

GRATE.

Patented Mar. 12, 1912.

3 SHEETS—SHEET 1.

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Fig. 1.

Fig. 2.

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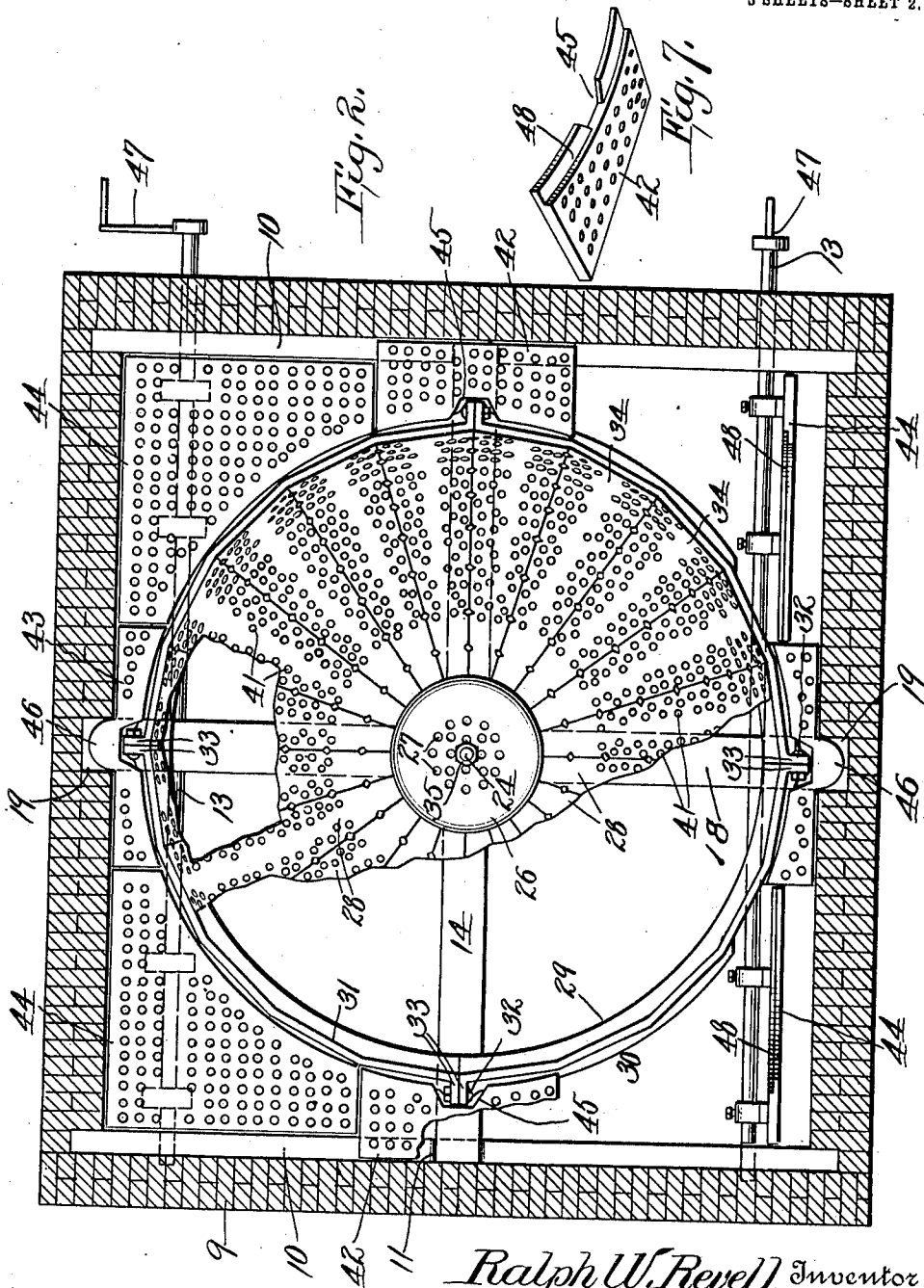
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3 SHEETS—SHEET 2.

1,019,837.



