

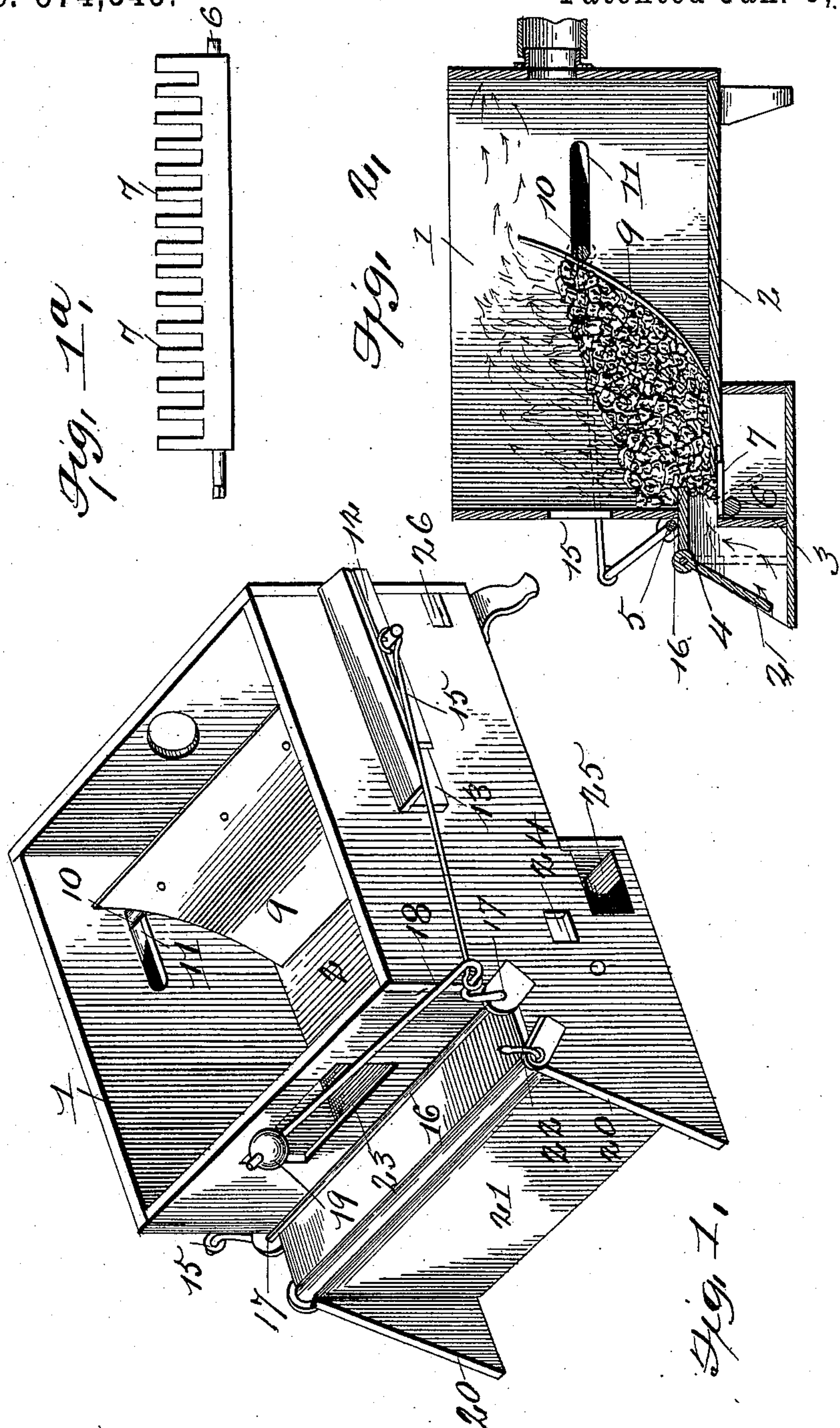
(No Model.)

2 Sheets—Sheet 1.

E. FALES.
FURNACE AND HEATER.

No. 574,845.

