

No. 775,041.

PATENTED NOV. 15, 1904.

W. A. KÖNEMAN.
SMOKE PREVENTING FURNACE.

APPLICATION FILED MAR. 3, 1904.

NO MODEL.

5 SHEETS—SHEET 1.

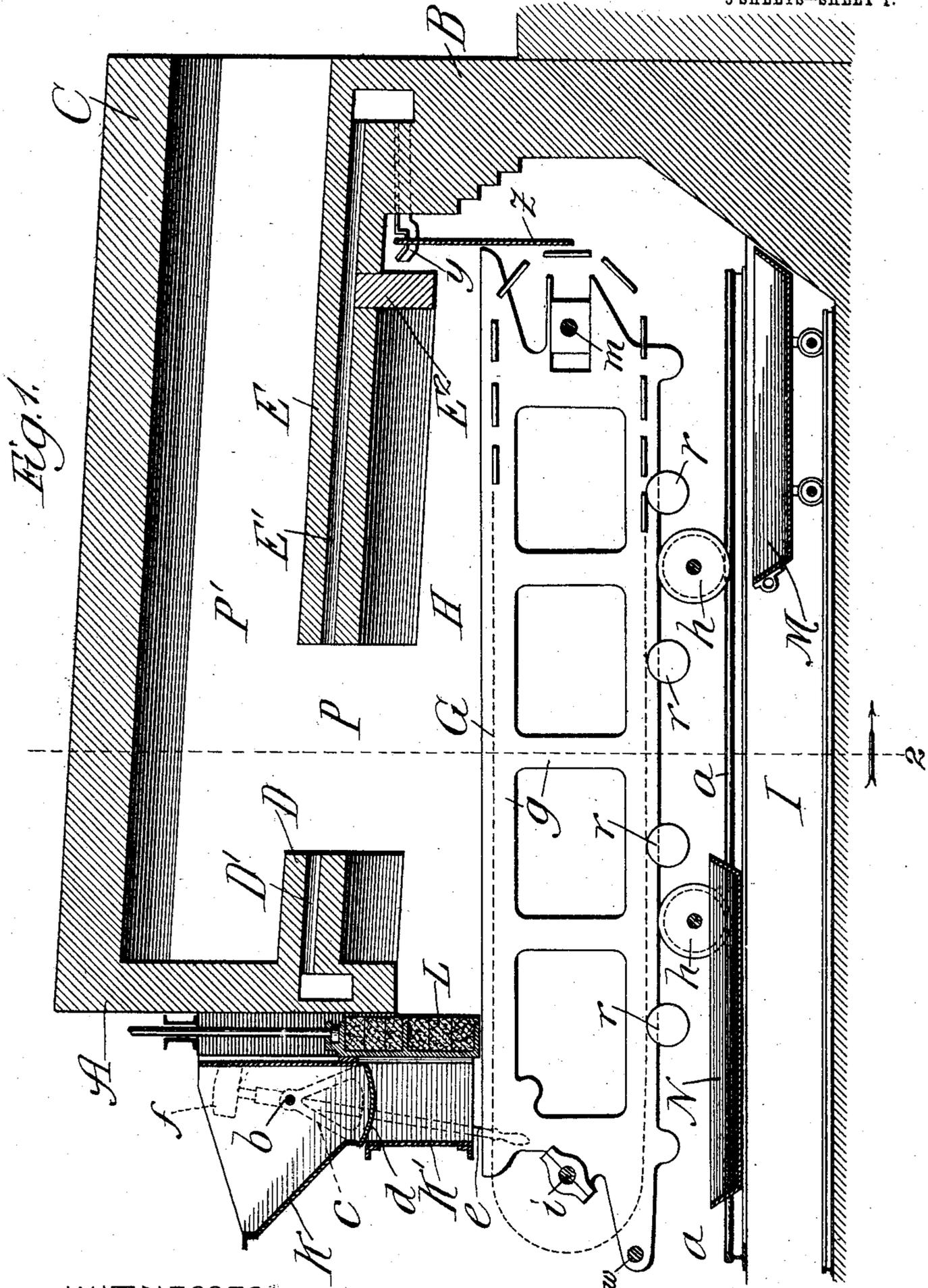


FIG. 1.