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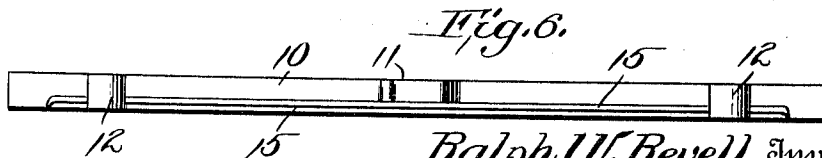
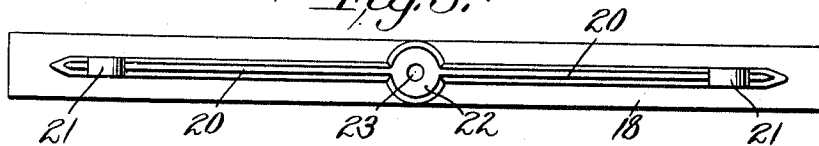
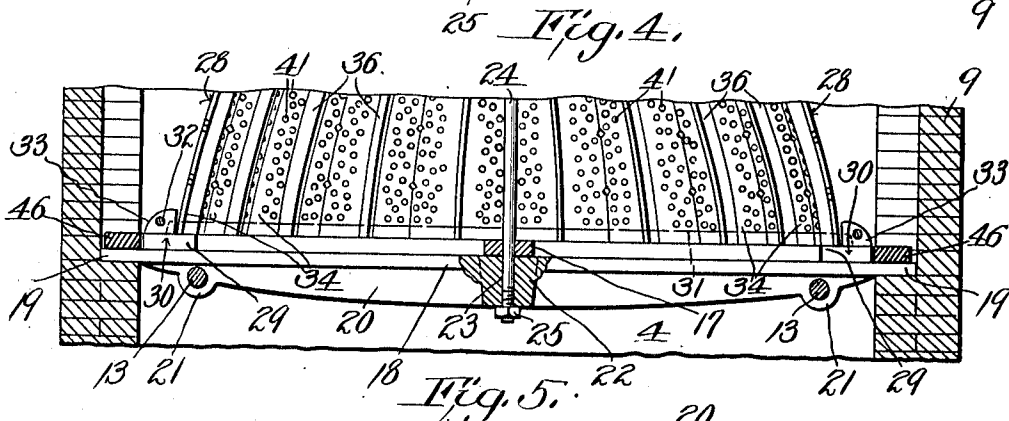
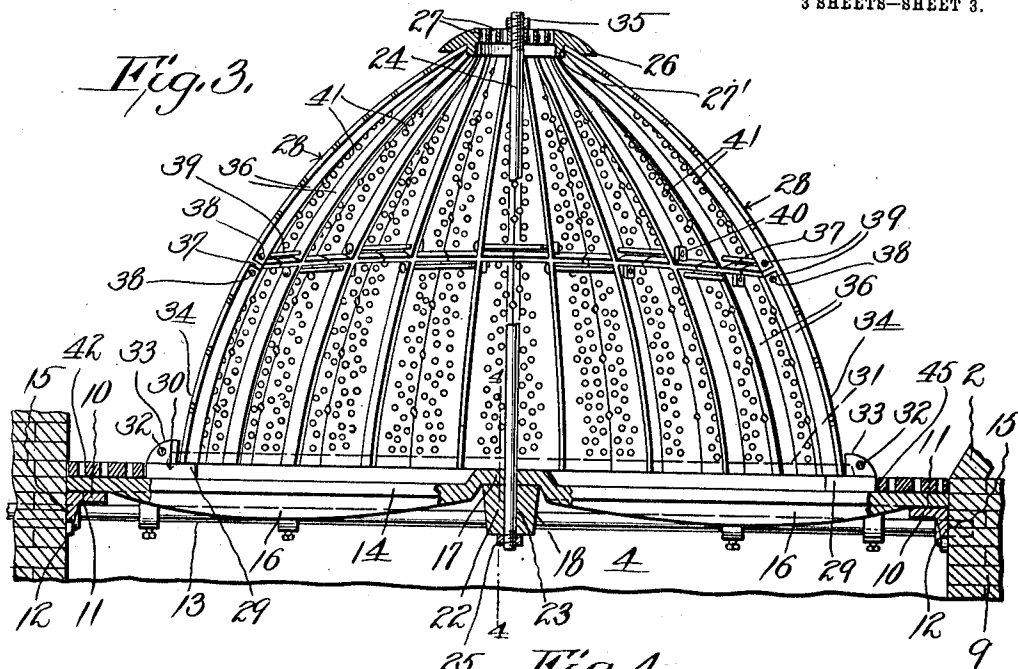
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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GRATE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RALPH W. REVELL, a citizen of the United States of America, residing at Raymond, in the county of Pacific and State of Washington, have invented certain new and useful Improvements in Grates, of which the following is a full, clear, and exact specification.

