A. B. COWDERY,
HEATER FOR GRAVEL, &c.
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FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

WITNESSES
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ARTHUR B. COWDEERY, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO BARRETT MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA.

HEATER FOR GRAVEL, &c.

1,025,687.


To all whom it may concern:

Be it known that I, ARTHUR B. COWDEERY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Heaters for Gravel, &c., of which the following is a specification.

This invention relates to improvements in apparatus for heating and drying gravel, broken stone or other material.

It is particularly suitable for use when such material has to be dried or heated for roofing purposes or for making concrete of various sorts. The objects of the invention are to obtain the advantages which characterize the apparatus hereinafter described. Among these are the elimination of a large part of the fuel and labor costs which have characterized all previous apparatus of this kind, of which I am aware; continuous action; cold and wet material being fed at any time and hot and dry material being drawn at any time; retention of dryness and heat overnight, ready to supply the beginning of the next day's work; elimination of the percentage of waste of material which is at present customary owing to the mingling of the material with mud and dirt on the adjacent ground; a perfection of operation, in heating and drying, with respect to individual particles of the material; and other advantages incidental to the structure hereinafter described.

One embodiment of the invention is shown in the accompanying drawings in which—

Figure 1 is a side elevation in section; Fig. 2 is an end elevation in section on the line 2—2 of Fig. 1, viewed from front; Fig. 3 is a plan view; Fig. 4 is a front elevation, the cover being in a different position; Fig. 5 is a front elevation, enlarged in section, with the covers in still a different position.

Referring to the drawings, a structure is represented containing a fire place 10; flames 11, having contracted tops 12; and compartments 13 for material, intervening between the flames. The compartments are open at the top as at 14, are closed at the back 15, and are closed at the front 16, except their lower portions 17 which may be opened. The bottom of the compartments 18 and the top of the fire place are inclined upward from the front to rear. One or more spouts 19 are provided at the front, and a vertical sliding door 20, closing the open front portions of the compartments 13. A door 21 may be provided for the fire place if desired. The sides 22 of the apparatus go straight down to the ground. The back 23 also goes straight down to the ground, so that the fire place is entirely inclosed except at the fire door. Covers 24 and 25 are provided, hinged at each side. These are adapted to lie completely open as shown by Fig. 4, position A; or open, but projecting upward and outward, as shown by Fig. 5, position B; or upward and inward as shown in Fig. 2, being the position C; or closed horizontally over the top. Braces 26 are provided, hinged to the covers 24 and 25 and adapted to engage in blocks 27 to support and brace the covers when occupying the B position. Lugs 28 are provided inside of one of the covers, adapted to engage the other cover and hold the two in the position illustrated, when the covers are in the C position. When the covers are closed one of them laps past the other.

The apparatus is preferably made of sheet metal with suitable strengthening irons at 80 the corners and elsewhere, and suitable stays to make it perfectly strong for all purposes. To this end it is preferred to cover each outside corner with angle iron 80 and to provide, immediately on each side, one or more uprights 81 of T-iron and also cross supports 82 of T-iron under the bottoms of the compartments. It is also preferred to stay the sheet metal pieces which form the walls between the compartments 13 and the flues in a thorough manner by passing tension members 83 horizontally through the apparatus from side to side, which may be bolted to the T-uprights, and by stringing on these tension members tubular sleeves or spacers 34 which intervene between the adjacent upright walls of metal, thus holding each in its proper place and preventing warping and buckling.

The dimension of the compartments and of the flues may vary greatly according to the special circumstances or size of apparatus required. One suitable size and proportion is to make the apparatus about 43 feet high to the top of the flues, which would be for a capacity of about 3,000 pounds, the other parts being in the proportions shown in the drawings. On this scale the compartments 13 would be about 4 inches wide and the flues about 2 inches wide. The tops of
the flues would be contracted to about \( \frac{1}{4} \) of an inch opening; and this dimension would remain about the same whatever changes would be made in the size or proportions of the other dimensions. The contraction of the top of a flue to this narrow dimension serves several purposes. It holds the smoke and heated gases in the flue. Incidentally to this, it causes the outflow of smoke and gases to be distributed uniformly from front to back of the flue, because the quantity inside the flue, being restrained, seeks exit at every possible place both front and back. Another purpose served by the contraction of the top of the flue is that it enables broken stone, gravel etc. to be shoveled at random into the top of the apparatus without falling down through the flues to any considerable extent. The inclined portions 35, where the upright flue walls are bent together to make the contraction, deflect material which would otherwise fall into a flue and turn it into one of the adjacent compartments. Any individual stone which falls square upon the middle of the flue cannot enter unless it is so very small that it can pass through the contracted opening.