Patented Jan. 5, 1897.



WITNESSES-
G. W. Johnson,
James S. Jester

INVENTOR-
Edward Fales
By J. R. Nottingham *Att'y.*

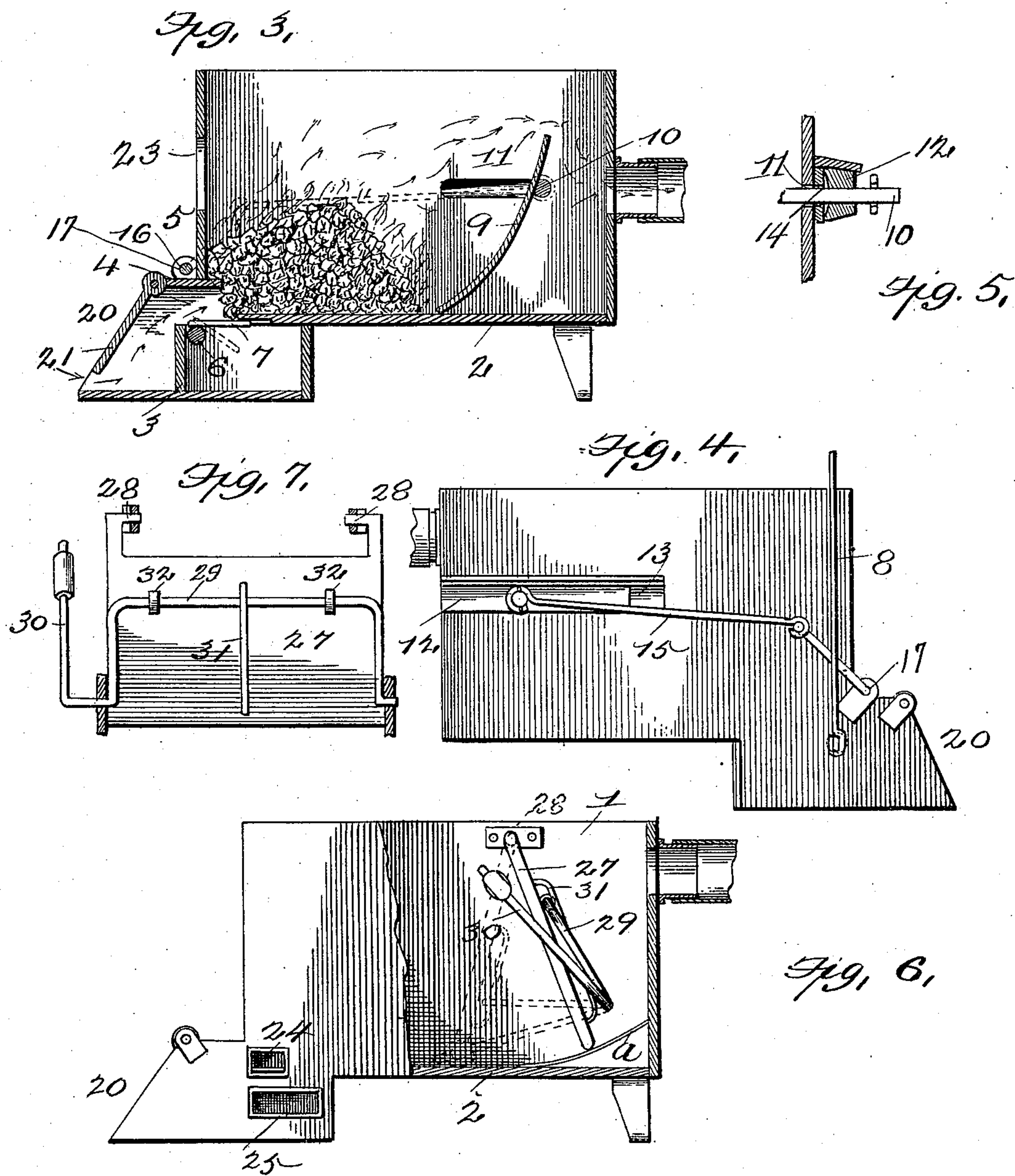
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UNITED STATES PATENT OFFICE.