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Geo. H. Mayer

INVENTOR:
William A. Koneman,
BY
Dyrenforth, Dyrenforth & Lee
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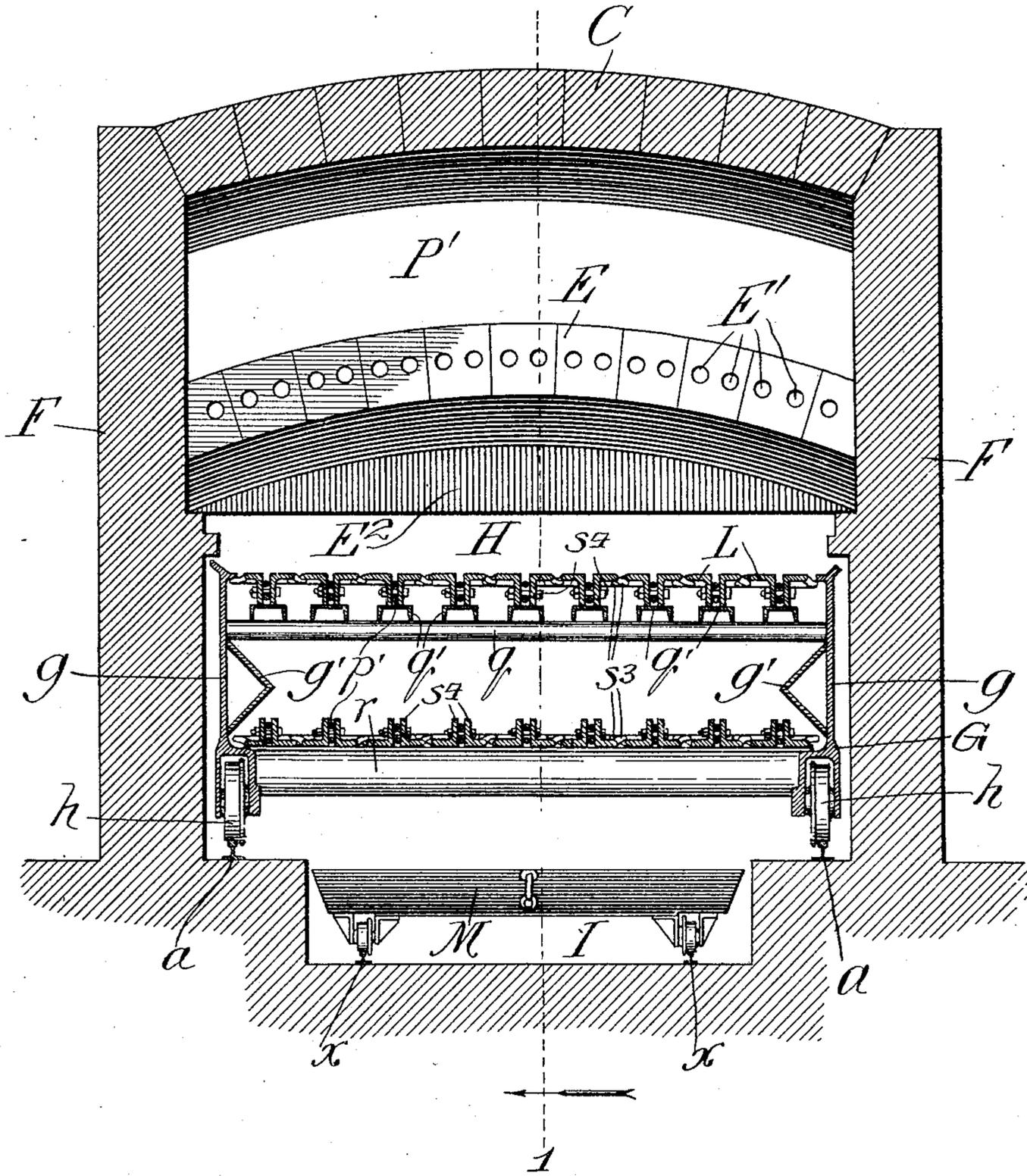
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5 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:
Walter N. Winberg.
Geo. M. Mayer.

