H. McN. PARSON.

METHOD OF FURNACE PRACTICE.

APPLICATION FILED JUNE 13, 1908.

Patented May 9, 1911.

991,637.

2 SHEETS—SHEET 1.

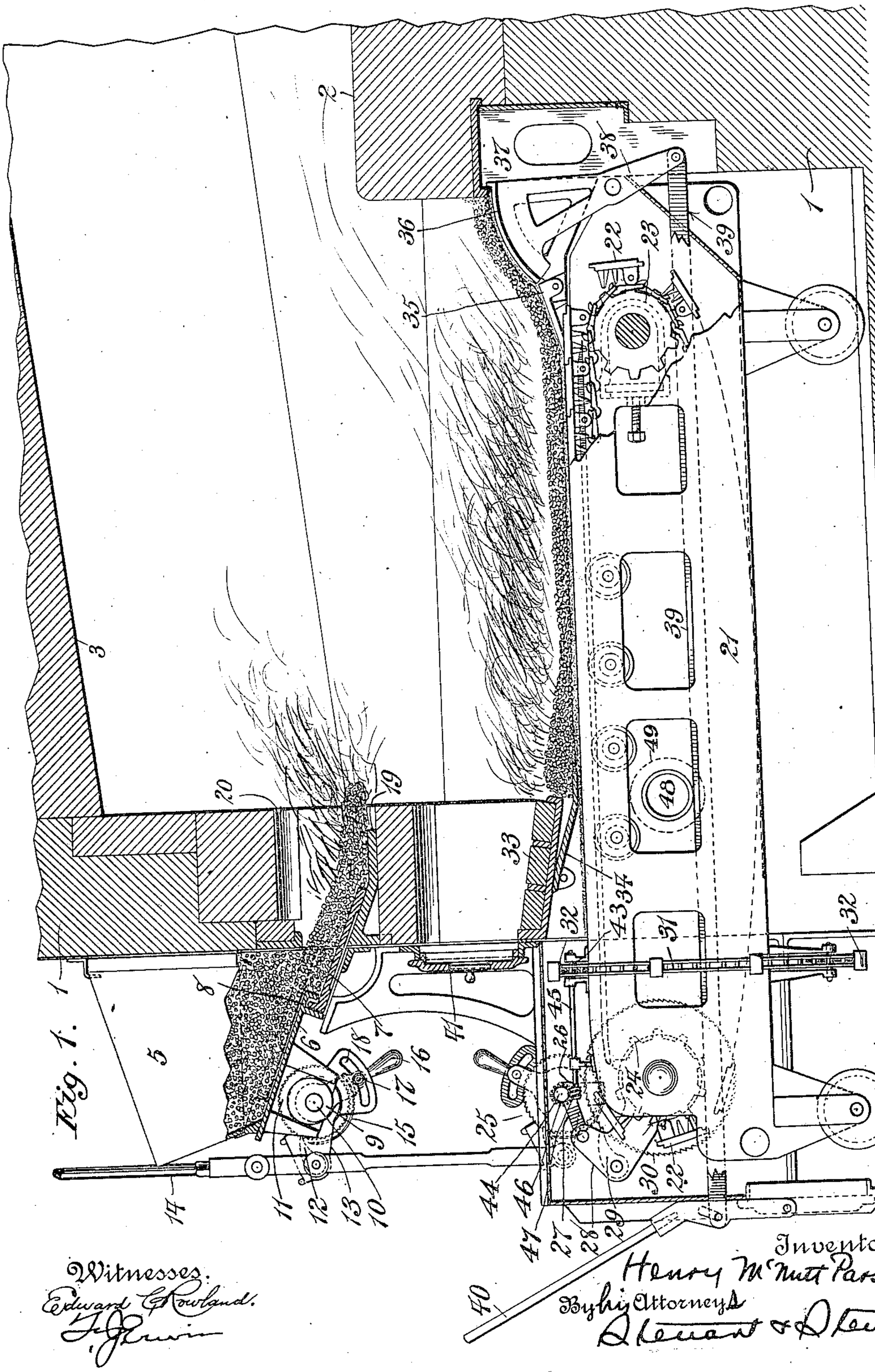

Fig. 1.

