these connections afford means for operating the stirrers at any height.

The stirring shafts have, at their lower ends, yokes F^8 in which are pivotally swung the stirrers F′, these stirrers having, projecting from said pivotal point, upwardly inclined arms F^9 rigidly connected in any suitable manner with the stirrer rod itself, the upper ends of said arms freely reciprocatable within sleeves, F^{10}, trunnioned in brackets F^{11} projecting from collars F^{12} ro-

tatable with the stirrer shafts, but reciprocatable thereon by reason of the feather and groove or other suitable connection therewith. Each of these collars is reciprocated up and down on the stirring shaft by means of a sort of cross head F^{13}, or common yoke, which, in turn, is operated by a link F^{14} eccentrically pivoted to a rotatable wheel F^{15} driven through the medium of reducing gears by a bevel pinion F^{16} carried by the carriage frame and reciprocated on the squared shaft F^3 before mentioned. The moving of the collars up and down obviously will entail a change in the inclination of the arms F^9 relatively to the stirring shafts F^6 since these arms are thrown in or out by reason of the trunnioned sleeve F^{10} sliding up and down thereon. The tilting of the arms F^9 will, of course, throw the lower end of the stirrer F' out of alinement with the axis of the shaft F^5 so that it will, during its rotation, describe a curve the path of which will depend upon the angular displacement of the stirrer rod. The eccentricity of the pivotal connection of the link F^{14} to the wheel F^{15}, together with the length of the link, will obviously determine the extreme angular displacement of the stirrer rods. This mechanism for inclining the stirrer rods will not interfere in any manner with the simultaneous rotation of the stirrer shafts and rods as the engagement between the reciprocating cross head and the collar mounted on the shaft is such that the collars are perfectly free to rotate.

In order that the top of the furnace may be properly closed during the stirring operation, it should be provided with a suitable and simple form of cover, such as the one I have devised and which I have shown in Figs. 6 and 7. This cover consists of a simple plate G having openings therethrough corresponding in number and location with the stirring rods used in the stirring apparatus, such openings being, of course, located so that the stirrer rods, when depending vertically, will pass therethrough. In order that the closure may be automatic and sufficiently close, both during the stirring operation and at other times, I preferably surround the openings with retaining flanges and cover the openings with caps G^3 having concave tops with a perforation G^4 therethrough adapted to receive the stirring rod, these perforations being normally closed by a ball G^5 of proper size which may be displaced to one side when the end of the stirring rod strikes it. After the rods have been passed through the openings into the furnace, the eccentric movement of the rods will cause the caps to follow the curve described by the rod, but this will not interfere with the closure as the cap rides on the top plate. It will be noted that each cap is independent of the others so that its movement would not be dependent upon or associated with the movements of the other caps, except as they are all controlled by the movement of the stirring mechanism.

In operating the mechanism the traveling crane is stopped over the producer furnace in which it is desired to stir the fuel and the drum controlling the stirrer frame is rotated to allow the latter to drop until the stirrer rods strike the balls covering the openings in the furnace top, displacing them and permitting the stirrer to enter the furnace, the stirrers being, at this point, in vertical alinement with their shafts. When the rods have been lowered into the fuel to the required depth the operator starts the motor controlling the squared shaft and the pinions F^4, F^{16} mounted thereon, as before described. Through the medium of the upper pinion F^4 the stirring shafts are given a constant rotation, while the lower bevel pinion F^{16} rotates the wheel to which the link of the cross head is eccentrically pivoted, thus causing an alternate raising and lowering of the cross head, which, by reason of the trunnioned sleeves F^{10} reciprocating up and down on the inclined arms F^9 rigidly connected with the stirring rod, causes the lower ends of these rods to swing away from the axis to the stirring shafts. This swinging or tilting of the stirring rods will be more or less gradual, depending upon the train of reduction gears through which motion is transmitted to the cross head, but it is clear that the path of the lower end of each rod will be that of a spiral,—first an increasing spiral on the outward movement, then a decreasing spiral on the inward movement. It is to be noted that the spiral formed on the outward movement does not coincide in path with the spiral formed on the inward movement. By reason of this action, which is duplicated in each of the stirrers, it will be seen that the action of the stirring mechanism is particularly effective in that all parts of the fuel chamber may be reached and that there are no zones of any consequence which escape the action of the stirring rods whose paths will overlap somewhat, the overlapping depending of course upon the extent of the reciprocation of the cross head.

With this apparatus, as above described, it will not only be possible to give a thorough and efficient stirring in the producer, but it is to be noted that this stirring takes place without any especial structural peculiarities on the part of the producer, which may be of the ordinary type. In other words, the stirring apparatus may be applied to producers now built without the necessity of reconstructing the same. The top, which I prefer to use in my apparatus,

is a simple metal top which I can apply to any form or size of furnace, whether already built or not. It involves no change in the furnace body. Further, it will be seen that this stirring apparatus, being separate and independent from the furnace in which it is used, may be shifted from one producer to another, as desired, and enable the working force to be materially reduced, since one man may operate a stirrer for a bank of furnaces.