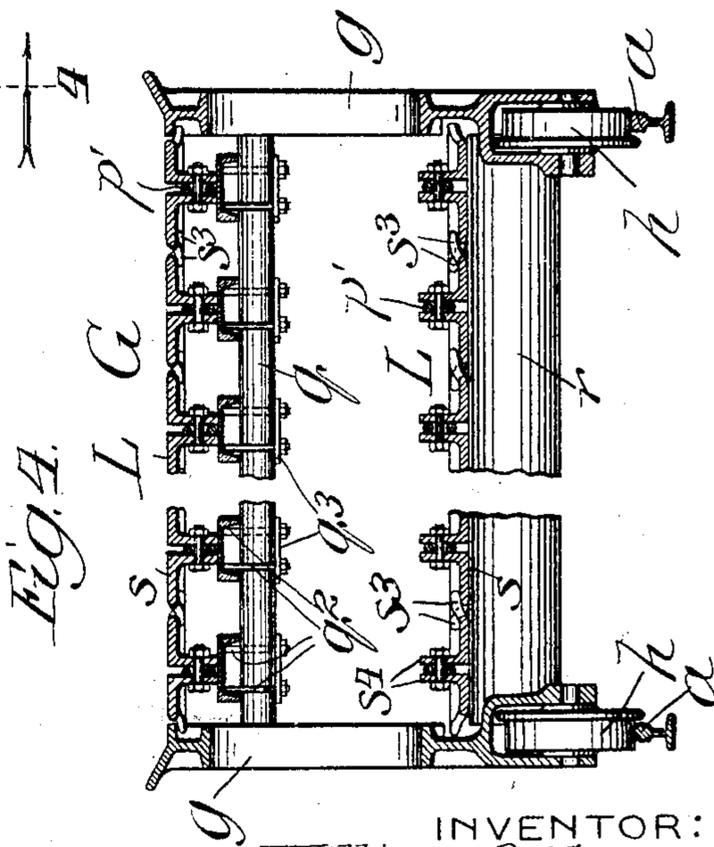
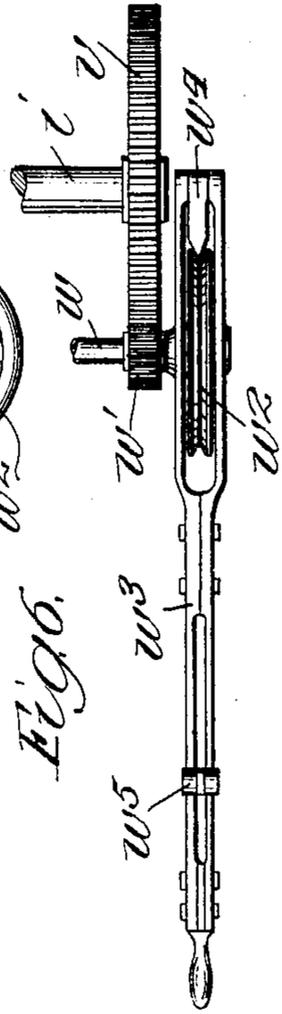
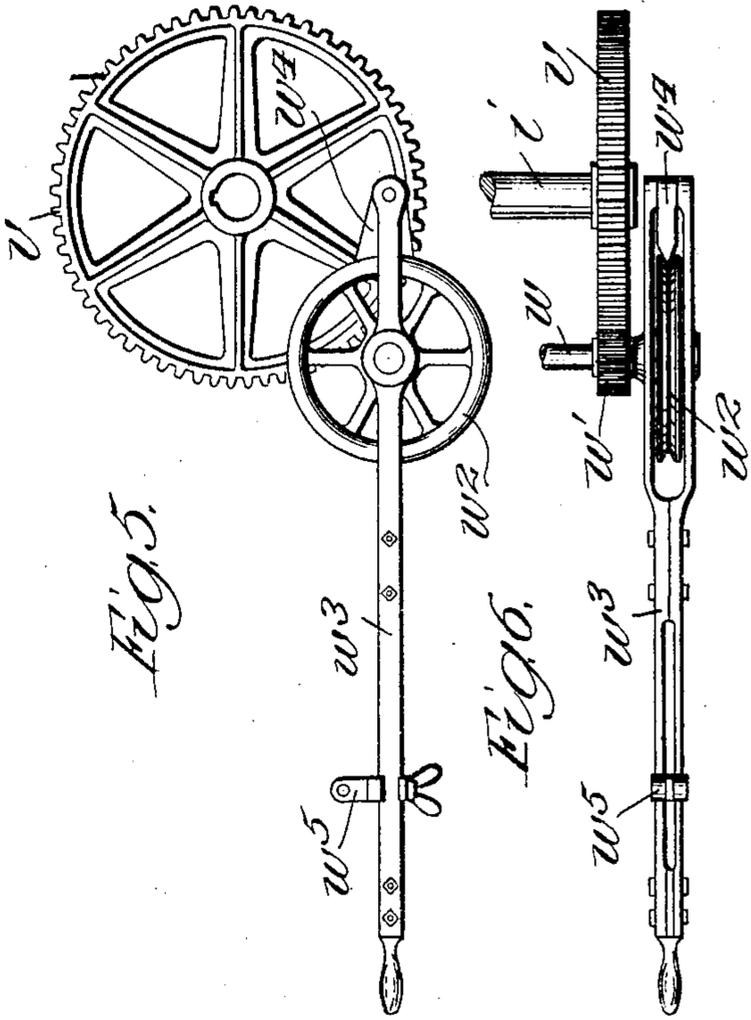
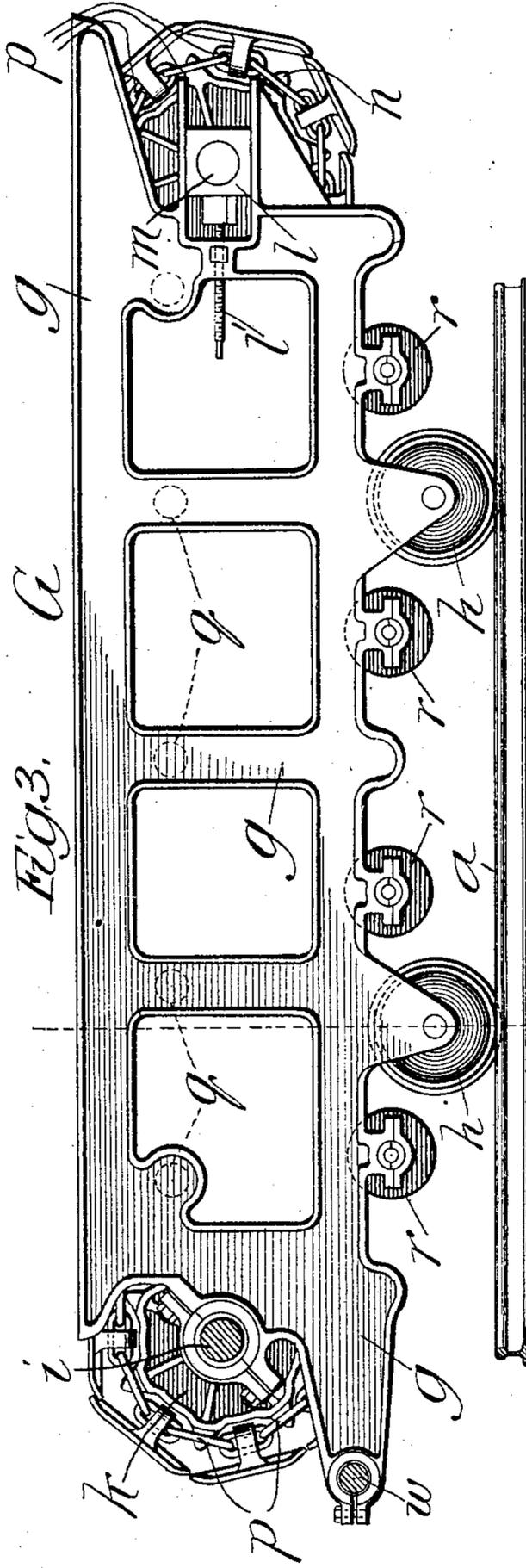
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SMOKE PREVENTING FURNACE.

