No. 726,258. PATENTED APR. 28, 1903.

H. G. COX.

MECHANICAL STOKER.

APPLICATION FILED OCT. 23, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

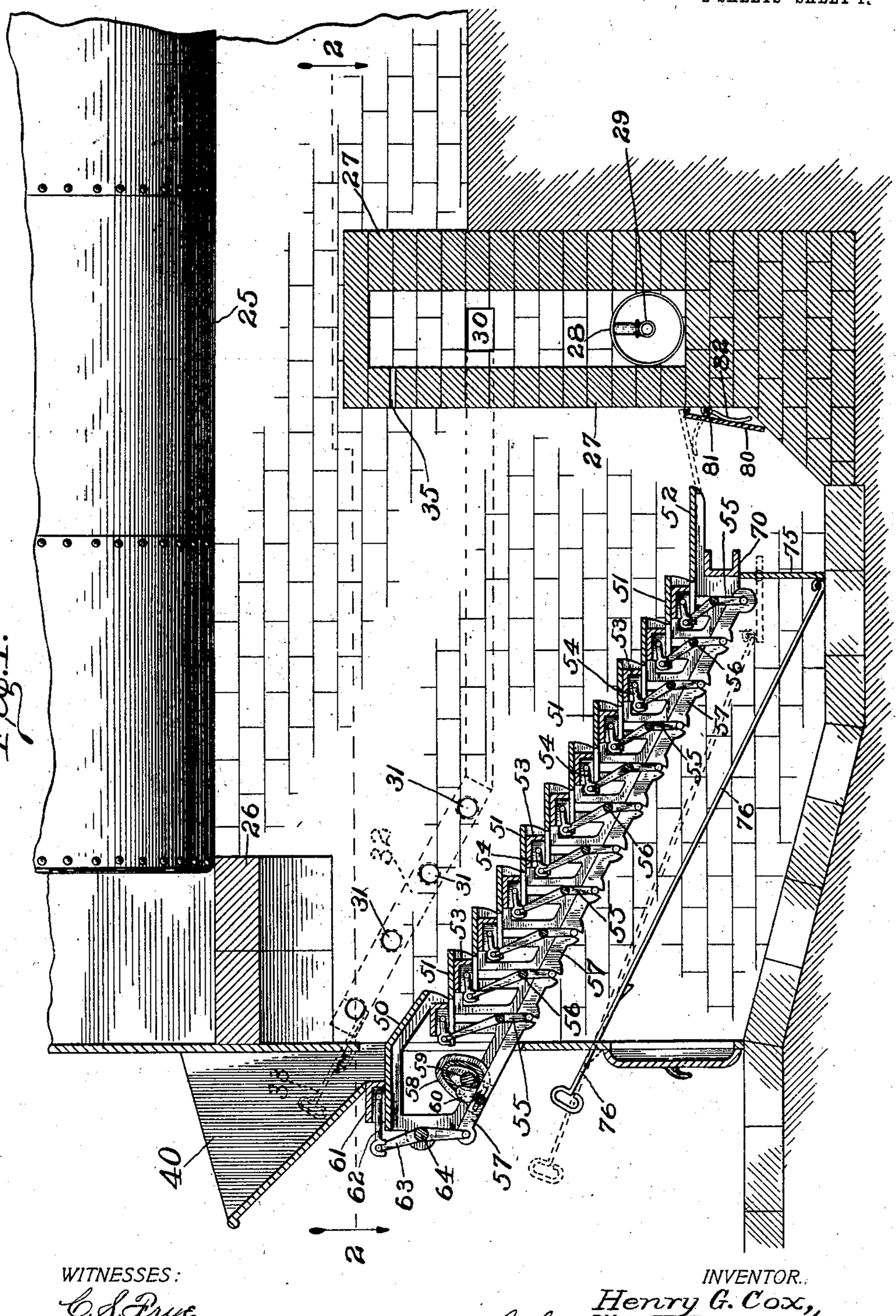

Fig. 1.

