

(No Model.)

2 Sheets—Sheet 1.

F. H. RICHARDS.
TRAVELING GRATE FURNACE.

No. 527,719.

Patented Oct. 16, 1894.

Fig. 5.

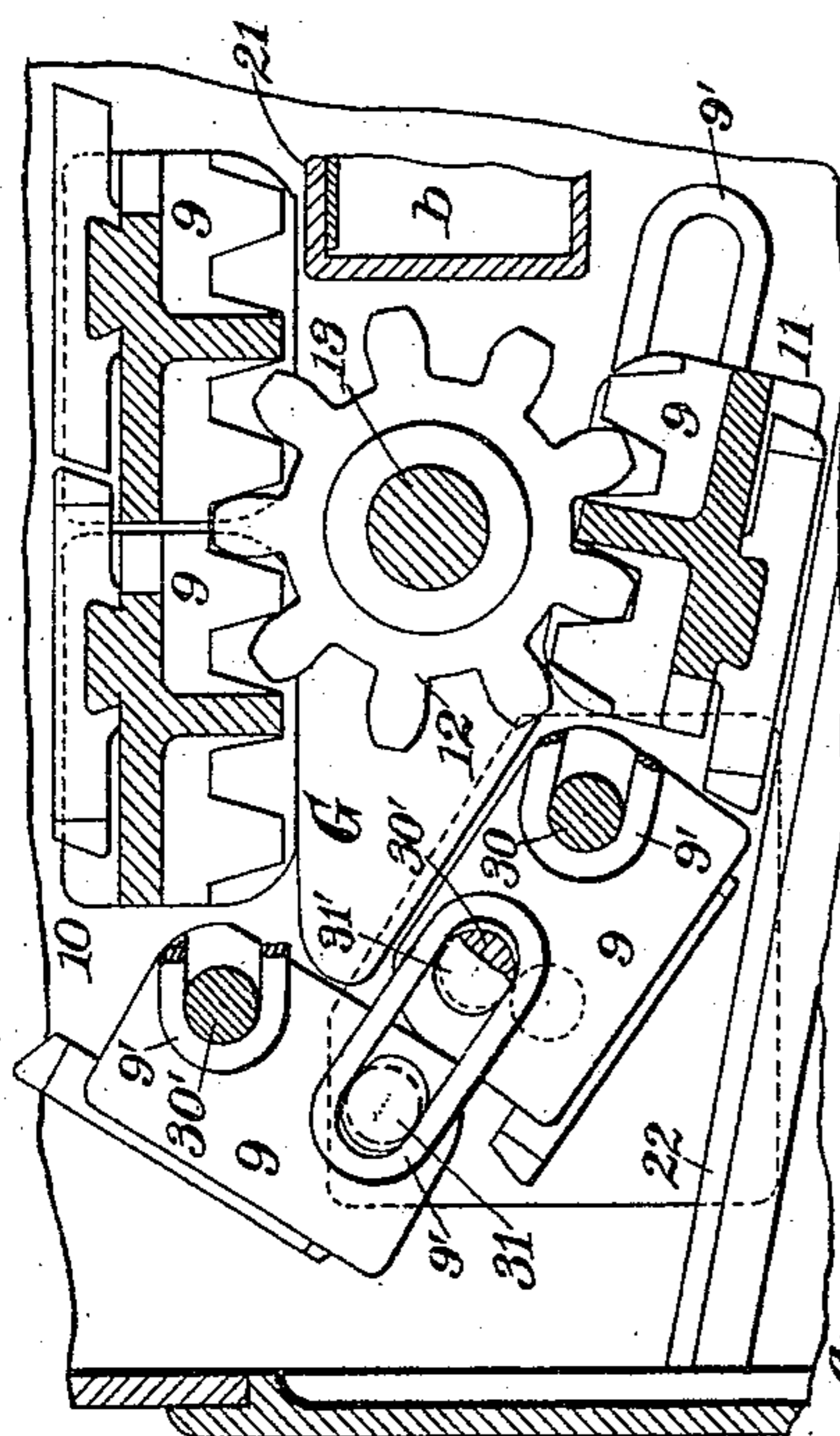
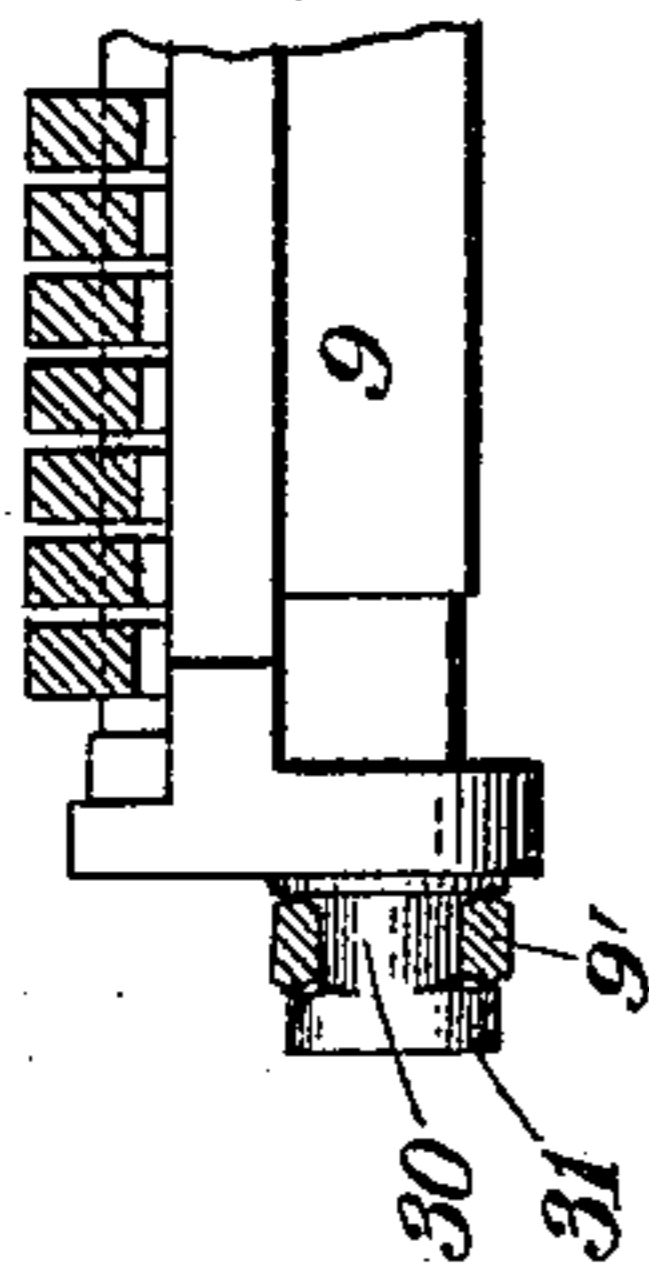