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NO MODEL.

5 SHEETS—SHEET 3.



WITNESSES:

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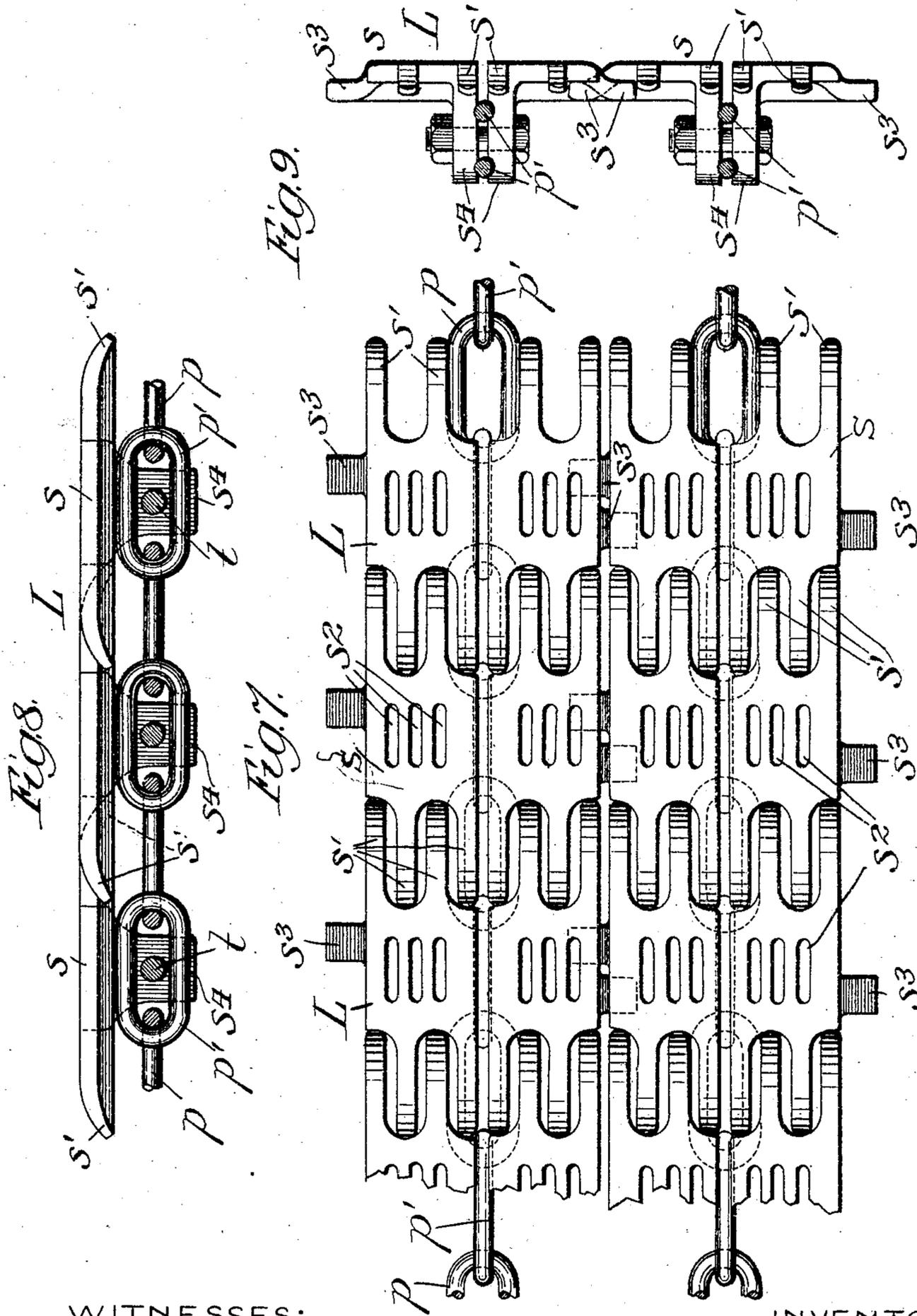
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NO MODEL.