Witnesses.
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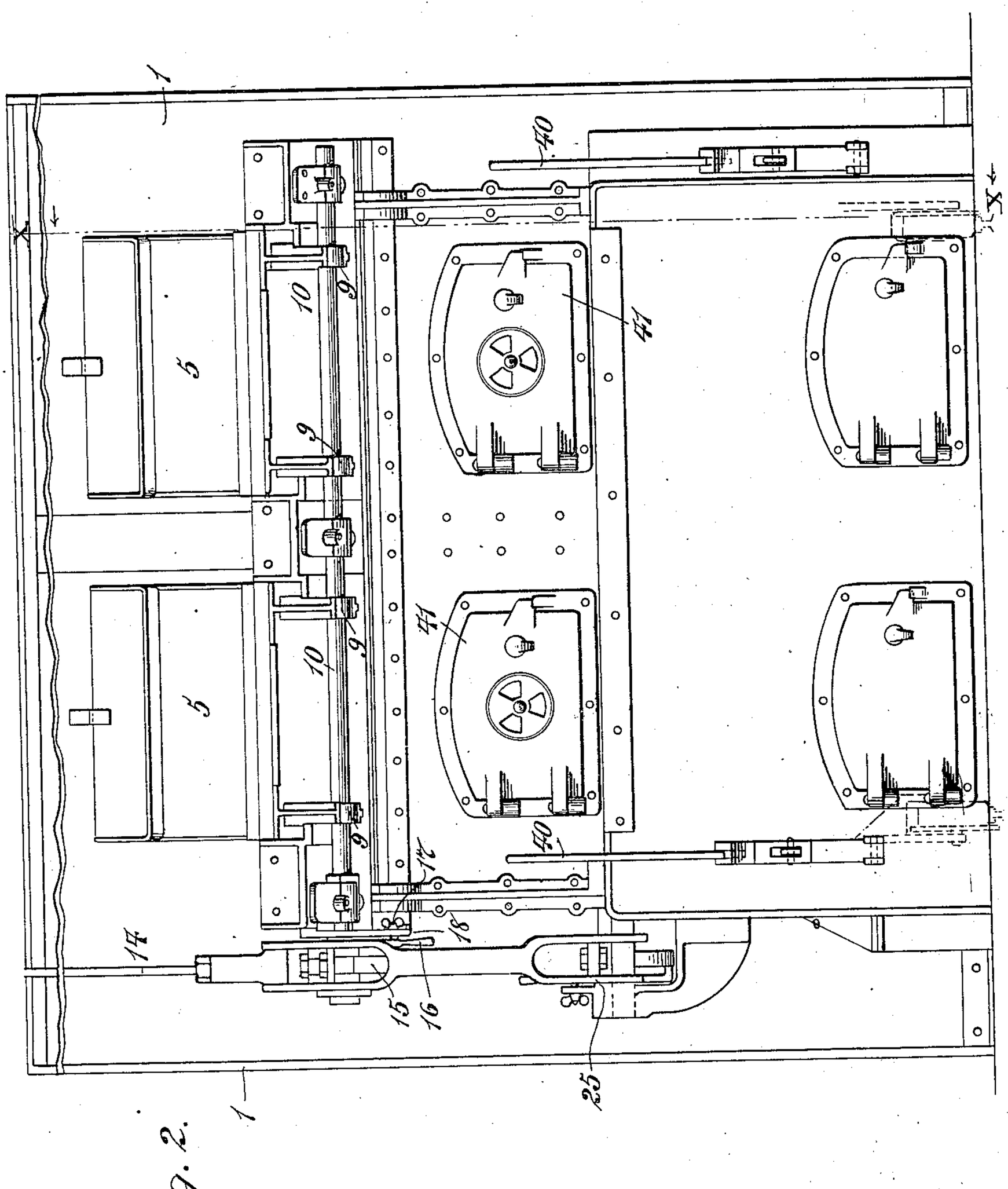

Fig. 2.

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UNITED STATES PATENT OFFICE.

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METHOD OF FURNACE PRACTICE.

991,637. Specification of Letters Patent. Patented May 9, 1911.

Application filed June 13, 1908. Serial No. 438,356.

To all whom it may concern:

Be it known that I, HENRY MCNUTT PARSON, a citizen of the United States of America, residing at the city of Elizabeth, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Methods of Furnace Practice, of which the following is a specification.

This invention relates to the art or method of furnace practice and the treatment of fuels.

The principal object of the invention is to obtain general increase in efficiency and economy of operation.