EDWARD FALES, OF WINTHROP, MASSACHUSETTS.

FURNACE AND HEATER.

SPECIFICATION forming part of Letters Patent No. 574,845, dated January 5, 1897.

Application filed January 21, 1896. Renewed December 7, 1896. Serial No. 614,834. (No model.)

To all whom it may concern:

Be it known that I, EDWARD FALES, a citizen of the United States, residing at Winthrop, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Furnaces and Heaters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in furnaces or heaters, more particularly to that class of furnaces which are adapted to burn bituminous or other smoky coal; and it has for its principal object to provide a furnace with certain new and useful devices whereby certain gases are thoroughly consumed at the moment of their generation and while in a nascent state, whereby other gases or vapors are burned as soon as they are liberated, so as to prevent smoke, economize fuel, and secure a high degree of heat, and whereby the fuel is thoroughly freed from ashes, as will be hereinafter more fully explained.

The invention consists, essentially, in providing the fire-box of a furnace or other heater with a solid or imperforate fuel-support, in front of which is arranged a grate or finger bar forming a continuation of said fuel-support and with a wall extending to a point somewhat below the level of the fuel, whereby a supply of air is directed to a limited portion of the fuel.

The invention further consists in providing the downwardly-extending wall with a horizontal plate arranged in such a manner that the air will be directed not only to a limited portion of the fuel, but toward the center thereof in proper regulated quantities.

The invention further consists in the combination of the above-mentioned elements with certain novel mechanism for automatically feeding forward the fuel and for returning said mechanism to normal position, as will be hereinafter more fully described, and specifically set forth in the claims.

In all furnaces where the fuel is burned from the bottom the heat passes up through the unburned fuel on top, distilling and roasting it and driving off a large percentage of the inflammable hydrocarbons in a gaseous

unconsumed state, forming smoke, which not only causes a great loss of the most effective part of the fuel, but, escaping into the atmosphere, condensing, and settling, contaminates everything in the immediate neighborhood of the furnaces, all of which is highly objectionable. By constructing a furnace upon the line of my improvements such objectionable features are wholly obviated, as the combustion of fuel takes place at the surface, where it is incandescent, thoroughly consuming the gaseous products at their point of generation, as before stated.

In the accompanying drawings, Figure 1 is a perspective view of my improved furnace or heater with the top removed; Fig. 1^a, a plan view of the finger-bar; Fig. 2, a vertical longitudinal sectional view showing the device for feeding forward the fuel in its extreme forward position and just before it is returned to its other extreme position for a supply of fresh fuel; Fig. 3, a similar view showing the said device returned to its extreme rear position in order to put another supply of fresh fuel into the fire-box; Fig. 4, an elevation of the opposite side to that shown in Fig. 1; Fig. 5, a transverse section of one of the slides in which one of the ends of the shovel-shaft is journaled and the slide guide-rail; Fig. 6, a side elevation, partly broken away, showing a modified form of the device for feeding forward the fuel; and Fig. 7, a detail view of said feeding device.

Referring particularly to the several views, the numeral 1 indicates the walls of the furnace or heater, which may be constructed of brickwork, metal, or other suitable material, and is preferably rectangular in shape and provided with the usual ash-pit and smoke-exit.

The numeral 2 indicates a fuel-support, which also forms the bottom of the fire-box and consists of an imperforate or solid plate of metal or other material situated a proper distance above the ash-pit and, extending from the rear, terminates a short distance from the front wall of the furnace, so as to leave a sufficient space between its forward edge and the said front wall for the fall of the ashes. The fuel-support, it will be thus observed, is inclosed or bounded by the side and rear walls of the furnace. The front

