2 Sheets. Sheet 1.

J. D. Smedley,

Burning Hydrocarbon.

No. 36,805. Patented Oct. 28, 1862.

Fig: 1.

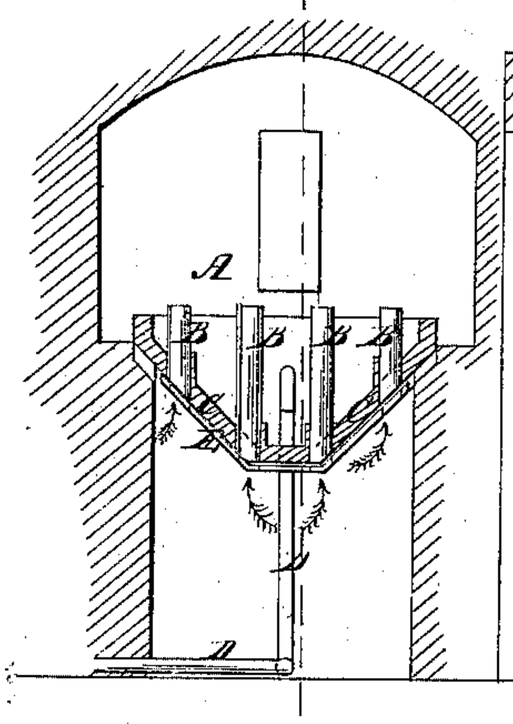
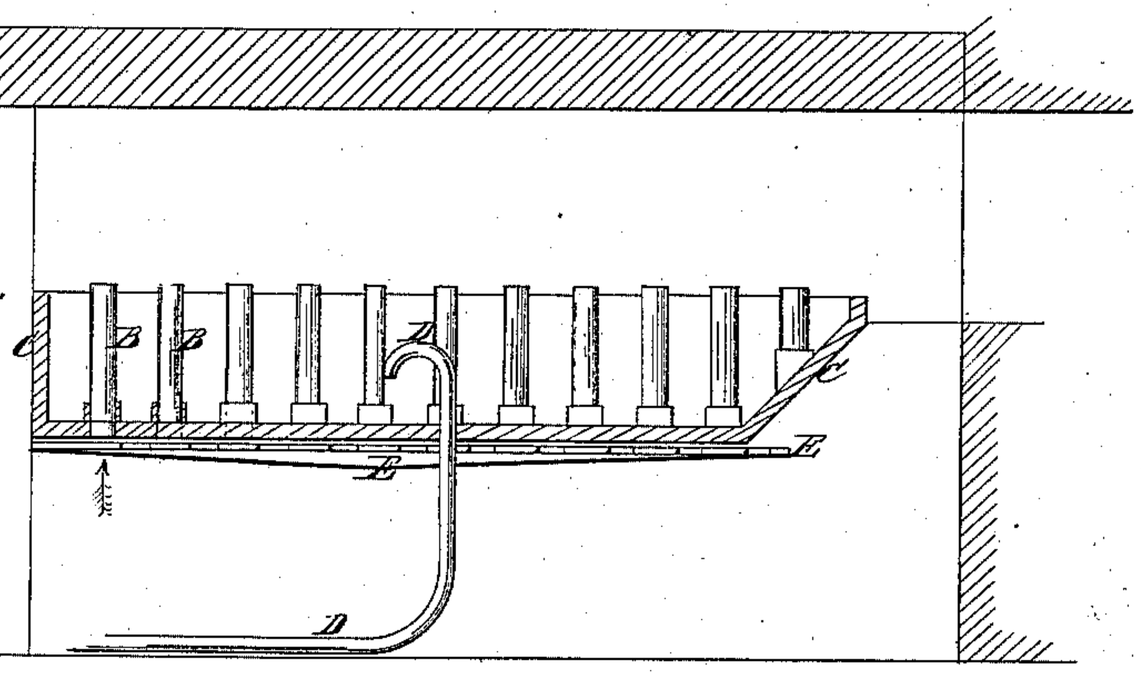


Fig: 2.