A particular object is to provide a novel and improved method or process for treating fuels particularly those having a large proportion of volatile constituents wherein the full fuel values may be realized and the rate and character of combustion improved.

Other particular objects are to provide a new and valuable method of treating fuel to a preliminary distillation or coking process within the furnace and during its progress to the grate; and in connection therewith to provide for such regulation and control of air as to permit a perfect combustion both of the gaseous products of the preliminary distillation and of the solid residuum or coke, to secure the delivery of fuel to the grate in the most favorable condition, and to provide for the adequate protection of the grate. I have discovered that by treating the fuel to a preliminary distillation or coking in the upper part of the furnace (preferably as it progresses in a layer across a preliminary hearth or coking platform suitably situated at a considerable height above the grate) and allowing it to drop upon the grate by gravity distinctly new and important advantages are secured. By proper regulation of the rate of feeding, a substantially complete coking or preliminary distillation of the fuel is had as the layer progresses and its advancing edge, which has become a cake or mass of coke, may be extended beyond its support so as to break off and drop to the grate below. By positioning the platform at a sufficient height above the grate the fall effectually breaks up the coke into fragments of a suitable size. In addition to the extreme simplicity of apparatus required another important and distinct advantage is secured by reason of the fact that the mass is completely ignited for some time before it breaks off, and reaches the grate in a burning condition, so that the fuel is fed to the grate to an extent superposed upon a layer or insulation of its own ash. In practice it is found that the fragments of coke or partially consumed fuel do not cake or run together but remain in an open and freely burning condition. Even in the case of anthracite and non-coking coals, or other fuels where coking cannot be completely effected the preliminary heating and ignition is found to be of the greatest practical advantage. This system of feeding is particularly valuable in connection with a traveling or progressive grate as the peculiarly efficient condition in which the fuel is delivered permits a much deeper fire than is otherwise practicable and materially increases the consumption per unit of grate area. In feeding a traveling hearth in this manner it is found that even if the preliminary combustion has not so completely advanced as to furnish initial ash insulation the ash is formed with sufficient rapidity to prevent any destructive heating of the grate, and to preserve the open condition of the fire. A distinct advantage lies in the ease with which the fire can be controlled by hand should it become necessary, since the novel location of the coking platform allows ample space for fire doors beneath through which the fire may be reached in case the grate mechanism breaks down. The results which may be obtained with a progressive grate are in certain cases materially enhanced by making special provision for the maintenance of additional ash both for insulation and for effecting a seal at the front and rear of the hearth where it is usually most difficult with this type of furnace to control the draft. Where this is desirable I obtain the most satisfactory results by progressively supplying a layer of ash upon the grate in addition to the incidental ash of combustion. By proper utilization of ash both incidentally and artificially supplied to seal as well as to insulate the hearth the combustion can be carried to a very high degree.

It will be seen that the complete inven-

tion involves not only the peculiarly novel and efficient method of feeding and preliminary treatment of the fuel but also that process in connection with a progressive or traveling grate and a suitable use of ash to effect the sealing and insulation of the hearth.

In the drawings, which show the invention as carried into practice in an approved arrangement of furnace apparatus, Figure 1 is a side view of the feed and grate mechanism, while Fig. 2 is a front view of the furnace, (the side wall of the furnace being removed in Fig. 1 on the line *x*—*x* of Fig. 2).

I prefer to introduce the green fuel into the furnace at the front, since this allows a convenient connection of the operating mechanisms of the fuel supply and the grate progression. Such an arrangement is shown in Fig. 1. 1, 1 is the setting of the furnace shown in section, the section being taken just within the side wall of the furnace; 2 being the bridge wall. In the structure shown, 3 is a combustion arch. The fuel feeding mechanism consists of one or more hoppers 5, the lower portion being shown in section, each of which supplies a fuel pusher consisting of movable platforms 6 and 7 loosely interlocked as at 8 and given a reciprocating motion by an eccentric 9 carried upon shaft 10. By suitable angular displacements of the eccentrics the pushers or fuel feeders can be operated at predetermined intervals. Upon the shaft 10 is a ratchet wheel 11 actuated by a pawl 12 carried on a rocker arm 13 actuated by a reciprocating rod 14. Two pawls are preferably utilized in practice in order to secure a closer adjustment or regulation of the angular motion to be given to the shaft 10 by a reciprocating motion of the rod 14 although only one is shown in the figure. Embracing a portion of the periphery of the ratchet wheel 11 is a shield 15, movable by means of a handle 16 which can be locked in any position by means of a bolt 17 within the groove of a fixed guide plate 18. By suitably positioning the shield the pawl may be prevented from engaging the ratchet during a greater or less portion of its stroke and by use of two pawls, one of which is longer than the other, the throw of the ratchet can be readily regulated. Fuel is discharged from each feeder unit upon a platform 19 preferably set under an arch 20 in the front wall of the furnace where the layer of fuel can receive the full heat of radiation. In the operation of the pushers (which are so regulated as to feed the fuel no faster than it can be satisfactorily coked) the fuel layer is first coked at its inner or advancing edge and then pushed beyond the plate or platform 19 and allowed to break off and drop upon the hearth below, where it is broken up into fragments. There may be a separate coking platform for each pusher unit or a common platform wide enough to accommodate a number of them. With a number of pusher units the coke may be pushed out and broken off from first one platform and then another in some predetermined order so as to produce a practically uniform feeding to the fire below.