wall of the fire-box terminates above the surface of the solid or imperforate fuel-support, and forward of said wall is situated a lower wall 3, which rises from the bottom of the ash-pit to a line about level with the plane of the said fuel-support. Above this lower wall is a horizontal plate 4, which passes under the lower edge of the upper wall and forms an abutment 5 within the fire-box to serve as a deflector to direct the cold air onto the front and upper surfaces of the fuel and thereby prevent it from passing directly up into the fire-box, the space between the upper and lower front walls of the furnace being of sufficient width for the admission of the air. At the upper edge and just back of the lower wall is journaled a bar 6, which is provided with fingers 7, the outer ends of which normally rest in the rabbeted bottom edge of the fuel-support, as shown in Figs. 2 and 3. One end of the finger-bar projects through the side wall of the furnace and is provided with a lever 8, by means of which said finger-bar may be turned to lower the fingers when it is necessary to empty the fire-box of its contents.

The numeral 9 indicates a feeding-shovel, which is situated within the fire-box and consists of a metallic plate extending from side to side of the fire-box. The said shovel is preferably secured to a cross-bar 10, which has its ends passing through horizontal slots 11, made in the side walls of the furnace, and journaled in slides 12, traveling on ways 13, which are secured upon the outside of the furnace-walls, and are provided with slots 14, corresponding and registering with the slots 11. The shovel is journaled at such a height that its position is slightly inclined, with its lower edge resting loosely upon the surface of the fuel-support. The inner faces of the slides are slightly concaved, as shown in cross-section in Fig. 5, so that their side and end edges may fit closely to the outer faces of the ways in order to prevent the entrance of air through the registering slots in said ways and the side walls of the furnace. Each of the journaled ends of the shovel-bar extends through its respective slide and has secured to it one end of a rod 15, which has its other end connected to the short arm of a rock-bar 16, which is journaled at the front of the furnace in bearings 17 at opposite sides thereof. To one of the short arms of the rock-shaft is secured a lever 18, which extends from said arm in a forward direction and is provided with a weight 19, which exerts a constant downward pressure upon said lever and causes the rock-shaft to turn in a forward direction, thereby automatically drawing the shovel also in a forward direction to push the fuel to the front as it is consumed and to cause the discharge of the ashes through the fingers of the finger-bar into the ash-pit below.

The lower front portions of the side walls of the furnace extend forward a slight distance beyond the edge of the horizontal plate 4 and terminate in inclined ends 20. Between the

upper corners of the side wall extension is journaled a swinging door 21, which is designed to regulate the draft or shut it off completely, as may be required, and is lined with any refractory material to prevent the radiation of heat. One of the journal ends of the swinging door is provided with a suitable handle 22, by means of which said door may be manipulated to regulate the draft. By inclining the forward ends of the side walls of the extension the air is compelled to enter below the door, as shown in Figs. 2 and 3.

The numeral 23 indicates the opening through which the furnace is charged, said opening being preferably closed by double doors. (Not shown.) At one side of the furnace, just above the finger-bar, is an opening 24, through which a bar or rod may be inserted to rake the fire. The ash-pit is provided at one side with an opening 25, through which the ashes may be removed, and an opening 26 is made into the fire-box back of the shovel, by means of which accumulated coal dust and ashes may be removed. These openings 24, 25, and 26 are provided with the usual doors.

In the modifications shown in Figs. 6 and 7 instead of the horizontally-moving shovel a swinging shovel 27 may be employed. This modified form of the shovel consists of a flat plate which is provided with short arms 28, journaled in bearings secured to the inner side of the side walls of the furnace. The shovel is so hung that its lower edge rests loosely upon the surface of the fuel-support, the same as shovel 9, but is not set at an inclination. The means of operating this shovel consists of a rocking bail 29, which is journaled in the side walls of the furnace and has one of its journals extended and provided with a weighted lever 30, whose normal position is forward of a vertical line drawn through the bearings. The bail is connected to the swinging door by means of a long staple 31 and is provided with rollers 32 to facilitate the operation of said bail in its forward pressure against the door, said forward pressure being produced by the weighted lever, as in the case of shovel 9. To accommodate the sweep of the shovel in its forward movement from normal position and its return to the same, the rear portion of the fuel-support is curved, as shown at *a*, Fig. 6, the normal position of the shovel and its feeding mechanism being shown in full lines and the extreme forward position being shown in dotted lines.