5 SHEETS—SHEET 4.



WITNESSES:
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NO MODEL.

5 SHEETS—SHEET 5.

Fig. 10.

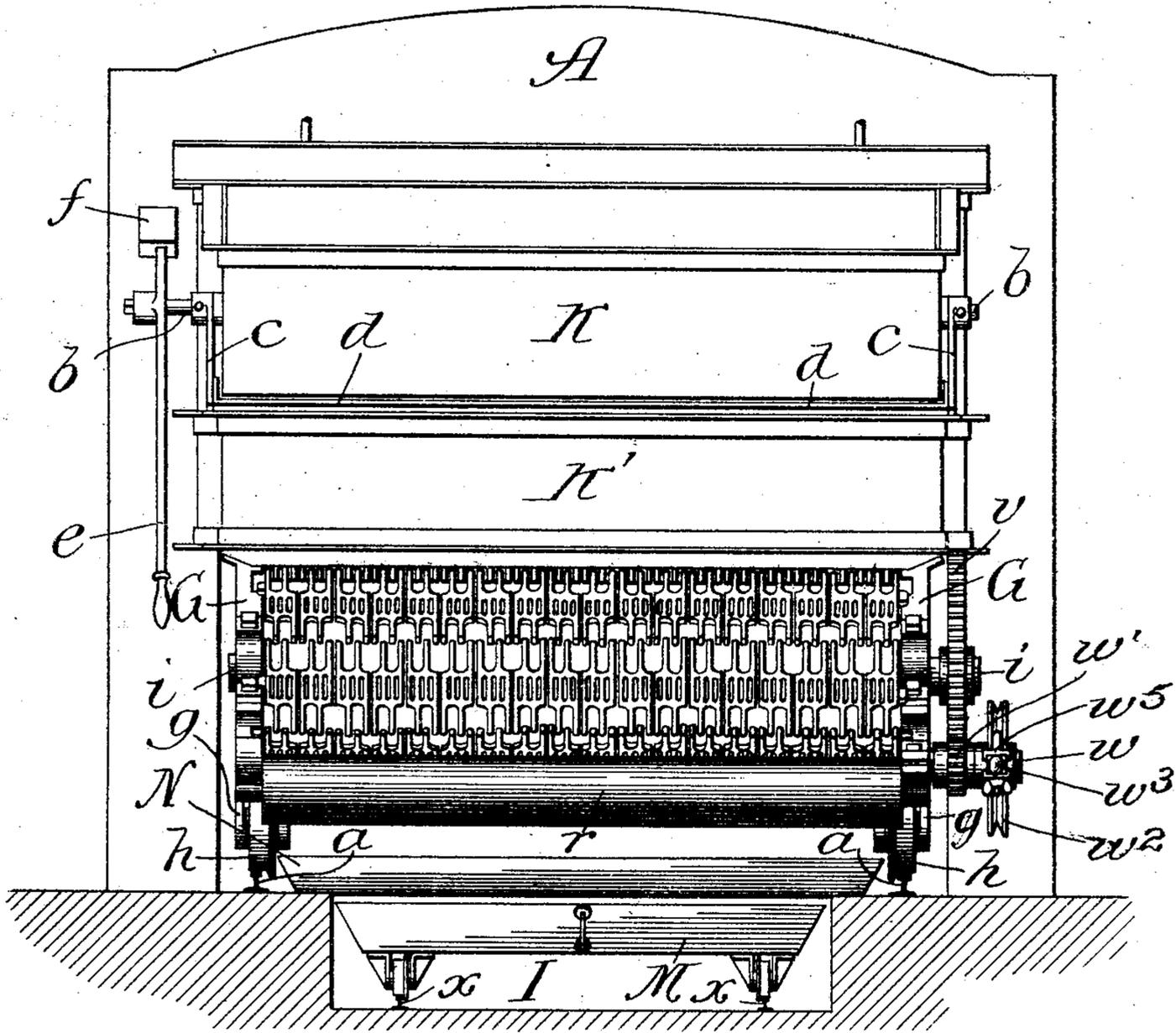
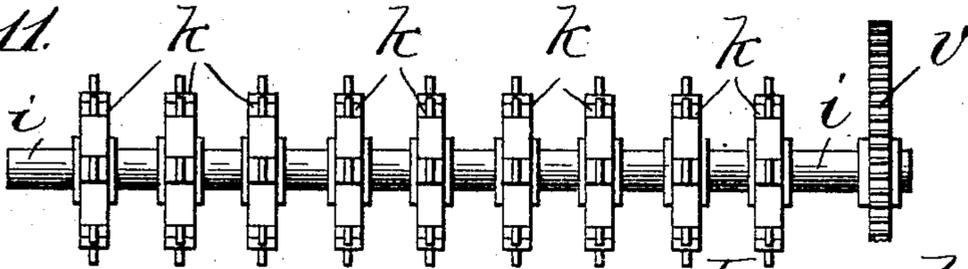