My invention relates to improvements in grates for use in Dutch ovens, steam boiler furnaces or other apparatus in which the fuel employed is in a finely comminuted condition, such as sawdust, finely ground coal or other combustible material, and the primary object of the invention is to provide a grate which will prevent the packing or accumulation of the fuel in such a manner as to prevent the free circulation of air therethrough and consequently retard the combustion.

A further object of the invention is to provide a grate of such construction that the air will be admitted to the fuel in sufficient quantity and over such a wide area that the combustion will be properly supported and complete consumption of the fuel assured.

A still further object of the invention is to provide a grate for the purpose stated which will be so constructed that worn, broken or warped parts may be readily repaired or renewed without necessitating the provision of an entirely new grate and also to so construct the grate as to facilitate the cleaning of the same.

All these objects, and such other incidental objects as will hereinafter appear, are attained in the use of the apparatus illustrated in the accompanying drawings, and the invention consists in certain novel features of the same which will be hereinafter first fully described and then more particularly pointed out in the appended claims.

In the drawings:—Figure 1 is a central, longitudinal vertical section of my improved grate applied to a Dutch oven with a steam boiler attachment. Fig. 2 is a plan view, partly broken away, of the grate on a larger scale. Fig. 3 is an enlarged central vertical section of the grate. Fig. 4 is a similar view of the lower portion of the grate taken on the line 4—4 of Fig. 3. Fig. 5 is a detail bottom plan view of one of the central supporting beams. Fig. 6 is a detail bottom plan view of one of the cross

beams. Fig. 7 is a detail perspective view of one section of the grate looking at the under side of the same. Fig. 8 is a detail side view of the beam shown in Fig. 6.

The furnace, which is indicated by the reference numeral 1, may be of any desired size or construction and in the form illustrated is provided with a bridge wall 2 and a fire chamber 3 in advance of the said bridge wall, an ash pit 4 being arranged below the fire chamber, and a door opening 5 being provided at the front side of the ash pit to admit air thereto in order to support the combustion. In the roof 6 of the fire chamber is a feed opening 7 through which the fuel may be passed, being fed to the said opening through a flue 8 by a blower or any other form of force feed device.

A transverse wall 9 is built at the rear side of the ash pit 4, and supported by the said wall, as well as the front and side walls of the furnace, is a cross beam 10 which is provided with a recess or depression 11 in its upper side, and is also provided on its under side, near its ends, with bearings 12 in which rock shafts 13 are journaled. The ends of a central cross bar or beam 14 are seated in the recesses or depressions 11 and said beam extends across the ash pit so as to form one of the main supports for the grate. The side beams 10 are reinforced by ribs 15 on their under sides, and the cross beam 14 is likewise reinforced by ribs 16 on its under side, but the ribs 16 do not extend entirely across the beam 14 as they merge into the under surface of the said beam at the center of the same, where the beam is provided with an upstanding boss 17 to accommodate a cross beam 18, as shown most clearly in Fig. 3. The beam 18 extends at right angles to the beam 14 and has its ends set into the side walls of the furnace, as shown at 19. This cross beam 18 is also reinforced by a longitudinal rib 20 on its under side, and in the said rib, near the ends of the same, are formed bearings 21 which receive and support the rock shaft 13. By reason of the upstanding boss 17 on the cross bar 14, the upper surfaces of the two intersecting centrally disposed cross bars are brought into the same or approximately the same horizontal plane so that the conoidal body or the grate proper may be properly supported.