Fig. 4.

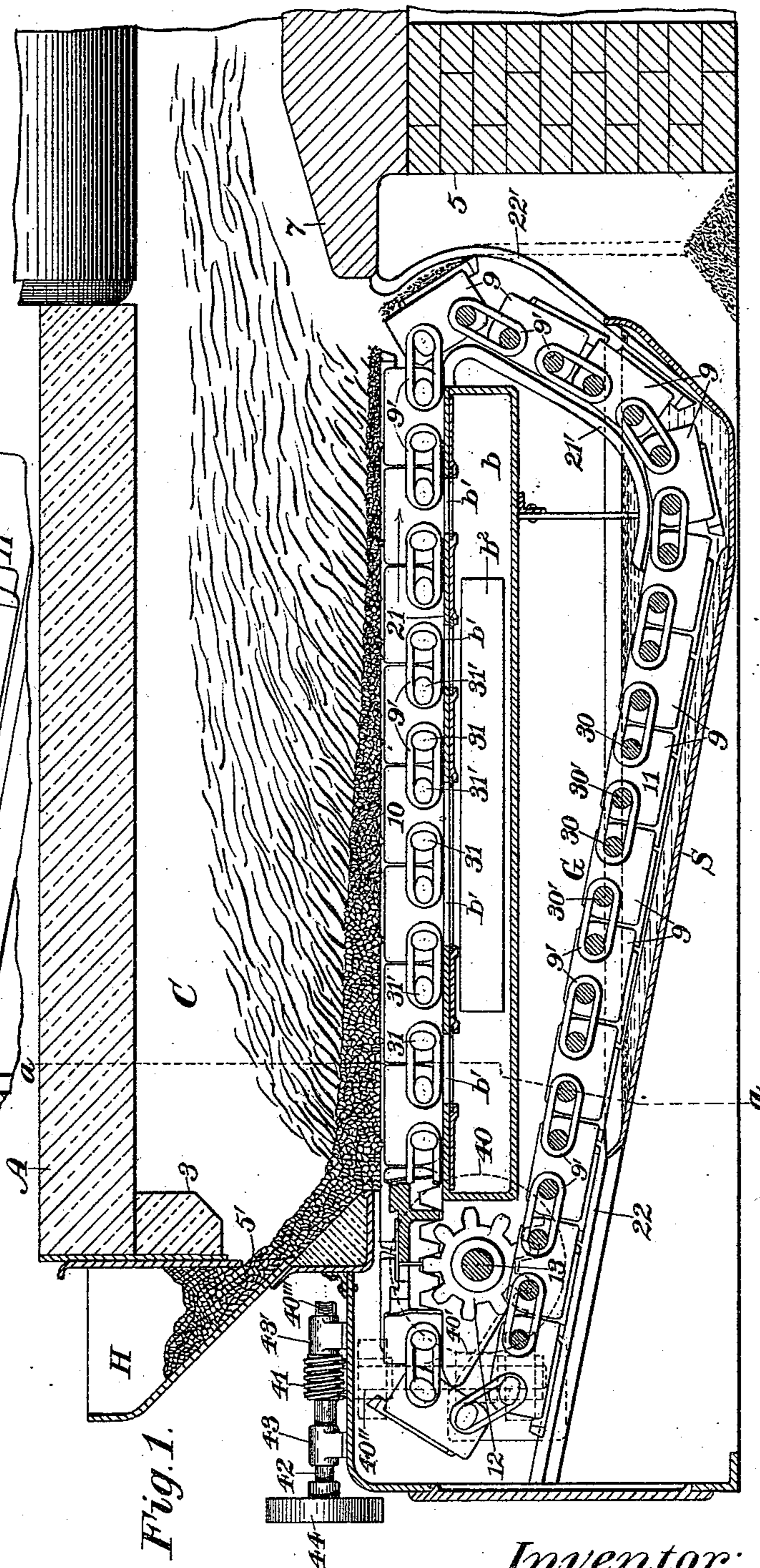


Fig. 1.