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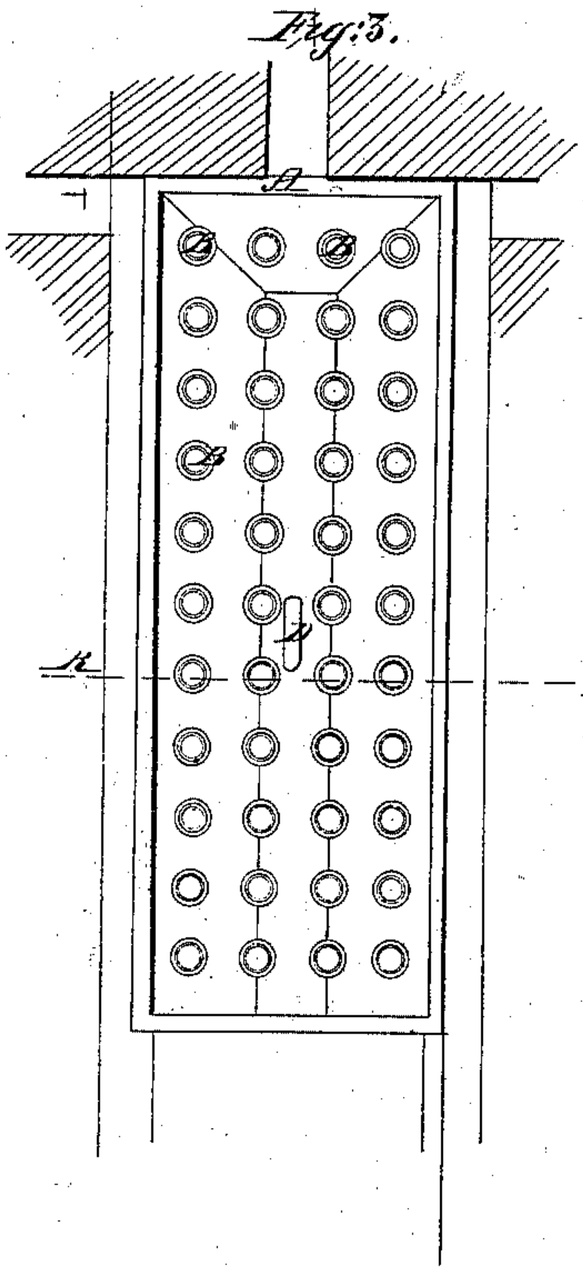


Fig: 4.

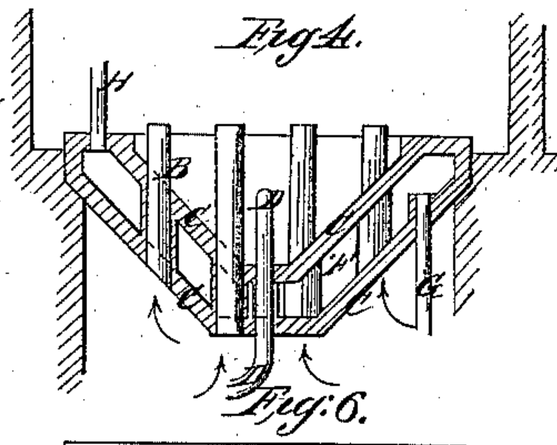


Fig: 5.

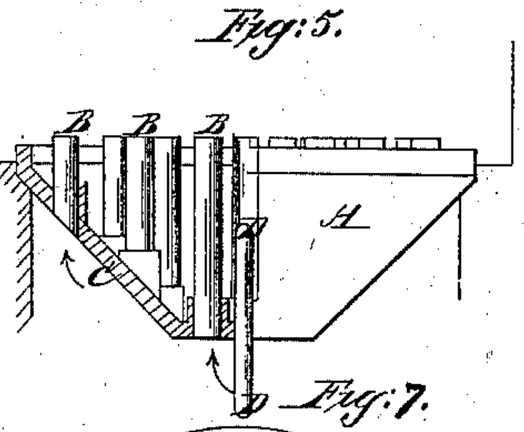
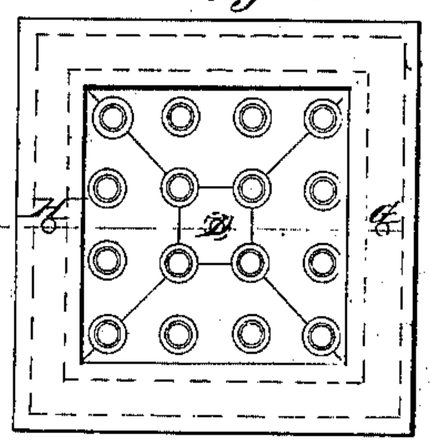


Fig: 6.