A central hub 22 is formed on the beam 18, and the bore 23 of the said hub regis-

ters with an opening in the upstanding boss 17 of the cross beam 16, and through the said bore and opening a long bolt or securing rod 24 is inserted. The opposite ends of this bolt or securing rod 24 are threaded, and on the lower end of the same a nut 25 is mounted and adapted to be turned home against the under side of the boss 22, as shown most clearly in Figs. 3 and 4. The upper end of the bolt passes through a central opening in a cap plate 26 which is provided with a number of perforations 27 to permit the escape of air rising through the ash pit and the grate, and on its under side the said cap plate is provided with an annular flange or shoulder 27' against which the upper end of the grate body 28 bears. The lower end of the grate body 28 rests upon the inwardly projecting flange 29 of a supporting ring 30 which rests upon the cross beams 14 and 18, and is also provided with an upstanding flange 31 on its upper side against which the lower end of the grate body 28 bears whereby the said grate body is prevented from spreading or moving away from its concentric relation with the central securing rod 24. The spacing and supporting ring 30 is constructed of a plurality of sections connected by fastening bolts 32 inserted through lugs 33 at the meeting ends of the sections, and the upstanding rib 31 is composed of a connected series of straight portions whereby the said rib will be adapted to effectually and firmly engage the lower ends of the sections 34 of the grate body, as will be readily understood on reference to Fig. 2. These sections 34 of the grate body are tapered plates which are segments of a sphere, so that when the several sections are assembled with their tapered edges in contact, a conoidal body will be formed. As shown, the lower ends of the sections 34 rest upon the spacing and supporting ring 30 against the upstanding rib 31 thereon and the upper ends of the sections fit against the annular shoulder or flange 27' of the cap plate 26, the outer edge of the said cap plate overlying the upper ends of the sections 34, as clearly shown in Fig. 3. A securing nut 35 is fitted on the upper end of the securing rod 24 and is turned home against the cap plate 26 so as to clamp the said sections 34 firmly in position between the ring 30 and the said cap plate.

The tapered plates constituting the sections 34 of the grate body, are provided on their inner sides with longitudinal ribs 36 and with transverse ribs 37 intersecting the said longitudinal ribs 36, and in the said longitudinal ribs above and below the transverse ribs are formed openings 38 through which fastening bolts 39 are inserted, the said bolts being equipped with securing nuts 40 which are adapted to be turned home

against the longitudinal ribs, whereby the plates will be held in their proper relative positions with their side edges in contact. The fastening bolts 39 are arranged alternately above and below the transverse ribs 37 so that all the plates will be connected and a firm, rigid grate body will be provided.

The entire body of the grate is provided with minute perforations 41 through which the air escapes to the fuel, as will be readily understood, and as this grate body will preferably be of such dimensions as to rise within the fire chamber to a point near the feed opening in the roof of the same, it will be readily seen that the air necessary to support combustion will be admitted to the fuel through a wide area and will consequently act upon the entire body of the fuel.

Between the spacing and supporting ring 30 and the walls of the fire chamber, are arranged a number of perforated plates 42, 43 and 44 which are adapted to cover the space between the ring and the said walls, as will be readily understood on reference to Fig. 2. The side plates 42 and 43 are supported by the spacing ring 30 at their inner edges and are provided with notches 45 to accommodate the lugs 33 of the said ring 30, and the outer edges of the plates 43 are provided with lips or projections 46 which set into the side walls of the furnace immediately above the cross beam 18 whereby they will be secured in position. The outer edges of the plates 42 rest upon the beams 10 and are supported by the same. The plates 44 fill the substantially quadrantal spaces presented by the corners of the fire chamber and the plates 42 and 43, and these substantially quadrantal plates 44 are secured to the rock shafts 13 so that upon rotation of the rock shafts by means of the handles 47 on the ends of the same the said plates 44 will be moved into a vertical position, as indicated at the lower side of Fig. 2, so as to dump ashes into the ash pit and otherwise facilitate the cleaning of the grate. It will be understood, of course, that the handles 47 are in front of the furnace and may be permanently or removably secured to the rock shafts, as may be desired. In order to support the plates 42, 43 and 44 upon the ring 30, and thereby hold them in their proper position in one horizontal plane, and also to permit them to rest upon the supporting beams, the inner edges of the plates are rabbeted, as indicated at 48, so as to fit around the edge of the spacing ring 30 and project slightly over the upper side of the same, as will be readily understood. This construction aids in maintaining the conoidal body of the grate in its proper central position in the fire chamber, inasmuch as the plates 42 and 43 are stationary and serve to space the ring 30 relative to the walls

of the fire chamber and to that extent relieve the strain on the central securing rod 24. All of the plates are provided with a plurality of small perforations extending throughout their area so that the air entering the ash pit through the opening 5 and rising therefrom may pass through the said plates to the fire chamber, so as to mingle with the fuel at the sides of the conoidal body as well as through the area of said body.