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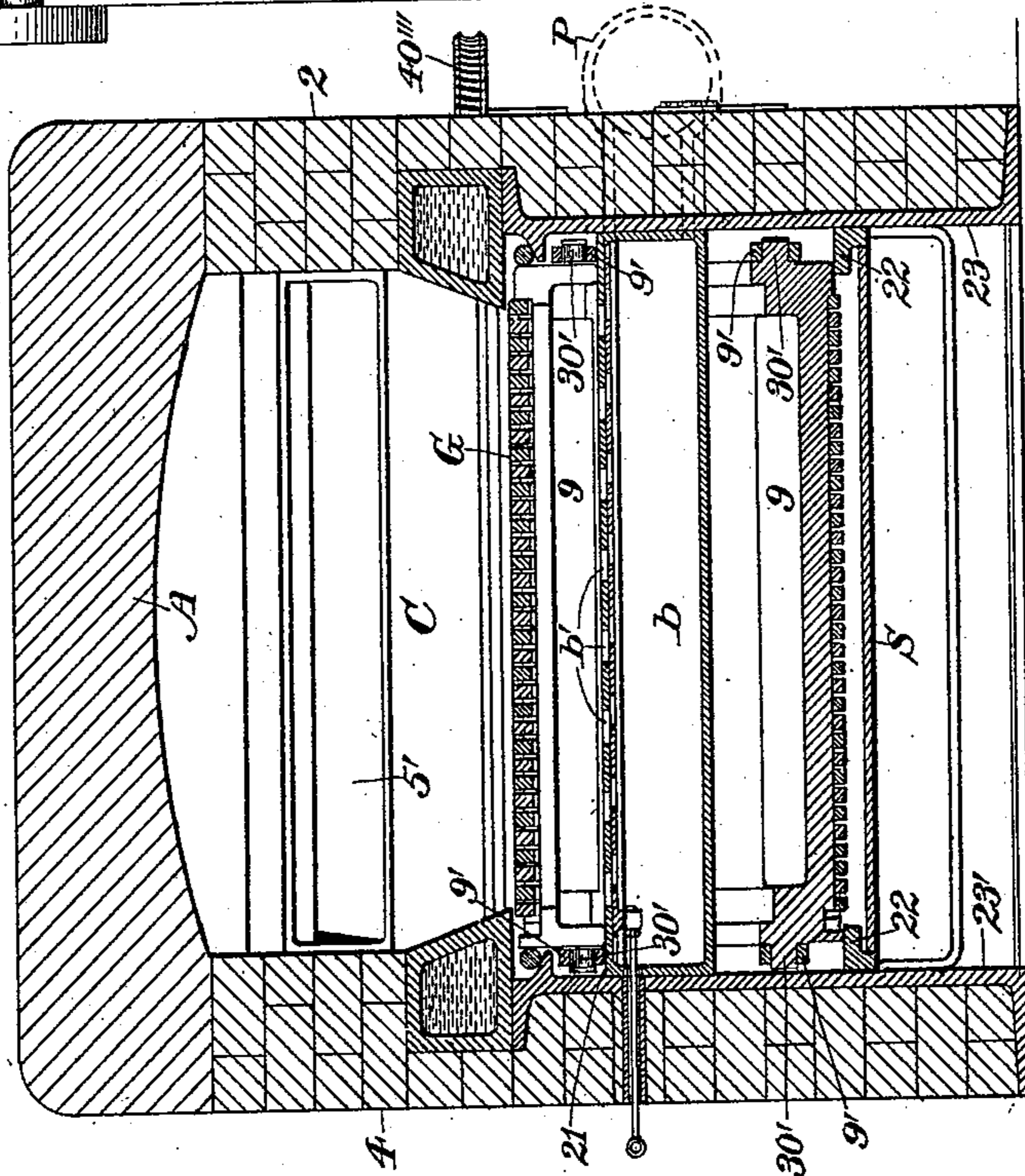
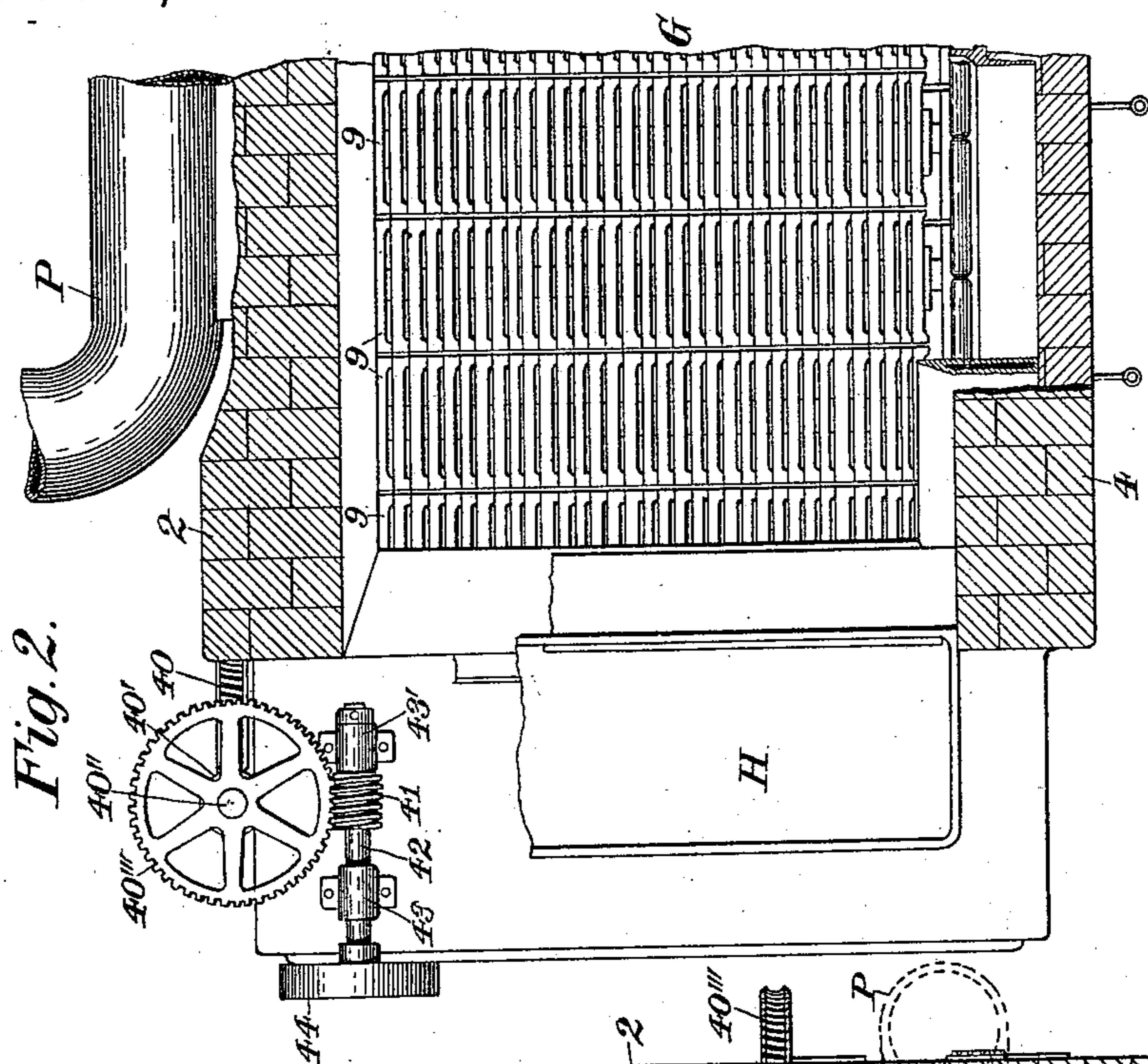
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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