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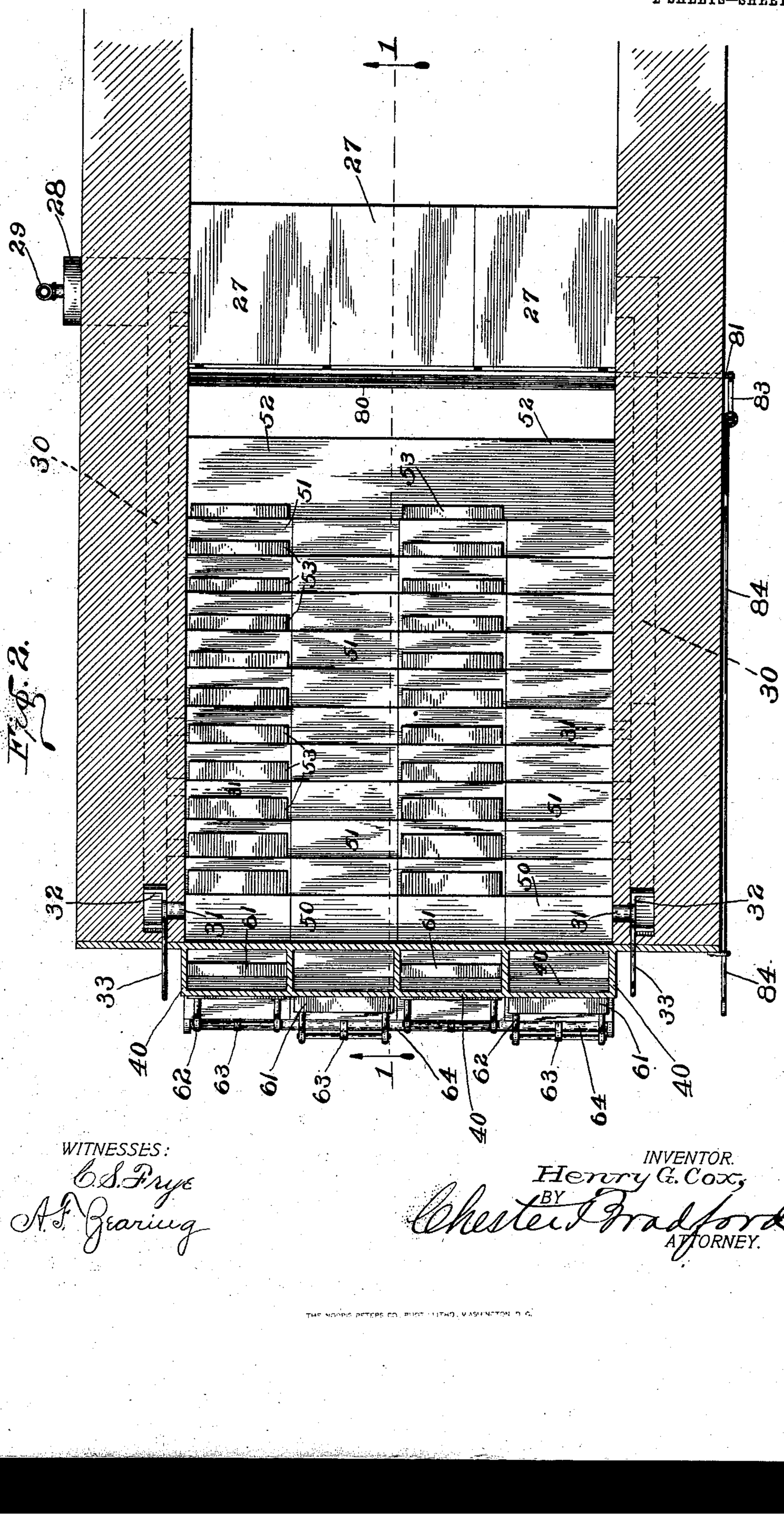

Fig. 2.

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UNITED STATES PATENT OFFICE.

HENRY GRANDISON COX, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO JOHN T. BRUSH, OF INDIANAPOLIS, INDIANA.

MECHANICAL STOKER.

SPECIFICATION forming part of Letters Patent No. 726,258, dated April 28, 1903.

Application filed October 23, 1901. Serial No. 79,660. (No model.)

To all whom it may concern:

Be it known that I, HENRY GRANDISON COX, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Mechanical Stokers, of which the following is a specification.

This invention relates to that class of apparatus by means of which fuel is automatically fed into and through the combustion-chamber of a furnace by mechanical appliances.

Said invention will be first fully described and the novel features thereof then pointed out in the claims.

