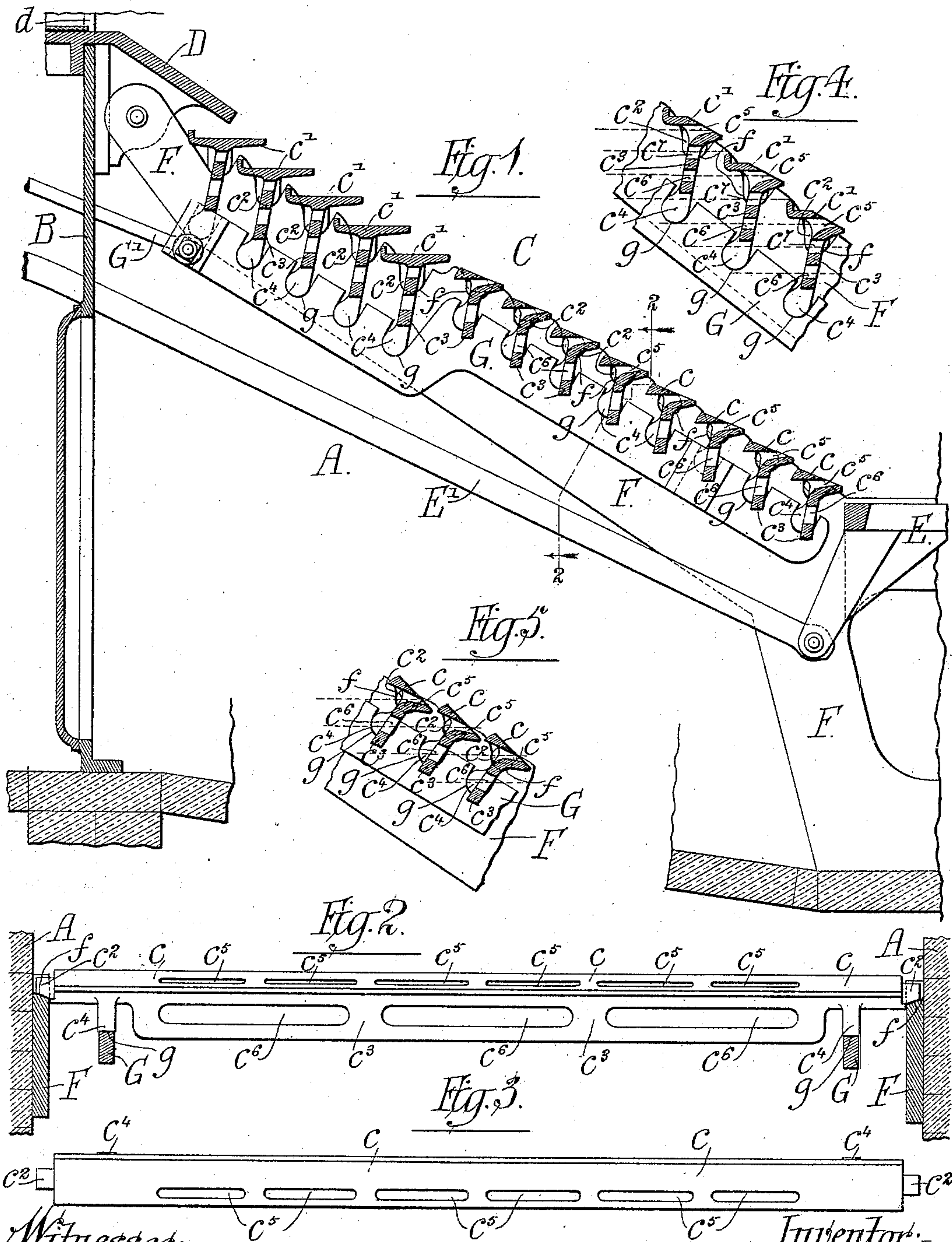


(No Model.)

W. R. RONEY.
GRATE.

No. 473,963.

Patented May 3, 1892.



Witnesses:-
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UNITED STATES PATENT OFFICE.

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GRATE.

SPECIFICATION forming part of Letters Patent No. 473,963, dated May 3, 1892.

Application filed June 30, 1891. Serial No. 398,019. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. RONEY, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Grates; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a
10 part of this specification.

This invention relates to furnace-grates and more especially to that class of inclined grates consisting of a series of horizontal transversely-arranged grate-bars having flat
15 top surfaces to receive the fuel and depending webs or flanges for giving stiffness to the bars—such, for instance, as are shown in a prior patent, No. 409,304, granted to me August 20, 1889.