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TRAVELING-GRATE FURNACE.

SPECIFICATION forming part of Letters Patent No. 527,719, dated October 16, 1894.

Application filed August 13, 1894. Serial No. 520,128. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Traveling-Grate Furnaces, of which the following is a specification.

This invention relates to traveling-grate furnaces, and has particular reference to that class of furnace described in Letters Patent of the United States, No. 510,551, granted to me December 12, 1893, to which reference may be had.

The object of my present invention is, primarily, to provide, in connection with a furnace of this class, an endless grate of improved construction and organization, comprising an upper and a lower run consisting of a series of grate-sections flexibly coupled together, and to provide means for imparting a traveling movement to the upper and lower runs of the grate simultaneously in opposite directions, and also to provide means for supporting the upper and lower runs of the grate independent of their actuating mechanism.

Another, and the chief, object of my present invention is to provide grate-sections and shifting-means therefor of such construction and organization that two adjacent grate-sections may be quickly coupled together or disconnected from each other by simply tilting one grate-section relatively to the other and without disturbing the continuity of the remaining portion of the endless grate.

In the drawings accompanying and forming part of this specification, Figure 1 is a sectional side elevation of a traveling-grate furnace embodying my present improvements. Fig. 2 is a sectional plan view of a portion of the forward end of said furnace. Fig. 3 is a vertical cross-section of the furnace, taken in line *a-a*, Fig. 1, looking toward the left hand in said figure. Fig. 4 is an enlarged sectional side elevation of the forward end of the furnace, showing a portion of the endless traveling grate and one of the revoluble drivers for imparting a traveling movement thereto. Fig. 5 is an enlarged sectional side elevation of a portion of one end of a grate-section.

Similar characters designate like parts in all the figures.

The furnace in connection with which my present improvements are shown is, or may be, as to the general construction and arrangement thereof, substantially the same as the furnace described in Patent No. 510,551, hereinbefore referred to, but it will be understood that my improvements are applicable to other furnaces than the one shown in said patent.

The furnace herein shown has the usual furnace-chamber, C, inclosed by the usual inclosing walls at the sides and ends thereof, and is also shown provided with the ordinary roof, A. The side-walls are designated by 2 and 4, respectively, the front end-wall by 3, the rear end-wall by 5, and the bridge-wall by 7. At the forward end of the furnace, this is provided with the usual fuel-hopper, H, from which coal is delivered to the furnace-chamber through the chute or opening 5', in a well-known manner. In the form thereof herein shown, the grate, which is supported for traveling movement in the furnace-chamber C, is in the nature of an endless grate, designated in a general way by G, and comprises the upper and lower runs, 10 and 11, respectively, the upper run 10 of which constitutes the furnace-floor proper.

As a means for supplying air to the fuel at varying pressures at successive points in the length of the furnace-chamber, to secure the best practical results in the combustion of the fuel, I have provided an air-blast apparatus, which air-blast apparatus is shown located underneath the fuel-carrying run of the grate and preferably consists of an inclosed air-supply chamber, *b*, extending, substantially, the entire length of the fuel-carrying portion of the grate and having successive series of valve-regulated outlet openings, *b'*, at successive points in the length of, and contiguous to, the upper run of the endless grate. This air-supply chamber is in the nature of a box having side, end, top and bottom-walls, and will be supported by some suitable connection with the side-plates, 23 and 23', which constitute the inner portion of the side-walls 2 and 4 of the furnace, said air-supply

chamber being shown with an inlet opening, b^2 , at one side thereof which communicates with an air-supply pipe P, as will be understood by reference to Figs. 1 and 2 of the drawings. The air-supply pipe P will receive its supply of air from any suitable air-pump or blower (not shown) in a well-known manner. As a means for regulating the effective areas of the successive series of outlet openings and air-supply chambers to thereby vary the air-supply at successive points in the length of the furnace-chamber C, I have provided a series of perforated slide-valves, one contiguous to each series of outlet openings, which slide-valves are provided with operating-rods extending through one side-wall of the furnace, as clearly shown in Figs. 1 and 3 of the drawings.