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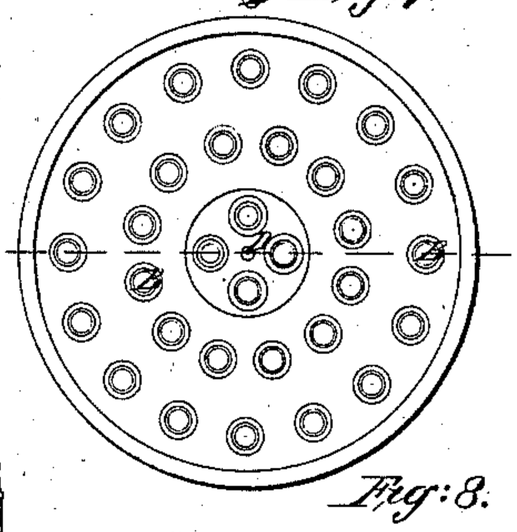
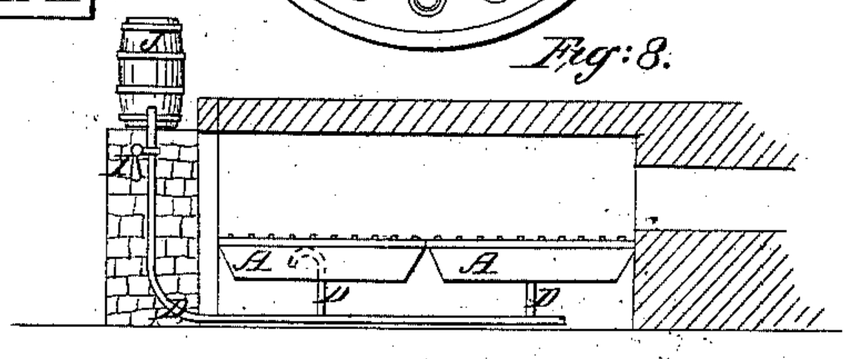


Fig: 8.



Witnesses:
D. Goodwin Jr
Stephen A Goodwin

Inventor:
John D Smedley

2 Sheets. Sheet 2.

J. D. Smedley,

Burning Hydrocarbon.

No. 36,805. Patented Oct. 28, 1862.

Fig: 1.

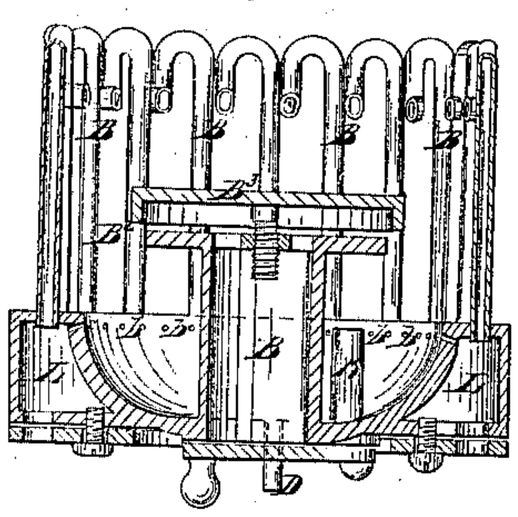


Fig: 2.

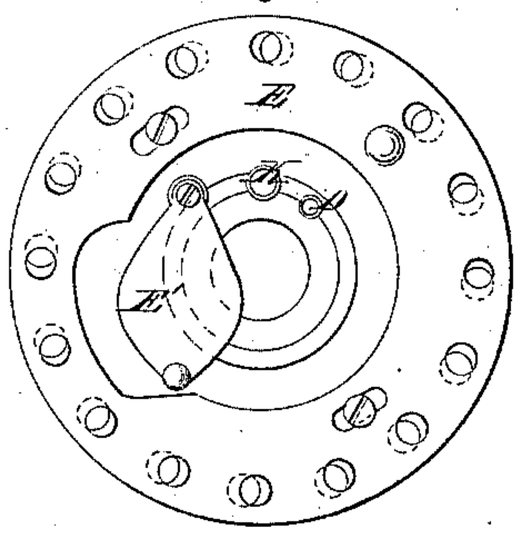


Fig: 3.