20 In a prior application, Serial No. 356,340, filed June 23, 1890, by myself and John T. Arnold, is shown and described a construction in grates of the character referred to by which the depending flanges of the bars are provided with
25 longitudinal slots arranged opposite or in line with the horizontal openings or spaces between the bars, so that a "slicing-bar" or other suitable implement may be inserted from the front of the grate through said slots and be-
30 tween the grate-bars for the purpose of stoking or stirring the mass of coal upon the grate.

The present invention embraces an improved construction by which the upper parts of the bars are inclined and provided with
35 longitudinal apertures extending longitudinally through the inclined top or supporting faces thereof to the rear or outer surfaces, and in which the longitudinal slots in the depending flanges, instead of being arranged op-
40 posite the spaces between the bars, are arranged opposite the said slots or longitudinal apertures in the upper parts of the bars. By this construction a slicing-bar or other suit-
45 ably-shaped tool may be inserted from the front of the grate through the slots in the depending flanges and also through the slots or openings in the upper parts of the bars for the purpose of stoking or stirring the fire and
50 at the same time of removing any adherent clinkers or masses of fuel which may attach themselves to the surfaces of the bars.

The grate-bars shown in said prior patent, No. 409,304, are rocking grate-bars, and auto-
matic feed devices are shown in said patent for continually moving or actuating the same, 55
so as to produce a practically-continuous feed of the fuel downwardly along the inclined surface of the grate. A grate provided with bars made as herein set forth may be em-
ployed with advantage when such actuating 60
devices are used, inasmuch as it may often be found desirable to insert through the bars a slicing-bar or other tool to loosen or remove the clinkers or masses of the latter which ac-
cumulate on the grate even when a rocking 65
motion of the grate-bars is relied upon for feeding the fuel downwardly along the sur-
face of the grate. A grate embracing the improvements herein described may, however,
be used with advantage in a stationary or 70
non-rocking grate, it obviously being practicable, especially in the case of small grates, to properly feed the fuel downwardly along
or over the inclined grate by agitating the
fuel by the use of a hand-tool inserted 75
through the slots or openings provided for the purpose. In many cases, however, it may not be found necessary to use grate-bars
constructed in accordance with the present
improvement throughout the entire length of 80
the grate—as, for instance, owing to the fact that the clinkers are more likely to accumu-
late where the fire is hottest—to wit, at the lower part of the inclined grate—the grate-
bars constructed in accordance with the pres- 85
ent invention may be employed at the lower part of the grate and grate-bars of other con-
struction—such, for instance, as those shown in said prior application, Serial No. 356,340—
may be employed in the other part of the 90
grate, and a construction of this kind is illustrated in the accompanying drawings.

In the accompanying drawings, illustrating my invention, Figure 1 is a central vertical section of a furnace-grate constructed in ac- 95
cordance with my invention. Fig. 2 is a detail cross-section of the same, taken upon line 2 2 of Fig. 1. Fig. 3 is a plan view of the grate-bar shown in Fig. 2. Fig. 4 is a detail sectional view corresponding with Fig 1 and 100
illustrating a modification. Fig. 5 is a similar detail sectional view showing the lower

set of grate-bars of Fig. 1 in a different position.

As illustrated in said drawings, A A are the side walls of the furnace, and B the front wall thereof.

C indicates as a whole an inclined grate arranged within the furnace, and D an inclined plate located over the uppermost bar of the grate C, and upon which the fuel is delivered through a passage *d* in the front wall of the fire-box either by hand or by an automatic feeding device.

E is a horizontal dumping-grate located at the rear of the inclined grate C, and E' a rod for operating said dumping-grate.

The grate C herein illustrated is composed of two sets of transverse horizontally-arranged grate-bars, the set *c c c*, forming the lower part of the grate, being constructed in accordance with my present improvement, while the set *c' c' c'*, at the upper part of the grate, is constructed in the same manner as the bars illustrated in said prior application, Serial No. 356,340. All of the grate-bars belonging to both sets are provided at their ends with bearings or trunnions *c² c²*, which rest in notches *f f f* in the upper edges of stationary inclined supporting-bars F F, which are secured against the opposite side walls of the furnace. All of said grate-bars, furthermore, are provided with depending webs or flanges *c³ c³*, acting to give stiffness to the bars, and with top surfaces on which the fuel rests, the front and rear edges of the bars being continuous or non-fingered, while the bars are arranged in a stepped position, so that the rear edge of one bar is adjacent to but somewhat distant from the edge of a subjacent bar, vertical spaces being thus provided between the adjacent edges of the bars to allow the necessary openings for the influx of air.