My present invention particularly resides in the improved construction and organization of traveling grate, and in the several means for supporting, guiding and actuating said grate, as will be hereinafter more fully described. In the preferred form thereof herein shown, the traveling grate, which, as before stated, is supported for traveling movement within the furnace-chamber, and which comprises the upper and lower runs 10 and 11, respectively, consists of a series of transversely disposed grate sections 9, flexibly coupled together by coupling-links 9', at opposite ends thereof, as most clearly shown in Figs. 1, 4 and 5 of the drawings, and as will be hereinafter more fully described.

As a means for supporting the upper and lower runs of the endless grate, and as a means for guiding the successive grate-sections and maintaining them in their proper relative positions during the traveling movement thereof, I have provided grate-supporting tracks, 21 and 22, located below the upper and lower runs, 10 and 11, respectively, of the traveling grate. The upper track 21 has a depending portion, 21', at the rear end thereof, which acts as a support and a guide for the grate-sections during their traveling movement around this end of their circuit, and the lower track 22 has an upwardly extending portion, 22', adjacent to the portion 21', which acts a guide for, and limits the lateral movement of, the grate-sections relatively to each other during their traveling movement around the rear end of the circuit, as will be understood by reference to Figs. 1 and 3 of the drawings.

In the form herein shown, the upper wall of the air-supply chamber b constitutes the middle portion of the upper track 21. This construction may, however, be modified without departure from my invention. The tracks 21 and 22, portions of them, will usually be formed integral with the side-plates, 23 and 23', of the furnace-chamber.

In the present instance I have shown the furnace provided with a water-seal adapted for preventing the escape of air from the air-chamber b through the lower run of the trav-

eling grate, and designated in a general way by S, which water-seal may be of the same general construction and organization as the water-seal described in Letters Patent of the United States, No. 510,588, granted to Eckley B. Coxe, December 12, 1893, to which reference may be had. In the form thereof herein shown, each grate-section consists of a grate-beam and a series of grate-bars removably secured to a longitudinal flange upon the upper side of said beam; said grate-bars being of the same general construction and being secured to the grate-beams in substantially the same manner as the grate-bars described in Letters Patent of the United States, No. 515,656, granted to Eckley B. Coxe, February 27, 1894, to which reference may be had for a more complete description of the construction and organization of said grate-bars.

The grate-beams, which are longitudinally flanged at their under sides and have transverse flanges or runners 27 at opposite ends thereof, and are provided at or near the opposite ends with depending driving-teeth adapted to be engaged by the teeth of the revoluble driver 12, as hereinafter more fully described, are provided at each end with two remote and longitudinally-disposed trunnions 30 and 30', respectively, having elongated link-engaging heads 31 and 31', at their outer ends, respectively. These trunnions 30 and 30' are preferably formed integral with flanges of the grate-beam, and will have their elongated heads set preferably at right angles to each other as shown in Fig. 1 of the drawings; that is to say, a longer axis of one of the trunnion-heads, as 31, will be at right angles to the shorter axis of the adjacent trunnion-head, as 31'. These heads 31 and 31' are formed upon the trunnions 30 and 30', respectively, by forming lateral flanges at opposite sides of said trunnions at their outer edges, the inner edges of said flanges being preferably tangent to the periphery of the trunnions. The grate-sections are, respectively, secured or coupled together, by coupling-links 9' engaging adjacent trunnions of adjacent grate-sections as shown in Figs. 1, 4 and 5 of the drawings, said links being normally held in place between the headed end of the trunnion and the end flange 27 of the grate-beam. These end flanges 27 constitute runners which rest upon and travel over the tracks 21 and 22, said runners forming a convenient means for supporting said grate-sections and retaining them in proper alignment relatively to each other.