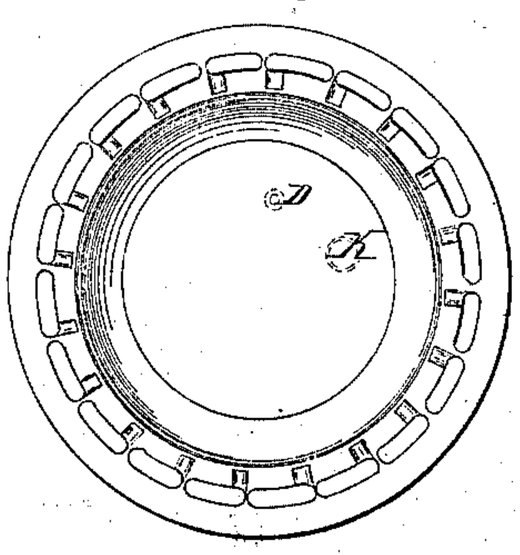


Fig: 4.

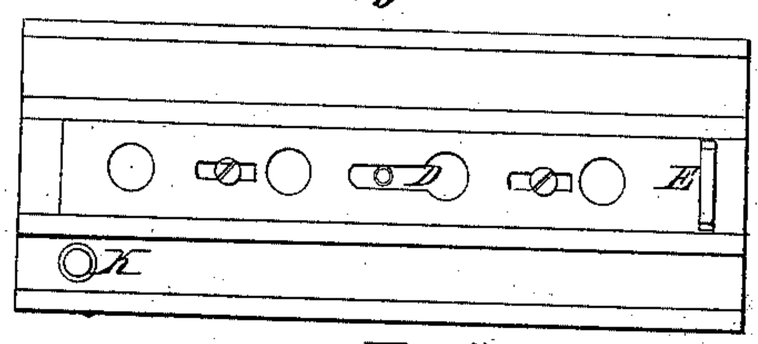


Fig: 5.

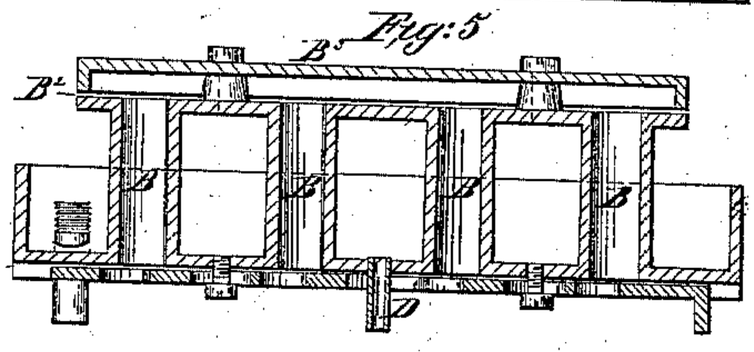
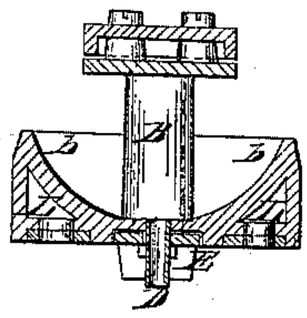


Fig: 6.



Witnesses:

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Stephen A. Goodwin

Inventor:

J. D. Smedley

UNITED STATES PATENT OFFICE.

JOHN D. SMEDLEY, OF CHICAGO, ILLINOIS.

IMPROVED GRATE FOR BURNING PETROLEUM AND OTHER LIQUID FUEL.

Specification forming part of Letters Patent No. **36,805,** dated October 8, 1862.

To all whom it may concern:

Be it known that I, JOHN D. SMEDLEY, of Chicago, Cook county, in the State of Illinois, have invented a new and useful article, device, or apparatus, which I call a "petroleum-grate," for the purpose of burning petroleum or rock oil, both crude and refined, also benzole and the residuum or foot of distillations in refining oils, and also coal-tar and all fluids distilled from coal, and known as "crude coal-oil," separate or combined, as a fuel; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, Nos. 1 and 2, making a part of this specification, and to the figures and letters of reference marked thereon, of which—

Figure 1, No. 1, represents an end section of the grate with the fuel-pipe; Fig. 2, a longitudinal section of the same with the fuel-pipe; Fig. 3, a ground plan of the same; Fig. 4, an end section showing a water-space between two troughs combined; Fig. 5, a transverse section of the grate; Fig. 6, a ground plan of the grate, square; Fig. 7, a ground plan of the grate, round; Fig. 8, an end section of two grates in one furnace with fuel-pipe and reservoir.