In the particular construction illustrated the grate-bars are hung in such a manner as to enable them to be rocked or oscillated in the manner set forth in said prior patent, No. 409,304, and for this purpose are provided with depending arms *c⁴ c⁴*, which engage with notches *g* in a reciprocating rod or bar G, which bar is adapted for endwise movement in a manner to rock the grate-bars in their bearings on the supporting-bars F. An actuating-rod G' is attached to the bar G, and serves as a means of communicating motion to said bar G from an external actuating device—such, for instance, as that shown in said prior patent above referred to. As hereinbefore stated, however, the employment of means for rocking the grate-bars is not essential as far as the present invention is concerned. When devices are employed for rocking the bars, however, the fuel placed upon the inclined grate is carried along or down over the grate-bars during the process of combustion through the rocking movement of the several grate-bars, as fully set forth in said prior patent.

The several grate-bars *c c c*, which more especially embody the present invention, are somewhat inclined upon their top surfaces in the same direction as the surface of the grate as a whole, but at a less inclination than that of the grate, so that the top surfaces of the several bars form in effect a series of steps, the top surfaces of which, however, are inclined instead of being horizontal. In the upper part or body of each bar, above the depending flange *c³* thereof, is formed a series of longitudinal and horizontal slots or openings *c⁵*, arranged parallel with the edges of the bar and extending from the outer or rear surface thereof through the inclined top surface of the grate in a generally-horizontal direction, the rear or lower opening of the said slot or aperture being located at the junction of the depending flange with the body of the bar, so that the said aperture or opening extends from the rear or outer surface of the flange and over the top of the same to the supporting-surface of the grate-bar. The depending flange of each bar *c c c* is also slotted, and the slots *c⁶* therein are arranged horizontally opposite the openings or apertures *c⁵*, which are formed in the body of the bars, as above described. From this arrangement of the slots or openings in the webs or flanges it is obvious that, notwithstanding the fact that the flange of each grate-bar extends downwardly past the next adjacent grate-bar, said slots afford a means of inserting from the front of the grate a tool or implement which may be thrust through the slots *c⁵ c⁵* for the purpose of stirring the fuel resting on the grate or removing clinkers from the surfaces of the grate-bars. In the case of rocking grate-bars, such as those shown, the slots or openings *c⁶* are made wide enough to permit the insertion of the slicing-bar or other implement when the grate-bars are inclined, as well as when they are horizontal. For the same purpose the slots or apertures *c⁵* are shown as made wider at the outer or rear surface of the grate-bar than at the top or inclined surface thereof, so that the oscillatory movement of the grate will not prevent the insertion of a poker or other implement through said slots or apertures.

As herein shown, the flanges of the bars *c c c* are relatively narrow, the drawings showing them much narrower than those of the bars *c' c' c'*, and said flanges contain but one set of slots or openings. It will be understood, however, that with deeper webs or flanges two sets of slots or openings may be employed therein in the same manner as illustrated in connection with the said bars *c' c' c'*, the number of slots or openings employed depending upon the vertical depth of the webs or flanges, which may be varied in number according to the length of the grate-bars and the strength or stiffness required therein.

The employment of the longitudinal slots or apertures *c⁵* has the advantage not only of affording access to the supporting-surface of

the grate-bars from the front of the grate, but they admit of a better supply of air to support combustion and facilitate the cooling of the grate-bars, and thereby lessen the chances of the clinker becoming fused and adhering to the bars by the excessive heating or fusion of the metal composing the bars. It will of course be understood that the said slots or openings $c^5 c^5$ enable the attendant to properly stir the fire by a hand implement and also, when necessary, to aid the downward movement of the fuel and clinker over the grate-bars toward the bottom of the grate.

The slots or openings c^5 in the bars and also the slots c^6 in the depending flanges of the bars are not shown as extending continuously the full length of the grate-bars; but intermediate connecting-pieces are present to connect the longitudinal parts of the bars and flanges with each other, so that the bar as a whole is made sufficiently strong and rigid. It is of course understood, however, that the number and location of these connecting-pieces is immaterial and that any construction may be employed adapted to give sufficient strength and rigidity to the bars. It is, furthermore, unnecessary that each grate-bar should be cast or formed in a single piece, and bars may be constructed with suitable slots or openings of proper shape to produce the results herein described when made either of cast or wrought metal and when made in one or more parts or pieces.