The construction and arrangement of the several parts of my improved grate having been thus made known, it is thought the operation and advantages of the same will be readily understood and appreciated. The fuel is fed into the fire chamber through the feed opening in the roof of the same, and will drop onto the conoidal body so as to spread around the same, as will be readily understood on reference to the dotted representation in Fig. 1. An initial supply of fuel having been admitted to the fire chamber and ignited, the fuel will then be fed to the said chamber continuously and the air admitted to the ash pit will, of course, rise through the multitude of perforations in the several horizontally disposed plates, and also through the conoidal body of the grate, so as to reach the entire quantity of fuel and cause complete combustion of the same, so that a large flame will be produced and consequently an intense heat quickly generated. The ashes accumulated upon the horizontally disposed plates at the base of the grate may be readily dumped into the ash pit by merely swinging the corner plates 44 around the rock shafts 13, as described, and as will be readily understood.

Inasmuch as the grate is composed of a number of small sections secured together, the warping or burning out of any one section does not necessitate the provision of an entirely new grate, but the worn section may be removed and a new section substituted therefor without great loss of time or the expenditure of any considerable amount of labor. The cost of maintenance of a furnace equipped with my grate is therefore minimized. The connections described and shown enable me to secure the grate rigidly in position and rigidly connect the several sections, while at the same time the assembling of the grate may be easily and rapidly accomplished.

The advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely

illustrative, and that such changes may be made when desired as are within the scope of the claims appended hereto.

Having thus described the invention, what is claimed is:—

1. A conoidal grate body comprising a plurality of separate tapered sections having openings therethrough substantially throughout their area, means for securing the several sections one to the other, a perforated cap member for the small end of the grate body, means for supporting the wide end of the grate body, and fastening means extending from the cap member to the supporting means for the large end of the grate body for clamping the tapered sections between the cap member and the supporting means for the other end of the grate body.

2. A conoidal grate body consisting of a plurality of separate tapered sections each provided with a plurality of transverse perforations, means for connecting the sections together edge to edge, a perforated cap member for the small end of the conoidal grate body, a surrounding grate having an open portion provided with a marginal support for the large end of the conoidal grate body, supporting beams in underriding relation to the grate and traversing the intermediate space therein with one beam crossing the other, and a connecting and clamping member between the perforated cap member and the beams where crossing, the said connecting member traversing both the cap member and the crossed portion of the supporting beams.

3. A grate comprising supporting beams, a ring resting thereon and provided with an upstanding marginal flange, a conoidal grate body composed of sections connected together at the meeting edges with the larger end resting on the ring and confined by the marginal flange of said ring, a perforated cap plate for the small end of the conoidal body, and a securing and clamping member extending through the cap plate and through the supporting beams, said connecting member being substantially axial to the conoidal body.

4. The combination of a conoidal perforated grate body, an open support for the lower end of the same, stationary perforated plates resting on the said support adjacent the outer side of the body, and rockable perforated plates arranged to rest on the said support between the stationary plates.

5. In a grate, the combination of a conoidal perforated grate body having an open lower end, stationary perforated plates arranged adjacent to and in the horizontal plane of the said lower end outside the said body, movable perforated plates arranged between the stationary plates and normally in the same horizontal plane therewith, and means for actuating said movable plates.