Fig. 11.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM A. KÖNEMAN, OF CHICAGO, ILLINOIS.

SMOKE-PREVENTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 775,041, dated November 15, 1904.

Application filed March 3, 1904. Serial No. 196,358. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. KÖNEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Smoke-Preventing Furnaces, of which the following is a specification.

My invention relates to improvements in furnaces of the type in which the feed of fuel to the fire-chamber is effected and regulated by a movable grate.

My object is to provide certain improvements in the construction of the fire-chamber, the movable grate, and other features appertaining to such a furnace, with a view to rendering the construction as a whole particularly durable, economical in the use of fuel, and practically free from the production of smoke even when the cheaper grades of bituminous coal are employed.

In the drawings, Figure 1 is a longitudinal section taken on line 1 in Fig. 2 and viewed in the direction of the arrow, the figure being in part diagrammatic; Fig. 2, a section on line 2 in Fig. 1; Fig. 3, a side elevation of a movable grate of an improved chain-grate type; Fig. 4, a broken section taken on line 4 in Fig. 3; Fig. 5, a side elevation of chain-grate-operating mechanism, Fig. 6 being a broken plan view of the same; Fig. 7, a broken enlarged plan view of a portion of my improved chain grate, Figs. 8 and 9 being, respectively, side and end views thereof; Fig. 10, a front elevation of the furnace, and Fig. 11 a broken detail view showing the grate-moving shaft with a driving-gear and sprocket-wheels thereon.

The furnace structure comprises the front wall A, rear wall B, top arch C, forward coking arch or diaphragm D, and rear arch or diaphragm E, with side walls F F. A truck-frame G, carrying the chain-grate mechanism, is mounted upon track-rails *a*, whereby the entire grate may be moved into and out of the furnace. The space beneath the arches D E above the chain grate constitutes the initial combustion-chamber H of the furnace, while the space beneath the chain grate forms the ash-pit I.

At the front of the furnace above the grate

is a fuel-feed hopper K, having a downwardly-extending spout K', terminating above the plane of the grate, and between the said hopper and spout and the wall A is a fire-door L, having means for raising and lowering it with reference to the grate.

Journaled in opposite ends of the hopper K is a rock-shaft *b*, carrying toward each end at the outer surfaces of the hopper frames *c*, supporting a concavo-convex plate or valve *d*, movable across the base of the hopper above the spout K'. The shaft *d* at one end is provided with a handle *e*, having a counterweight *f*. In the position shown the valve *d* closes the lower end of the hopper; but by swinging the lever *e* in the outward direction the shaft *f* will be rocked to rock the frame *c* and move the valve or plate *d* to open communication between the hopper and chute. By means of this construction the feed of fuel from the hopper may be quickly opened and closed, as desired.