It is obviously practicable to employ the novel construction above described in connection with grate-bars, which are also constructed to provide for the insertion of a slicing-bar or poker horizontally between the adjacent margins of the bar in the manner set forth in said prior application and as illustrated in the case of the bars $c' c' c'$ of Fig. 1. Such use of the present improvement is illustrated in Fig. 4, wherein grate-bars $c' c' c'$ are shown having horizontal slots or apertures c^5 , extending from front to rear and through the inclined upper surfaces of the grate-bars, as hereinbefore described, with slots c^6 in the depending flanges, arranged horizontally opposite said openings $c^5 c^5$, and other intermediate slots or openings $c^7 c^7$, arranged opposite the spaces between adjacent grate-bars to allow the insertion of a slicing-bar through said spaces, as well as through the said openings c^5 .

It will be noted that the grate-bars ccc , (shown in Fig. 1 as embodying my improvement,) while arranged to overlap each other, in order to avoid leaving vertical spaces between the bars, are so constructed at their adjacent edges that the rear edges of the lower bars may be moved upwardly past the forward edges of the upper ones in the manner indicated in Fig. 5, which shows the changed position of said bars at the limit of their movement when rocked. The construction of the bars so that their adjacent edges may be moved past each other, as above indicated, is a desirable one

for those parts of the grate at which the clinker is liable to form in a solid mass, inasmuch as the rocking of the bars in the manner described greatly facilitates the breaking up of fused masses of fuel or clinker which are liable to form over or in contact with the grate-bars. It will of course be understood, however, that this particular construction in the bars is not essential in all cases where the bars are slotted or apertured in the manner herein described, inasmuch as efficient stoking may be accomplished and the clinker sufficiently broken up by the action of the slicing-bar or other tool inserted through said apertures or slots in the manner heretofore described. It will of course be understood that in the construction shown in Fig. 4 the breaking up of the clinker will be sufficiently accomplished by a tool inserted through the apertures in the grate-bars or through the spaces between the same, the bars in that case not being adapted to be rocked past each other at their adjacent edges.

It will be observed in connection with all of the forms of grate-bars herein shown and above described that practically no spaces are provided through which fuel may fall vertically through the grate, all of the spaces or slots through which the stoking or stirring of the fuel is accomplished being arranged horizontally, so that the ashes or particles of fuel which fall from the advance or lower edges of the bars or from the upper edges of the openings therein will be caught by and rest upon the horizontal surfaces below said edges. This construction is especially important in the use of "slack" or fine coal for fuel. The grate illustrated in the drawings, for instance, is more especially intended for slack coal, and for this reason more especially are the upper bars $c' c' c'$ of the grate made horizontal and overlapping in the manner shown. The utility of this construction will be rendered obvious when it is understood that the fuel is first heated and coked while resting upon the upper grate-bars $c' c' c'$, which, as will be clearly seen from the drawings, are so constructed as to prevent any part of the finest fuel from falling through the same. After the fuel is coked, however, it loses its pulverulent character and the particles are partially fused and adhere together, so that in passing downwardly over the grate they are not liable to fall through the spaces between the lower grate-bars ccc , except as it may escape in small quantities in the form of ashes. The lower grate-bars ccc , while not being arranged to overlap so as to prevent possibility of the escape of fine or granular fuel between them, are close enough together to practically obviate liability of the downward escape of the burning pieces or particles of fuel, while the openings through said bars, being practically horizontal, afford no means for such downward escape of the fuel. It will of course be understood, however, that in grates adapted for burning some kinds of fuel all of the bars may

be made like the bars *c c c* of Fig. 1, or part of the grate may be formed of bars of this kind and a part of the grate of bars of a kind unlike any herein shown.

5 I claim as my invention—

An inclined grate consisting of horizontally-arranged grate-bars having inclined top surfaces and depending webs or flanges, said grate-bars having openings or slots extending
10 horizontally from their inclined faces to their rear or outer surfaces, and the depending webs

or flanges being provided with longitudinal slots or openings arranged opposite said slots or openings in the grate-bars, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence
15 of two witnesses.

WILLIAM R. RONEY.

Witnesses:

C. CLARENCE POOLE,
IRVINE MILLER.