6. The combination with the walls of a fire chamber, of rock shafts supported thereby, a conoidal perforated grate body supported from the said walls between the rock shafts, perforated plates carried by the rock shafts and extending to the lower end of the conoidal body, and stationary perforated plates arranged between the plates on the rock shafts and extending from the walls to the lower end of the conoidal body.
7. The combination of intersecting supporting beams, a ring resting upon the said beams, a securing rod inserted through the said beams at the point of intersection of the same, a cap plate secured on the upper end of the said rod, and a conoidal perforated grate body having its upper end engaging the said cap plate and its lower end resting on the ring supported by the beams.
8. The combination of a support, and a conoidal grate body composed of tapered perforated plates provided on their under sides with reinforcing ribs, and connecting bolts inserted through and secured in the said ribs.
9. The combination of supporting beams, a ring resting on said beams and provided with an upstanding rib on its upper side, a series of tapered perforated plates having their lower ends resting on the said ring against the upstanding rib thereon, means for securing the said plates together, a cap plate engaging the upper ends of the said tapered plates, and a connection between the cap plate and the supporting beams.
10. The combination of supporting beams, a ring resting on the said beams, a conoidal perforated grate body resting on the said ring at the inner edge of the same, means for clamping the said body to the supporting beams, and a plurality of perforated plates resting on the supporting beams and the outer portion of the said ring at the base of the said grate body.
11. The combination of supporting beams, a ring resting on said beams and having an upstanding rib on its upper side, a perforated conoidal grate body having its lower end resting on said ring against the inner side of said rib, means for securing said body against said ring and the upstanding rib, and perforated plates arranged around said ring and resting thereon against the outer side of the rib.
12. In a grate structure, a centrally located upstanding perforated grate body, a series of outstanding perforated plates in surrounding relation to the lower end of the grate body, rock shafts carrying certain of the perforated plates and operable to rock said plates, and means for holding the remainder of the plates and the central upstanding grate body stationary.
13. The combination of an upstanding conoidal perforated grate body, stationary perforated plates at diametrically opposite points at the base of said body, and quadrantal perforated plates mounted between the stationary plates at the base of said body, said quadrantal plates being movable.
14. The combination of an upstanding conoidal perforated grate body, stationary perforated plates at the base of said body and arranged in the same horizontal plane therewith, quadrantal perforated plates also located at the base of said body and filling the spaces between the stationary plates, the quadrantal and stationary plates completely surrounding the conoidal grate body at the base, and means for connecting the quadrantal plates in pairs for a simultaneous dumping movement.
15. A conoidal grate body composed of tapered perforated plates having longitudinal ribs, and transverse ribs intersecting said longitudinal ribs, said longitudinal ribs being provided with openings above and below the transverse ribs, and connecting bolts passing through the openings, whereby the plates are held with their side edges in contact.
16. The combination with a central upstanding conoidal perforated grate body composed of separate plates fastened together, means for supporting the said body within the fire chamber, a series of perforated plates arranged in a horizontal position and entirely surrounding the grate body at the base, some of the plates being stationary and others being movable, and means for operating the movable plates.
17. The combination with the walls of a fire chamber, of a cross beam secured therein, an intersecting beam resting on the cross beam centrally of the same, a conoidal perforated body supported on the said beams, means for securing the body to said beams, rock shafts journaled in the ends of the cross beam, perforated plates carried by the rock shafts and extending to the lower end of the body, and stationary perforated plates supported by the beams between the plates on the rock shafts.
18. The combination of a support, a ring resting on the said support and composed of segmental sections each having an upstanding rib between its edges, means inserted through the ends of the ribs to secure the sections together, a conoidal body finely perforated throughout its area having an open lower end resting on the said ring against the inner side of the rib thereon, means for rigidly securing the said conoidal body to the support, and finely perforated plates extending entirely around the lower end of the body and resting on the said ring against the outer side of the rib thereon.
19. The combination of a support, a ring resting thereon and composed of segmental sections each having an upstanding rib be-

tween its edges and terminating in a lateral
lug, fastening devices inserted through said
lugs to secure the said segmental sections to-
gether, a finely perforated conoidal body
5 resting upon the said ring against the inner
side of the rib thereon, means for securing
the said body to the support, stationary per-
forated plates having their inner edges rest-
ing upon the ring and provided with
10 notches to fit around the lugs on the said
rib, and movable finely perforated plates ar-

ranged between the said stationary plates
and having their inner edges resting nor-
mally on said ring.

In testimony whereof, I have signed my 15
name to this specification in the presence of
two subscribing witnesses.

RALPH W. REVELL.

Witnesses:

MARTIN C. WELSH,
LAURRETTA WELSH.

Copies of this patent may be obtained for five cents each. by addressing the "Commissioner of Patents,
Washington, D. C."