Having thus described my invention, I claim:

1. A stirrer adapted for use with gas producers comprising a rotatable rod having a stirring end movably attached thereto, and means for inclining the stirring end of the rod to its axis of rotation.

2. A stirrer adapted for use with gas producers comprising a rod with means for rotating said rod on its axis and means for inclining the stirring end of the same, and means for reciprocating the rod longitudinally into and out of the position in which it is adapted to operate.

3. Stirring apparatus comprising a traveling carriage and a stirrer frame supported by the traveling carriage, means for reciprocating said stirrer frame relatively to the carriage, a stirrer carried by said frame and means for moving the stirring portion in a curvilinear path.

4. Stirring apparatus comprising a rotatable stirrer shaft, means for rotating the same, a stirrer pivotally connected to said shaft and means for tilting said stirrer.

5. Stirring apparatus comprising a stirring rod, means for reciprocating said rod longitudinally, means for rotating said rod and means for varying the inclination of the rod to its axis of rotation.

6. Stirring apparatus comprising a traveling carriage and a stirrer frame supported by the traveling carriage, means for reciprocating said stirrer frame, a stirrer carried by said frame, and means for moving the stirring portion in a curvilinear path.

7. Stirring apparatus comprising a traveling carriage and a stirrer frame supported by the traveling carriage, means for reciprocating said stirrer frame relatively to the carriage, a stirrer carried by said frame and means for moving the end of the stirrer in a curvilinear path in a plurality of positions of the stirrer frame.

8. Stirring apparatus for gas producers comprising a rod and means for moving the end of the rod along a spiral path.

9. Stirring apparatus for gas producers comprising a rod, means for giving the end of the rod spiral movement and means for reciprocating the rod longitudinally.

10. Stirring apparatus comprising a stirring rod, means for giving the stirring portion curvilinear movement and means for rotating the rod during said movement.

11. Stirring apparatus comprising a stirring rod, means for giving the stirring portion of the rod spiral movement, means for varying the inclination of the rod relatively to the axis of said movement, and means for moving said rod longitudinally.

12. Stirring or poking apparatus for gas producers, comprising a movable carriage mounted to travel over and above the top of the gas producer, and a stirrer or poker mounted on said carriage and depending therefrom, together with means on the carriage for reciprocating the stirrer or poker and for effecting a lateral movement thereof.

13. Stirring or poking apparatus for gas producers, comprising a carriage mounted to travel over and above the top of a gas producer, said carriage being structurally independent of the producer, and a stirrer or poker mounted on said carriage, together with means on the carriage for reciprocating the stirrer or poker and for moving it surring portion in a curvilinear path.

14. In combination, a gas producer and a poker-shaped stirrer, an opening in the gas producer an oscillatable closure for said opening through which the poker is slidable, means for giving the stirring portion of the poker a curvilinear movement and means for reciprocating the poker through said closure.

15. Stirring or poking apparatus, comprising a traveling carriage, a stirrer frame supported by the carriage, a rotatable stirrer shaft supported by said frame, and a stirrer pivoted to said shaft, together with means for reciprocating the stirrer and for moving its stirring end in a curvilinear path.

16. A gas producer having an opening therethrough suitably located to receive a stirring poker, an oscillatable closure adapted to close said opening whether the poker be in or out of position.

17. In combination, a gas producer having a stirring opening, a carriage mounted to travel over and above the producer, a rotary stirrer shaft, a stirrer pivoted to said shaft, means for rotating the shaft and stirrer within the furnace, and for inclining the stirrer during its rotation, and means for closing the stirrer opening when the stirrer is withdrawn.

18. In stirring apparatus for gas producers, an overhead traveling carriage, a stirrer frame supported by said carriage for vertical reciprocation, means for effecting a reciprocation of said frame, a motor mounted on the carriage, a shaft having a driving connection with the motor, and a plurality of rotary stirrer shafts mounted upon said frame and geared to the first named shaft.

19. In stirring apparatus for gas pro-

ducers, a stirrer shaft having a stirrer hinged thereto, and a reciprocating device arranged to engage said stirrer and cause an angular displacement of the stirrer with reference to the shaft.

20. In stirring apparatus for gas producers, a plurality of stirrer shafts, a stirrer hinged thereto, and a reciprocating device arranged to simultaneously actuate the stirrers to cause angular displacement thereof with reference to the stirrer shaft.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

JOHN C. CROMWELL.

Witnesses:
E. B. GILCHRIST,
H. R. SULLIVAN.