The apparatus, being portable, may be set on the ground in any convenient location where a fire can be built under it. Material to be heated or dried is dumped or shoveled from a cart into the top, the cover 24, 25 being open and the compartments being thus filled. The bottom being sloping, the contained material always presses toward the opening closed by door 20. Upon raising the door 20 hot and dry material flows out over the spout 19. Material above in the compartment settles down. In the course of its descent particles are shifted and turned and brought in and out of contact with the hot flue sides; and the whole is thoroughly heated and dried. Although the door 20 will ordinarily be opened intermittently, leaving the material for a definite period in each new position, yet the apparatus is so effective that the door may be left open continuously; cold wet material being continuously supplied at the top and hot dry material running out over the spout. In case of rain or leaving the apparatus overnight, the cover may be closed to the position C, shown in Fig. 2, in which there is escape for the products of combustion at the front and back, but the heat is prevented from rising vertically, and rain is shed by the cover. Although the fire be dead, material in the interior remains heated and dry overnight, ready for use in the morning. The cover may also be closed flat upon the top. If the weather conditions permit, the cover may be opened to the position B, forming a hopper above the apparatus; and material may then be piled high thereon, covering the tops of the flues. The smoke and gases of combustion work their way out through the interstices of the material, and their heat is thus absorbed almost entirely by the material.

As the material is transferred into the apparatus directly from a cart, and may be received from the spout of the apparatus into bags for transportation to the place where needed for use, none of the material is wasted by contact with mud and dirt of the surrounding ground. As the heated gases escape but slowly from the flues, and while retained therein are exposed to wide areas of flue surface, there is great economy of fuel as compared with the best of all previous devices known to me. On account of the shape of the apparatus all of the material changes place every time a bagful is drawn, bringing every particle sooner or later to one of the flues, which insures perfect drying and saves the labor of several men which hitherto has been necessary to shovel or stir the gravel on the heated plates or pipes according to methods heretofore in use. The incline of the bottom 18 serves the two purposes of directing the contents automatically downward to the spout so long as any contents remain, and of leading flames and gases of the fire from the front toward the back part of the flues as well as vertically upward.

It is, of course, understood that the thickness of the wall of sheet metal between the flue and the adjoining compartment, and the formation of the flue of sheet metal, constitute this wall a good conductor of heat from the gases within to the material without. The idea of forming the flues very thin and long in horizontal cross section gives them great area as compared with other forms and enhances the likelihood that each particle of gas and smoke on its way out will impart its heat to the walls of the flue.

1. Apparatus of the class described comprising a fire box and a receptacle for material, there being flues rising through the receptacle, said flues having tops contracted into narrow and long vents, whereby escape of gases contained in the flues is retarded and entrance of material to the flues is diminished.

2. Apparatus of the class described comprising a fire-box and a receptacle for material, there being a multiplicity of flues rising through the receptacle with divisions of the receptacle intervening between them, said flues having relatively high and approximately vertical side walls combined with tops for the flues inclining from the tops of the vertical sides and covering most of a flue in a relatively short rise above the top of the sides thereof, a long vent nar-
rower than the flue being formed between these tops.

3. Apparatus of the class described comprising a fire box, a receptacle for material above it, there being flues rising from the fire box through the receptacle; the receptacle being formed into compartments between the flues having means for receiving material at the top and for discharging it at the bottom; the discharge openings from the flues being at their tops and being so small, that material deposited over them does not enter them.

4. Apparatus of the class described comprising a structure of sheet metal substantially rectangular in plan, and including a fire box underneath and a receptacle above, there being upright divisions in the receptacle, between alternate pairs of which the receptacle is bottomless, forming flues, there being bottoms, forming compartments to hold material between the other alternate pairs of divisions; the said divisions being arranged parallel with the front to rear direction of the fire-box, and said bottoms inclining upward from the front to the rear of the fire box, whereby products of combustion are distributed toward the rear of the flues and contents of the receptacle gravitate to a position ready for delivery close above the fire.

5. Apparatus of the class described comprising a structure of sheet metal substantially rectangular in plan and including a fire box and a receptacle, there being upright divisions in the receptacle forming adjacent flues and compartments; in combination with horizontal stays traversing the structure perpendicular to said divisions, and tubular spreaders arranged upon the stays between the divisions.

6. Apparatus of the class described comprising a fire box, a receptacle for material, flues passing through the receptacle and discharging through its top and hinged covers adapted to engage each other over the receptacle, forming a combined roof and funnel, open-ended, above it.

7. Apparatus of the class described comprising a fire box, a receptacle for material, flues passing therethrough, said flues having at the top openings too small for entrance of material deposited thereon, and plates sloping upward from the top edges of the receptacle, forming a hopper wherein material may be held above the top thereof, the products of combustion rising from the flues through interstices of said material.

8. Apparatus of the class described comprising a fire box, a receptacle for material, flues passing through the receptacle and hinged covers adapted to engage each other above it, forming a pitch roof, open-ended, above it; there being outside props for converting said hinged covers into sides of a hopper when swung outward about their hinges.

Signed by me at Boston, Mass. this 29th day of November, 1909.

ARTHUR B. COWDERY.

Witnesses:

EVERETT E. KENT,
JOSEPH T. BRENNAN.

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