Referring to the accompanying drawings, which are made a part hereof, and upon which similar reference characters indicate similar parts, Figure 1 is a vertical sectional view through a steam-boiler furnace provided with an automatic or mechanical stoker embodying my said invention, the point at which said sectional view is taken being indicated by the dotted line 1 1 in Fig. 2; and Fig. 2, a horizontal sectional view looking downwardly from the dotted line 2 2 in Fig. 1.

A fragment of a steam-boiler 25 is shown as mounted in the usual way in brickwork above the combustion-chamber, and the products of combustion are designed, as is common, to pass first up against said boiler, thence (generally) through flues or tubes therein, and thence out to the smoke-stack in the usual way. The floor to the smoke-head consists of an arch 26, preferably formed of fire-brick. This is directly above the point when the combustion first takes place, and being in close proximity to the fire becomes highly heated, and consequently assists in consuming the smoke. The bridge-wall 27 is hollow and a conduit 28 leads from the outside to the chamber therein and admits a suitable supply of air. The air is driven in under pressure by any suitable means. A small steam-pipe 29 (which acts as an injector) is shown as the means. One or more conduits 30 lead from the chamber in the bridge-wall around to alongside the forward part of the combustion-chamber, and several orifices 31 are formed in the walls of said chamber at that point, through which a supply of air may enter said chamber from said conduits. A slide 32, having a handle 33 and provided with perforations corresponding to the orifices 31, is arranged to serve as a gate to said orifices, and said orifices may thereby be either shut off or their size diminished, as may be desired. The slit 35 (or equivalent holes) leads out from the chamber in the hollow bridge-wall through the front side thereof and discharges into the combustion-chamber. Air is thus introduced under pressure into the combustion-chamber both at the front and rear and in different directions. The resulting conflicting air-currents cause a violent agitation of the gases and a very complete consumption of the smoke and combustible portion of such gases.

The fuel is introduced into the hopper-like bin 40 in front of the furnace and passes thence into the combustion-chamber through a suitable passage-way formed through the furnace-front at the bottom of the bin just above the first stationary plate 50 of my improved automatic stoker and passes down said plate, being moved along step by step, as will be presently described. The stationary parts of said stoker, which carry the fuel, consist of numerous step-like plates 51, and the structure terminates in a wider plate or platform 52 at the bottom. The arch 26 and the plate 50 serve to coke the fuel and may therefore be denominated the "coking-arch" and "coking-plate," respectively.

The fuel is forced over the steps 51 by suitable plungers 53, which are mounted in ways underneath, as shown, and said plungers are connected by means of links 54 to bell-crank levers 55, and these in turn are carried by rock-shafts or pivots 56, which are mounted in suitable bearings in the structure, of which the steps 51 form a part. All these bell-crank levers are connected at the lower end to an actuating bar or rod 57, which is driven from a cam 58 on a shaft 59, the connection being preferably made by means of an adjustable arm 60. By adjusting the arm 60 on the rod 57 the plungers 53 are driven out to such points (with respect to the outer edges of the plates or steps 51) as may be desired, so that

the fuel is pushed off said plates more or less rapidly, according to requirements. A plunger 61, similar to the plungers 53, is provided as a means for forcing the fuel into the combustion-chamber from the bottom of the bin 40 and is connected by means of the link 62 to a bell-crank lever 63, which is carried on a rock-shaft or pivot 64, and is connected at the other end to the actuating-bar 57.

The bell-crank levers 55 are of different lengths, so that the strokes of the plungers 53 shall be different. As the fuel passes down the stoker it becomes more and more consumed, so that if the movements of the plungers were equal the mass of fuel at the lower end of the stoker would be less than at the upper end. Consequently in order to maintain an equal body of fuel over the entire surface of the stoker it is necessary that it be forced forward more rapidly at first, and thus enabled to accumulate to some extent on the succeeding steps or plates. The unequalness of the bell-crank levers enables this to be done, those with longer arms at the upper end forcing the fuel forward more rapidly than the shorter-armed ones at the lower end.

The cam 58 is so formed as to operate during only about one-half its revolution, about one-half of the cam-groove therein being equidistant from the axis of rotation, while the other half is eccentric thereto. The plungers are thus moved out and drawn in quickly and remain at rest for about one-half the time, so that the fuel is not kept in constant motion, but has certain periods of rest, during which the combustion can proceed without interruption or disturbance. The plungers may thus be also kept protected by the plates or steps from the intense heat of the furnace during a considerable portion of the time, and warping thereof thus prevented and their life prolonged.