No. 2 is a drawing showing modifications of my invention, with also an additional air-chamber at the sides of the grates.

Fig. 1, No. 2, is a transverse section of the round grate. Fig. 2 is a bottom view of the same. Fig. 3 is a bird's-eye or top view of the same. Fig. 4 is a bottom view of the oblong grate. Fig. 5 is a longitudinal section of the same. Fig. 6 is an end view of the same.

The nature of my invention consists in such an arrangement, construction, and combination of the several parts and elements employed as to make a new and peculiar burning-grate adapted to the burning of the various fuels above mentioned, and others of a similar character, and to be used for that purpose in all furnaces or apparatus for generating heat.

My invention aforesaid for the purpose of burning such fuels may be usefully and advantageously applied in coal or petroleum oil refining, as the residuum of each distillation, which has heretofore been useless and thrown away, furnishes with my invention all the fuel for running the refinery. It may also be applied usefully and advantageously in all kinds of heating apparatus for the generating of steam—such as locomotive-engines and every kind of steam-boiler—and also to stoves of nearly every pattern, as it is cheaply fitted, and is adapted to all and every apparatus for generating heat, and makes a great saving of fuel.

The nature of my invention is such that by the arrangement, construction, and combination described the amount, degree, or quantity of heat and of fuel consumed may be kept uniform, and may be regulated and varied and made adjustable at the will of the operator. By means of this arrangement, construction, and combination in its operation and effect, I am also enabled by passing the atmospheric air through the heated tubes, as described, not only to supply the necessary oxygen for the combustion of the lighter oils above the surface of combustion, but also when thus heated the air by my arrangement being brought into the grate above the fuel distributively over the whole surface, and in my numerous separate currents I am enabled to decarbonize and burn with a perfect combustion the denser and highly-carbonized fuels—such as the residuum aforesaid, coal-tar, and other like fuels—which, as far as I know, has never been before accomplished.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

The grate consists of a trough or concave shaped vessel, A, as represented in Figs. 1, 2, and 3 of Drawing No. 1, with the floor or bottom C C made on either such an angle or curve as to govern and control the quantity of surface of supply and combustion to create the heat desired, by increasing or diminishing such surface of supply and combustion with this or any analogous device. This I do through supply-pipe D, the feed being governed and controlled in quantity by the stop cock or gage I, Fig. 8, which transmits the supply through an adjustable opening, thereby admitting no more fuel than the capacity of the grate to consume or than is desirable by the operator.

The grate A is perforated with a sufficient number of air-passages distributed over its whole area, so that the area of the surface of

such air-passages shall approximate the surface area of the grate A, in which are inserted pipes or tubes or air-conductors B B, and extending above the extreme surface of the grate A in the fire-chamber, for the purpose of causing perfect combustion in highly-carbonized liquid fuels, such as the residuum of distillation aforesaid, and other such fuels. The operation of these pipes, tubes, or air-conductors is such that the air continually passes through them distributively while they are in a heated state, and thus the air, becoming heated to the necessary temperature to prevent cooling, it comes instantaneously in contact with the volatilized fuel over the whole area of the fire-chamber in numerous separate currents or jets, and thus promotes, supports, and intensifies the combustion and the decarbonization of the denser and highly-carbonized liquid fuels.

The draft through the tubes or air-conductors may be governed and controlled by means of a perforated slide or damper, E, Fig. 2, causing the openings of the air-conductors to be made large or small, as the desired combustion may require.

The grate may be made of cast or wrought iron or other metal, single or double, as shown in Fig. 4, F representing a space of two or more inches between the walls of the floor C C, which space is to be filled with water by means of feed-pipe G and discharged at waste-pipe H, for the purpose of heating the water for boiler use when desired, and also to prevent any coking or residuum from burning fast to the inside of the grate-flooring C C. The air tubes or conductors may be cast with the grate, or may be put in with any metal pipe or wrought-iron pipe, which latter I prefer.