While I have shown an approved form of feeding device it is by no means the only one which would answer the purpose. I prefer a number of pusher units acting intermittently but it is obvious that a continuous feeding of fuel might be had with any suitable mechanism for advancing the layer of fuel.

The grate mechanism consists of the grate frame casing 21 having a chain grate 22 running upon sprockets 23 and 24 and actuated by a ratchet and pawl mechanism 25 similar to that described in connection with the fuel pusher. The ratchet mechanism 25 by means of a crank of short radius 26 and a link 27 is connected with a rocker arm 28 carrying a pawl 29 engaging a large ratchet wheel 30 fixed to the shaft of the grate sprocket 24 whereby a slow motion of progression may be given to the chain grate. The reciprocating rod 14, described in connection with the feed mechanism is also connected with the ratchet mechanism 25, the one rod driving both the feed and grate mechanisms and being connected to any suitable source of power. The grate frame casing for the greater part of its length toward the rear is closed at its bottom so as to form a channel or conduit in which the grate bars on their return convey the ash deposit from the rear to the front. 35 is an inclined grate hinged at the back and resting upon or otherwise adjusted with reference to the chain grate and forming a part of the hearth surface. 36 is a movable dumping grate preferably formed as shown and capable of withdrawing as within a recess 37 in the bridge wall. The dumping grate 36 may be carried on suitable sectors or arms, one of which is shown at 38, and retracted by a rod 39 and a lever 40, or otherwise operated. The grate frame casing is housed within the furnace setting and a housing at the front of the furnace if forced draft is to be used so that the blast admitted within the ash pit or grate housing may escape only through the grate. The inclined grate 35 guides the ash and unconsumed fuel upon the dumping grate 36 where the accumulation effects a satisfactory seal against the bridge wall. The inclined grate 35 and the dumping grate 36 may be perforated with openings for the admission of air so that combustion may take place as readily as upon the chain grate, and are in effect a continuation of the active hearth surface

Beneath the dead-plate 33 of the front opening of the furnace is a hinged apron 34 which rests upon the grate bars or ash thereon. The apron may extend as shown some distance within the furnace beyond the edge of the dead-plate in which case the fuel is principally fed and banked upon the extension of the apron, the surplus falling or being drawn off upon the grate bars as they move toward the rear. A bank of burning fuel of relatively great depth may be then maintained against the dead-plate. 31 is a suitable ash elevating apparatus, such as a chain bucket conveyer driven by any suitable means as the gear 43 on the shaft 45 carrying the spiral gear 47 driven by a cooperating spiral 46 on the shaft 44. The buckets, 32, 32 etc., withdraw ash from the lower portion of the casing and deliver it upon the grate bars as they begin their rearward progress.

48 is an opening or inlet to the ash pit, and 49 a blower placed therein for supplying forced draft beneath the grate.

The operation of the furnace is sufficiently obvious. The gaseous products of the distillation, which may be more or less complete, are consumed as they are given off, particularly if additional air is admitted through the dampers in the fire doors 41, 41, or in any other suitable manner. In this way a practically perfect and therefore smokeless combustion of these gaseous products may be secured while the position of the coking platform is such that air so admitted does not interfere with the draft of the main fire.