In the present construction of chain grate the truck G is formed with sides or cheeks *g g*, mounted upon wheels *h*, running upon the track *a*. Journaled toward opposite ends in the forward ends of the cheeks is a shaft *i*, carrying a series of sprocket-wheels *k*, which in the present grate, constructed as shown in Figs. 2 and 10, are nine in number. Journaled in adjustable bearings *l* at the rear ends of the cheeks is a shaft *m*, carrying sprocket-wheels *n*, corresponding in number and position with the sprocket-wheels *k*. Running over the said sprocket-wheels are nine endless chains *p* of the well-known type illustrated. These chains at their alternate horizontally-disposed links are engaged and operated by the sprocket-wheels and are all of the same length, whereby shifting of the blocks *l* by means of the tightening-screws *l'* will tighten or loosen all the chains, as desired. Beneath the upper stretch of the chains is a series of tubes *q*, fastened at opposite ends to the cheeks and supporting longitudinal channel-bars *q'*, which extend normally nearly the full length between the sprocket-wheels. At the lower side of the chain-grate frame is a series of rollers *r*, disposed as indicated and journaled at opposite ends against the cheeks.

L is a series of grate-sections, each comprising a pair of companion members s , all constructed alike and each member comprising the body portion provided at each end
 5 with a pair of downwardly-curved fingers s' , with openings s^2 through the body portion and a laterally-projecting lug s^3 toward one end of the body portion. Extending from
 10 the under or reverse side of each member at one side thereof is an ear s^4 , having a central bolt-opening. The companion members of each section are fastened to the vertically-
 15 extending links p' of the chains p , resting at their ears s^4 against opposite sides of the said links and being fastened together by bolts t
 20 passing through the said ears and links. Thus each vertical chain-link p' of each of the nine chains carries rigidly attached thereto a pair of companion grate-section members s , and
 25 the fingers s' of one grate-section intermesh loosely with the fingers of the grate-sections in front of and behind them. The lower edges of the ears s^4 along the upper stretch of the
 30 chains slide upon the channel-bars g' , which thus sustain the upper stretch of the grate and maintain it level. The grate-sections along the under stretch ride upon the rollers
 35 r , which thus prevent their sagging and relieve the weight from the end sprocket-wheels. The lugs s^3 are at the outer under sides of each
 40 grate-section, whereby they engage the under surfaces of the adjacent grate-sections, as indicated, causing the grate-sections on the chains to interlock with the grate-sections on
 45 the chains at each side thereof. Thus it will be seen that the grate-sections not only intermesh with those in front of and behind them, but interlock with the sections at opposite
 50 sides. On the forward shaft i at one end beyond the cheek is a gear-wheel v , and journaled in the same cheek is a shaft w , carrying a pinion w' , meshing with the gear v . Also mounted
 55 upon the shaft w is a wheel w^2 , having a grooved peripheral friction face. Fulcrumed upon the shaft w is a lever w^3 , which straddles the wheel w^2 and carries at its short end a swinging friction-pawl w^4 with a wedge-shaped end bearing against the wheel w^2 in its
 60 peripheral groove. The pawl w^4 is so mounted upon the lever that as the forward end of the lever is raised the pawl will slide loosely along the wheel, and when the forward end of said lever is depressed the pawl will grip the wheel
 65 w^2 , whereby movement of the lever turns the shaft w and through it the shaft i and the sprocket-wheels carried thereby. The lever w^3 may be operated by hand when desired to advance the grate at its upper stretch in the
 backward direction, or the lever may be connected at an adjustable clip w^5 with a suitable reciprocating power device, which it is not thought necessary to show in this connection.

In the present construction the ash-pit I is
 65 somewhat narrower than the chamber H, as

indicated in Fig. 2, and is provided with track-rails x for a wheeled truck carrying an ash-pan M.

N is a pan resting upon the floor of the chamber H at opposite sides of the chamber I. 70

Mounted on hooks or the like y at the rear end of the fire-chamber is one or a series of swinging doors z , which extend normally downward just beyond the end of the chain grate. In front of the hooks y is a hanging
 75 wall E^2 , having a straight horizontal lower edge a little above the upper plane of the grate.