The supply of fuel is furnished from a fountain, as represented in Fig. 8, Drawing No. 1, marked "fuel," J, and is conveyed in supply-pipe D to the bottom of the grate, as shown in Fig. 8, controlled and governed by the stop-cock I, set to such a gage as may be desired.

The grate or trough described may be constructed of different materials, ground shapes, and dimensions, and the floor may be made at any desired angle or in a curved or bowl shape, and the number or size of the air-passages and air-conductors, and of the corresponding damper-openings may be varied, the whole yet operating upon the same principle and producing the same effects and results. The grate may also be constructed square, as in Fig. 6, No. 1, or round, as in Fig. 7, or with two or more grates in one fire-chamber, as in Fig. 8.

Figs. 1 to 6 of Drawing No. 2 are modifications of the same principle, with other additions, designed to illustrate my invention when applied to locomotive-engines, steamboat-boilers, or stoves, or when applied in large furnaces in a cheaper and simpler form.

Figs. 1, 2, and 3 of Drawing No. 2 show the principle applied by a single central air conductor or pipe through the bottom of the grate marked B′, and these may be increased to three, four, or more, ending with an air-chamber over the surface of combustion marked B^2, with an adjustable cap marked B^3. By the raising of this adjustable cap the air is projected horizontally in an entire circle over the whole area of the fire-chamber and the volume of the current regulated by the damper E′ and by raising or depressing the cap B^3. This form of the invention may be used in a common stove or furnace.

Figs. 1, 2, and 3 last mentioned also show the invention when adapted to low motive engines or steamboat-boilers, the grate A being constructed in this illustration in a circular or bowl form, but may be made square or oblong. The air conductors or pipes B B, &c., are brought high into the fire-chamber and open with a downward curve to prevent the possibility of slopping the fuel by the motion or in rising or descending grades into the air conductors or pipes. The grate in such cases is also furnished with an overflow-pipe, (marked K,) to obviate carelessness in the supply.

Figs. 4, 5, and 6 of Drawing No. 2 show the principle applied in another form, using the same letters of reference as in Figs. 1, 2, and 3 of Drawing No. 2, with one, two, three, four, or more air-conductors through the bottom of the grate in a parallelogram-shaped air-chamber above the surface of combustion, with a continuous slot or opening by which the air is projected horizontally over the entire area of the fire-chamber and controlled by the damper marked E.

To the grate A, thus described in all its forms, may be added an air-chamber at the sides, forms of which are seen in air-chambers marked L, Figs. 1 and 6, Drawing No. 2, with the dampers E E, Figs. 2 and 4, from the upper surface of which air-chamber the air-conductors marked B B, &c., proceed. This additional air-chamber is for the purpose of holding, when desired, the air temporarily to be heated in practical use to increase the combustion when necessary. Perforations may also be made from the air-chamber through the upper portion of the grate above the surface of combustion with the same purpose as shown at *b b*, &c. This air-chamber may also be constructed higher and perforations or air-passages in its continuous face be substituted for the air conductors or pipes.

Having thus fully stated the nature and object of my invention, and the different parts and combination of parts, and the operation of the grate for burning the fuels mentioned, and also several modes in which my invention may be applied without changing the principle, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The arrangement and combination of the trough or grate A and the air-conducting pipes B B, substantially as described, and for the purpose above set forth.

2. The arrangement and combination of the trough or grate A, the air-conductor pipes B B, &c., and the supply-pipe D, with its gage-

cock I appended, substantially as described, and for the purpose above set forth.

3. The arrangement and combination of the trough or grate A, the air-conductor pipes B B, &c., the supply-pipe D, with its gage-cock I appended, and the damper E, substantially as described, and for the purpose above set forth.

4. The arrangement and combination of the trough or grate A, the air-conductor pipes B B, &c., the supply-pipe D, with its gage-cock I appended, the damper E, and the lower air-chamber, L, substantially as described and for the purpose above set forth.

5. The so constructing the trough or grate A narrowing from its upper surface and edges at an angle or curve to the bottom as to present continually-reducing areas of surface, substantially as described, and for the purpose above set forth.

JOHN D. SMEDLEY.

Witnesses:

STEPHEN A. GOODWIN,

EDWARD EVANS, Jr.