While a certain amount of ash drops through the grate openings during the operation of the mechanism, the artificial application of ash to the grate and the usual rate of progression given to the feed and grate mechanisms may be such as to designedly cause an accumulation of ash upon the dumping grate against the bridge wall which it is found best in practice to normally maintain until it becomes excessive, when the surplus may be conveniently discharged by temporarily withdrawing the dumping grate.

While an approved form of apparatus for carrying the invention into effect has been described it is obvious that the method is in no sense limited to the specific mechanism set forth. This is particularly true with respect to the feeding of fuel upon and across a preliminary hearth or coking platform in the upper part of the furnace and allowing the cake or mass of coke to break off and fall upon and into the main fire. Important advantages are secured by using a progressive chain grate, but the invention is not limited to any particular type of grate, and a large proportion of the advantages of the method of feeding could be secured with a variety of forms of grate. While it is particularly desirable, especially in large installations, that the process be continuous or practically so, the continuity of the process is not essential.

It will be at once obvious to one skilled in the art that the particular form in which the method described may be carried into effect is capable of wide variation to suit different conditions without departing from the scope of the invention.

I claim—

1. The method described consisting in progressively supplying ash to a traveling grate in advance of the fuel, causing the fuel to undergo a preliminary combustion at a point above the level of the grate, and to drop therefrom upon the ash on the grate in a partially consumed condition, the fuel being dropped from a sufficient height to be broken by its fall, and being thereafter fed through the combustion area on top of the ash on the grate.

2. The method described consisting in progressively supplying a traveling grate with an insulating layer of ash, feeding fuel across a preliminary combustion platform above the level of the grate and allowing it to drop therefrom on to the ash deposited on the grate in a partially consumed condition, the fuel being dropped from a sufficient height to be broken by its fall, and being thereafter fed through the combustion area on top of the ash on the grate.

3. The method of furnace practice consisting in maintaining a layer of ash upon a traveling grate, feeding fuel across a preliminary combustion hearth above the level of the grate, subjecting it to a preliminary combustion during its progress across such hearth, and allowing it to drop therefrom upon the ashes on the grate in a partially consumed condition, the fuel being dropped from a sufficient height to be broken by its fall, and being thereafter fed through the combustion area on top of the ash on the grate, and intermittently dumping surplus ash from the grate.

4. The method of furnace practice consisting in combination with the progressive supplying of a layer of ash to a grate, the feeding of fuel thereto by advancing a layer of fuel upon and across a coking platform in the upper part of the furnace, coking the fuel as it advances across said platform, allowing it to drop therefrom a height sufficient to insure suitable breaking of the coke, and feeding it through the combustion chamber on top of the ash on the grate.

5. The method of operating a traveling grate consisting in progressively supplying a layer of ash upon the grate bars, maintaining a bank of burning fuel at the front of the fire and a bank of ash at the rear of the fire and feeding the fuel across a pre-

liminary combustion platform in the upper part of the furnace onto the layer of ash on the grate.

6. The method of operating a traveling grate furnace consisting in progressively applying ash to the grate bars, maintaining a seal of ash at the front and rear of the fire, maintaining a forced draft through the grate, causing fuel to undergo a preliminary combustion above the level of the fire and to drop therefrom onto the ash applied to the grate bars in a partially consumed condition.

7. The method of furnace practice in connection with a progressive grate consisting in normally supplying a layer of ash upon the grate, maintaining a seal of ash and burning fuel at the front of the grate and a seal of ash at the rear of the grate and causing fuel to undergo a preliminary combustion above the level of the fire and to drop therefrom onto the ash applied to the grate bars in a partially consumed condition.

8. The method of operating a progressive grate furnace consisting in normally supplying a layer of ash upon the grate bars, normally maintaining a seal of ash at each end of the fire, applying forced draft through the grate, causing fuel to undergo a preliminary combustion at a point above the grate and to drop therefrom onto the ash applied to the grate bars in a partially consumed condition.

9. A method of furnace practice consisting in feeding on to a traveling grate an insulating layer of ash, feeding green fuel slowly across a coking platform at a considerable height above the grate so that the fuel when coked and forced off the platform falls on to the insulating layer of ash on the grate and is broken by its fall and is thereafter fed forward by the traveling grate and passes through the combustion area resting on the layer of ash deposited on the grate.

Signed by me at New York city this 12th day of June 1908.

HENRY McNUTT PARSON.

Witnesses:
CHAS. H. PARSON,
R. H. SPURGEON.