Various modifications of my invention may be made without departing from the principle thereof, such, for instance, as casting the shovel 9 integral with its shaft instead of making the parts separate and securing them together, or dispensing with the mechanism for automatically forcing forward shovel 27 and substituting therefor a hand-operating lever secured to one of the journals of the swinging shovel, which journal may be extended for the purpose.

In operating the form of furnace shown in Figs. 1, 2, 3, and 4 the shovel is drawn or thrown back and the fire-box charged with fuel through the opening at the front of the furnace. The fuel banks against the shovel with the surface inclining upward from front to rear. The fuel is then kindled at its surface, air being admitted in suitable quantities beneath the door 21. As the fuel is consumed and converted into ashes, it, with the ashes, is gradually being pushed forward by the pulling action of the weighted lever, through the connecting-arms 15, on the shovel. The ashes pass through the fingers of the finger-bar, and the clearance of the same may be assisted by a raker or poker passed through the opening 24.

It will be observed that as the combustion of the fuel occurs at the surface no distillation or roasting of the fuel takes place, as is the case where the combustion takes place at the bottom of the fuel and passes upward through the same. Hence the fuel is thoroughly consumed and converted into carbonic-acid gas at the moment the air strikes the fuel, and, as no unconsumed inflammable gases are formed, but little smoke, which is of an extremely light color, is generated, but a fire with a clear and intense heat is obtained.

When the shovel has reached its extreme forward movement, as shown in Fig. 2, it is drawn back into the position shown in Fig. 3, which is its normal or other extreme position. In moving the shovel that portion of the fuel which is supported thereby drops down upon the imperforate support, leaving sufficient space for another charge of fresh fuel, after which charge the automatic action of the shovel again commences.

The operation of the feeding device shown in Figs. 6 and 7 will be readily understood without further explanation.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A stove or furnace having an imperforate fuel-support, a grate of limited area forming a continuation of said fuel-support, and a wall extending downward toward said grate and to a point which is in a plane somewhat below the normal level of the fuel, whereby the air-supply is directed to a limited portion of the fuel only.

2. The combination with the fire-box provided with a solid or imperforate fuel-sup-

port, of a movable feeding-shovel and means for operating the same, whereby the fuel may be pushed forward, as consumed, to discharge the ashes and make room for fresh fuel.

3. The combination with the fire-box having a solid fuel-support, of a fuel-feeding shovel having its lower edge resting upon said fuel-support, and means for moving said shovel back and forth, substantially as specified.

4. The combination with the fire-box having a solid fuel-support, of a fuel-feeding shovel having arms extending through slots in the opposite side walls of the furnace and connected to a rock-shaft by means of suitable connecting-rods, and means for moving said shovel back and forth, substantially as specified.

5. A stove or furnace having an imperforate fuel-support, a grate of limited area forming a continuation of said fuel-support, a wall extending downward toward said grate and to a point which is in a plane somewhat below the normal level of the fuel, and a horizontal plate situated immediately below the upper portion of the front wall of the furnace and extending into the combustion-chamber, whereby the air is directed not only to a limited portion of the fuel but toward the center thereof.

6. The combination with the upper front wall of the furnace, of the lower front wall setting forward of said upper wall, and the horizontal plate covering the top of the forwardly-extending portions of the side walls and projecting into the fire-box below the lower edge of the upper wall, the whole forming a passage whereby air is directed upon the front and upper surfaces of the fuel to support the combustion thereof.

7. The combination with the forward extension of the furnace and the horizontal plate at the top of the same projecting into the fire-box and forming an air-passage to said fire-box, of the downwardly-swinging door, whereby air in regulated quantities may be admitted to the fuel, substantially as specified.

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

EDWARD FALES.

Witnesses:

J. R. NOTTINGHAM,
L. L. JOHNSON.