In operation the door L is raised or lowered to a plane above the grate to regulate the depth
 80 of the layer of coal to be fed into the fire-chamber. When the valve d is opened, coal from the hopper K will fill the chute, the mass resting upon the forward end portion of the grate. Any fine particles of the coal which
 85 drop through the grate between the grate-sections will fall into the pan N, which is placed there for the purpose of catching and saving such particles. The coal is advanced into the fire-chamber at desired or regular
 90 intervals by operating the lever w^3 , as described. Air to supply initial combustion enters through the forward end of the furnace and passes upward between the grate-sections to the coal-bed on the grate. It has
 95 been found in practice that the tendency of the draft of air thus supplied is to travel with greater force up the edge portions of the grate than through the center. Thus fuel at the edges of the grate is consumed
 100 more readily than that lying along the center of the grate. To overcome this difficulty, I provide on the inner sides of the cheeks g deflector-plates g' , which may be constructed as shown in Fig. 2 and which may extend the
 105 full length of the cheeks between the sprocket-wheels. These deflector-plates operate in practice to direct the air toward the center of the grate, and thus balance the draft, whereby the fuel will burn equally throughout. 110
 The travel of hot products of combustion from the more or less spent fuel toward the rear end of the grate is in the forward direction and owing to the comparatively low arch E reverberates against the fuel-bed along the
 115 middle of the chamber. From the chamber H these hot products of combustion pass through the opening P to the supplemental combustion-chamber P', being mixed in the opening or flue P with air entering from the outside
 120 through passages E' D'. The arch D operates as a coking-arch, and by preventing the hot products of combustion from the rear part of the furnace from being directed against the front end of the chamber H it protects the fire-
 125 door, &c., from becoming too highly heated. The grate-moving mechanism should be so operated that the fuel will be spent and nothing but ashes remain when the doors z are reached. Thus in the backward movement of the grate 130

the ashes are discharged into the ash-pan M, the doors z tending to prevent such a rush of air upward from the rear end as would produce undue heat dilution. The rear hanging wall E^2 besides protecting the hooks y tends to prevent an unduly large volume of air from rushing forward from the rear end of the chamber. I have found this hanging wall to be an important feature in preventing heat dilution, which is the result of too great a volume of air being mixed with the hot products of combustion.

The door or doors z offer just sufficient resistance to the movement of the cinders to cause them to back up and automatically fill the space under the cross-arch or hanging wall E^2 to shut off the draft from the rear end of the grate. The doors must not press against the cinder-bed with sufficient force to crowd cinders between the teeth of the grate members, as this would tend to result in breaking of the teeth when the latter come together after passing around the rear sprocket-wheels. For this reason I provide doors which swing readily and do not bear with any material weight against the cinders.

In Fig. 4 I have shown that the guides or channel-bars q' are fastened to the tubes q by bolts q^2 , fastened to the bar and passing down opposite sides of the tubes through stirrup-plates q^3 on the under sides of the tubes. This and other features of my construction may be variously modified without departing from the spirit of my invention as defined by the claims.

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

1. In a furnace, a fuel-advancing grate device comprising, in combination, a frame, shafts journaled in said frame, an endless grate formed of grate-sections arranged in a plurality of parallel endless series, the sections intermeshing with the next adjacent sections in the same series, an endless chain for each of said series to which the sections are removably and independently secured, a sprocket-wheel on each of said shafts for each of said chains, and shaft-driving means.

2. In a furnace, a fuel-advancing grate device comprising, in combination, a frame, shafts journaled in said frame, an endless grate

formed of grate-sections arranged in a plurality of parallel endless series, the sections intermeshing with the next adjacent sections in the same series and interlocking with the sections of the series at opposite sides thereof, an endless chain for each of said series to which the sections are removably and independently secured, a sprocket-wheel on each of said shafts for each of said chains, and shaft-driving means.

3. In a furnace, a fuel-advancing grate device comprising, in combination, a frame, shafts journaled in said frame, an endless grate formed of grate-sections arranged in a plurality of parallel endless series, the sections intermeshing with the next adjacent sections in the same series, laterally-extending lugs on the sections engaging the under surfaces of the sections at opposite sides, an endless chain for each of said series to which the sections are removably and independently secured, a sprocket-wheel on each of said shafts for each of said chains, and shaft-driving means.

4. In a furnace, a fuel-advancing grate device comprising, in combination, a frame, shafts journaled in said frame, an endless grate, formed of grate-sections arranged in a plurality of parallel endless series, the sections intermeshing with the next adjacent sections in the same series, an endless chain for each of said series, the sections being formed each of two companion members removably secured to the chain, a sprocket-wheel on each of said shafts for each of said chains, and shaft-driving means.

5. In a furnace, a fuel-advancing grate device comprising, in combination, a frame, shafts journaled in said frame, an endless grate formed of grate-sections arranged in a plurality of parallel endless series, the sections intermeshing with the next adjacent sections in the same series, an endless chain for each of said series having vertical and horizontal links, the sections being independently secured to the said vertical links, a sprocket-wheel on each of said shafts for each of said chains, and shaft-driving means.

WILLIAM A. KÖNEMAN.

In presence of—

M. I. MACKENZIE,

WALTER N. WINBERG.