By providing trunnions at opposite ends of the grate-section having elongated ends in angular disposition, and connecting the adjacent trunnions by loop shaped coupling-links extending around said trunnion intermediate to the headed ends thereof and the flanged end of the grate-sections as hereinbefore described, I am enabled to readily connect or couple together two or more grate-sections and to readily disconnect said sec-

tions from each other by tilting one grate-section laterally of the other until the longer axis of the headed end of one or other of the trunnions is parallel to the longer sides of the coupling-link, as will be readily understood by reference to Figs. 1 and 4 of the drawings.

As a means for imparting a traveling movement to the upper and lower runs of the grate in opposite directions respectively, I have provided two revoluble drivers 12, one only of which is shown, said drivers being preferably located at opposite sides of the furnace-chamber at the forward end thereof. Each driver, in the form thereof herein shown, is in the nature of a gear-wheel, the teeth of which are adapted for engaging the teeth of the successive grate-sections 9. These revoluble drivers are preferably mounted upon a single-shaft 13, one at each end thereof, said shaft being journaled in bearings (not shown) in the side-plates 23 and 23' of the furnace-chamber, and being provided at one end thereof with a worm-wheel 40, the teeth of which are in engagement with a worm 40' upon a vertical shaft 40'' journaled in bearings upon the side-wall of the furnace-chamber as illustrated in dotted lines in Fig. 1, said shaft 40'' carrying a worm-wheel 40''' the teeth of which are in mesh with the teeth of a worm 41 upon a horizontal driving-shaft 42, journaled in bearings 43 and 43'. This driving-shaft 42 is provided with a pulley, 44, by means of which it is driven by a belt (not shown), from any suitable source of power.

Having thus described my invention, I claim—

1. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of an endless grate supported for traveling movement within said furnace chamber and comprising a series of transversely-disposed grate-beams flexibly coupled together by coupling-links at opposite ends thereof and having driver-engaging teeth at their inner sides at opposite ends, a series of longitudinally-disposed grate-bars removably carried by each grate-beam, and revoluble toothed-drivers in engagement with the teeth of said beam, substantially as described.

2. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of two remotely- and longitudinally-disposed grate-supporting tracks, an endless grate having the upper and lower runs thereof supported for traveling movement upon said tracks, and comprising a series of transversely-disposed grate-beams having internal teeth at opposite ends thereof and each having two link-engaging trunnions at each end thereof, coupling-links removably engaging the adjacent trunnions of and flexibly connecting adjacent grate-beams, a series of grate-bars removably carried by each grate-beam, and revoluble drivers engaging the

teeth of and adapted for imparting movement collectively to said grate-beams, substantially as described.

3. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of an endless grate supported for traveling movement within the furnace-chamber and comprising a series of transversely-disposed grate-sections each of which has two link-engaging trunnions at each end thereof, with elongated heads in angular disposition relatively to each other, and coupling-links removably engaging the adjacent trunnions of adjacent grate-sections, substantially as described and for the purpose set forth.

4. In a furnace of the class specified, the combination with the furnace chamber and its inclosing walls, of an endless grate having an upper and a lower run, and consisting of a series of transversely-disposed grate-sections having two trunnions at each end thereof with elongated heads, so disposed with relation to each other that their axes are at right angles, oblong loop-shaped coupling-links movably engaging the adjacent trunnions of adjacent grate-sections, tracks in position and adapted for supporting the upper run of the traveling grate, tracks in position and adapted for supporting the lower run of the traveling grate, and means for simultaneously imparting a traveling movement to the upper and lower runs of the endless grate, in opposite directions respectively, substantially as described.

5. In a furnace of the class specified, the combination with a furnace-chamber and its inclosing walls, of the grate-supporting track 21, having the downwardly-extending portion at its rear end, the grate-supporting track 22, having the upwardly-extending portion at its rear end, substantially as described, the endless traveling grate supported for traveling movement upon, and guided by, said tracks and their extensions, and comprising a series of transversely-disposed grate-sections having headed trunnions at opposite ends thereof and flexibly connected together by coupling-links removably engaging said headed trunnions, substantially as and for the purpose set forth.

6. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of an endless grate having its upper and lower runs supported for movement upon tracks, and consisting of a series of transversely-disposed grate-beams having fixed trunnions at opposite ends thereof, and flexibly connected together by coupling-links engaging said trunnions, mechanism in position and adapted for imparting a traveling movement to the upper and lower runs of said grate, and an air-supply apparatus located intermediate to the upper and lower run-supporting tracks and

adapted for supplying air through the upper run of the endless grate to the fuel supported thereon, substantially as described.

7. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of an endless grate supported for traveling movement within said furnace-chamber, and comprising a series of transversely-disposed grate-sections having internal teeth at opposite ends thereof, and each of which grate-sections has two link-engaging trunnions at each end thereof, coupling-links movably engaging adjacent trunnions of adjacent grate-sections and revolvable drivers in position and adapted for engaging the teeth of successive grate-sections, substantially as described and for the purpose set forth.

8. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of two remotely- and longitudinally-disposed grate-supporting tracks, an endless grate having the upper and lower runs thereof supported for traveling movement upon said tracks, respectively, and comprising a series of internally toothed transversely-disposed grate-sections each of which has two link-engaging trunnions at each end thereof, and the coupling-links removably engaging the adjacent trunnions of adjacent grate-sections, substantially as described and for the purpose set forth.

9. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of an endless grate supported for traveling movement within said furnace-chamber and comprising a series of transversely-disposed grate-beams each of which has two link-engaging trunnions at each end thereof and each of which has internal teeth adapted for engagement by a toothed driver, coupling-links removably engaging adjacent trunnions of adjacent grate-beams, and a series of grate-bars transversely disposed with relation to and removably-secured to said grate-beams, substantially as described and for the purpose set forth.

10. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of two remotely- and longitudinally-disposed grate-supporting tracks, an endless grate having the upper and lower runs thereof supported for traveling movement upon said tracks, respectively, and comprising a series of internally-toothed transversely disposed grate-beams each of which has two link-engaging trunnions at each end thereof, coupling-links removably engaging the adjacent trunnions of adjacent grate-beams, and a series of grate-bars transversely-disposed with relation to and removably secured to said grate-beams, substantially as described and for the purpose set forth.

11. In the herein-described grate-section for traveling grates of furnaces of the class specified, it consisting of a grate-beam having two trunnions formed upon or fixed to each

end thereof with their respective axes located approximately midway between the longitudinal axes of said beam and the side edges of said beam, and having internal teeth at opposite ends at the under side thereof adapted for engagement by drivers, substantially as described and for the purpose set forth.

12. The herein-described grate-section for traveling grates of furnaces of the class specified, it consisting of a grate-beam having teeth at the under side and at opposite ends thereof, and having two link-engaging trunnions at each end thereof having laterally-projecting link-holding flanges or heads at their outer ends, which trunnions are fixed to or formed upon said grate-sections with their respective axes located approximately midway between the longitudinal axis of the beam and the side edges of said beam, substantially as described and for the purpose set forth.

13. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of an endless grate supported for traveling movement within the furnace-chamber and comprising a series of transversely-disposed internally-toothed grate-sections each of which has two link-engaging trunnions at each end thereof having laterally-projecting link-holding flanges or heads at their outer ends, and coupling-links movably engaging the adjacent trunnions of adjacent grate-sections, substantially as described and for the purpose set forth.

14. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of two remotely- and longitudinally-disposed grate-supporting tracks, an endless traveling grate comprising a series of transversely disposed grate-sections, each of which sections has driver-engaging teeth at the inner side of each end thereof and has two transversely-disposed runners one at each end thereof supported for movement upon one of said tracks and each of which runners has two link-engaging trunnions projecting outward from the outer side thereof, and coupling-links removably engaging adjacent trunnions of the runners of adjacent grate-sections, substantially as described and for the purpose set forth.

15. The herein-described grate-section for traveling-grates of furnaces of the class specified, it consisting of a grate-beam having a transverse supporting runner at each end thereof, two trunnions formed upon or fixed to each runner of said grate-beam with their respective axes in parallelism with and located approximately midway between the longitudinal axis of said beam and the side edges of said beam, the driver-engaging teeth formed upon the under side of each end thereof, substantially as described and for the purpose set forth.

16. The herein-described grate-section for traveling grates of furnaces of the class speci-

5 fied, it consisting of a grate-beam having a longitudinal grate-bar-supporting flange and having a transverse supporting runner at each end thereof with driver engaging teeth adjacent thereto, two link-engaging trunnions formed upon or fixed to each runner of said grate-beam with their respective axes in parallelism with and located approximately midway between the longitudinal axis of said

beam and the side edges of said beam, and to transversely-disposed grate-bars removably secured to the longitudinal grate-bar-supporting flange of said beam, substantially as described and for the purpose set forth.

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