My improved stoker should be made in sections. These sections may be of any convenient width. I generally make them about one foot wide. In Fig. 2 I have shown a stoker composed of four of these sections or adapted to a fire-box of about the ordinary width for a single boiler. There are as many of the bins 40 as there are sections of the stoker. The cams 58 are set oppositely to each other on the shaft 59, so that the sets of plungers 53 in the different stoker-sections operate alternately, the plungers of one section being in their forward position, while those of the adjacent section are drawn back, as shown. The structure as a whole is suitably secured in the boiler-front at the upper end, and its lower end is supported from the furnace-walls by a suitable support, as the channel-bar 70.

While the principal part of the stoker should, as above stated, be formed in sections, the final plate or platform 52 may be and preferably is formed in a single piece and is arranged to receive the ashes from all the stoker-sections. These ashes are gradually pushed forward by the lower set of plungers and fall over the edge of this platform into the ash-pit, whence they are removed from time to time, as may be required.

The ash-pit is shut off from the space below the main body of the stoker by the swinging door 75, and the air is thus prevented from entering the combustion-chamber through the ash-pit, but is forced up through the interstices in the stoker among and through the fuel by the draft, and is thus supplied in the proper manner to promote combustion. If permitted to pass through the ash-pit, as it would in the absence of this door, the air consumed by the draft would be thus supplied through what would be substantially a by-pass and the effectiveness of the furnace thus greatly diminished.

When it is necessary to remove the ashes, the door is swung open by means of its pull-rod 76 and during this operation occupies the position indicated by the dotted lines in Fig. 1. At the same time the door 80 is swung up to closed position (see dotted lines) by means of the rock-shaft 81, having suitable arms 82, which come in contact with said door, said rock-shaft being operated by an arm 83 and a pull-rod 84, extending to the front of the furnace, where it can be easily reached by the operator. The combined surface of the door 80 and the plate 52 is sufficient to carry the ashes formed while the ash-pit is being cleaned, and the door 80 at this time (like the door 70 at other times) prevents the air from flowing through the ash-pit to the detriment of the operation of the furnace.

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

1. The combination, with a mechanical stoker, of a platform at the lower end and above the ash-pit for receiving the ashes therefrom as the fuel is consumed, a door hinged below said platform whereby the air is shut off from the ash-pit, a second door behind the platform which together therewith may completely cover the ash-pit, and means for operating said doors, thereby enabling the ash-pit to be cleaned without opening an air-passage therethrough, substantially as set forth.

2. In an inclined grate, the combination of a stepped series of stationary plates, plungers arranged between said plates, and means for intermittingly reciprocating said plungers, said means adapted to keep the plungers at the rear end of their strokes during their intervals of rest.

3. The combination, in a mechanical stoker, of a stepped series of stationary plates, plungers arranged between said plates, and means for intermittingly reciprocating said plungers, said means comprising a shaft, a cam thereon, a bar driven by said cam, and bell-crank levers connecting said bar to said plungers, said means being arranged to keep the

plungers at the rear of their respective paths of travel during their intervals of rest, substantially as set forth.

4. The combination, in a mechanical stoker, of a stepped series of stationary plates for receiving and carrying the fuel during the process of combustion, intermittingly-movable plungers arranged between said plates for feeding the fuel forward, an operating-shaft, a cam on said shaft the operating portion of which is concentric with the axis of rotation for a portion of its circumference and eccentric for another portion, a bar extending down beneath the plates and plungers and driven from said cam, and bell-crank levers having arms of different lengths forming the connections to said bar and said plungers, substantially as and for the purposes set forth.

5. The combination, in a mechanical stoker, of a stepped series of stationary plates for receiving and carrying the fuel during the process of combustion, movable plungers arranged between said plates for feeding the fuel forward, an operating-shaft, a cam on said shaft the operating portion of which is concentric with the axis of rotation for a portion of its circumference and eccentric for another portion whereby the member driven thereby is reciprocated during a portion of the rotation of said shaft and permitted to remain at rest during the other portion of said rotation, a bar extending down beneath the plates and plungers and driven from said cam, and bell-crank levers having arms of different lengths forming the connections between said bar and said plungers whereby the individual plungers are given different strokes, substantially as and for the purposes set forth.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 15th day of October, A. D. 1901.

HENRY GRANDISON COX. [L. S.]

Witnesses:
CHESTER BRADFORD,
C. S. FRYE.