Jan. 11, 1927. 1,613,736

H. P. ANDRESEN

COMBINATION HEATER AND MAINTENANCE APPARATUS

Filed Jan. 21, 1922 3 Sheets-Sheet 1

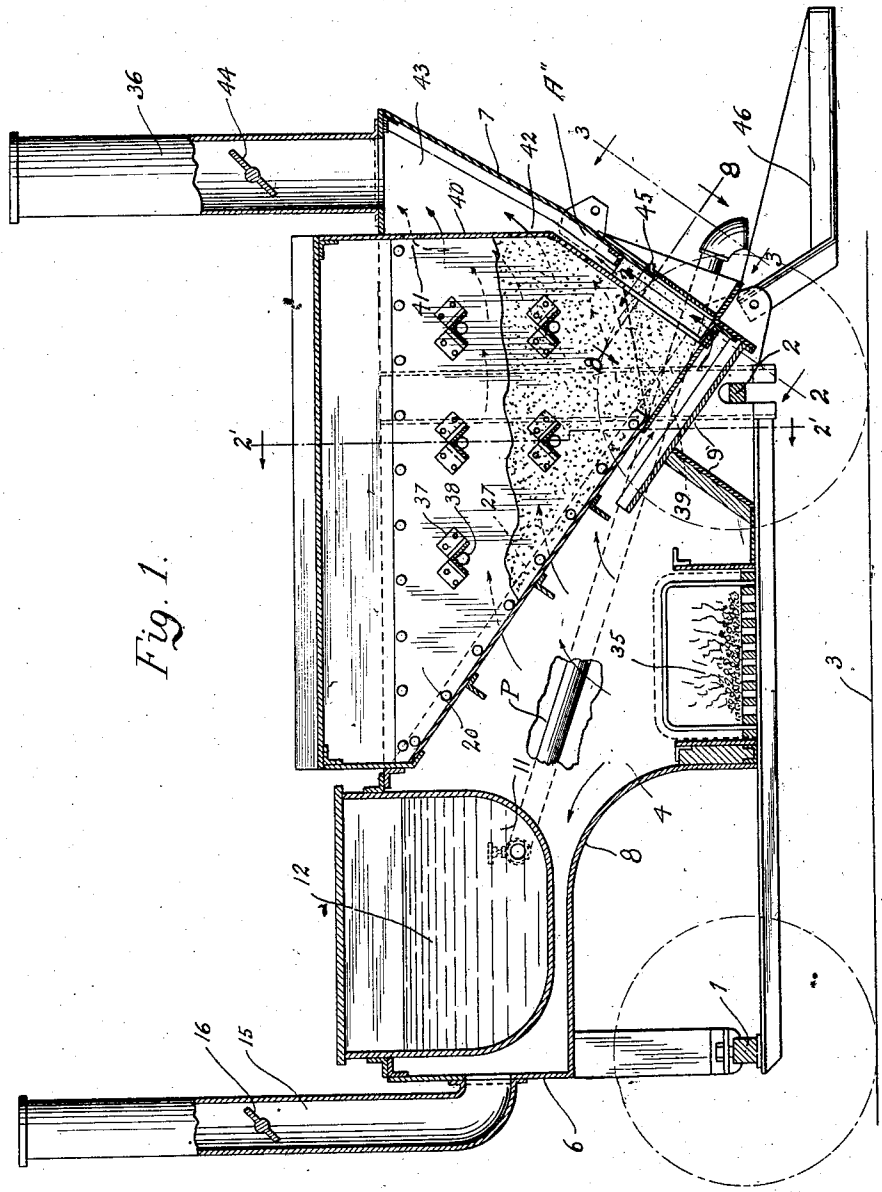


Fig. 1.

WITNESS.
O.E. Johnson.

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Fig. 4

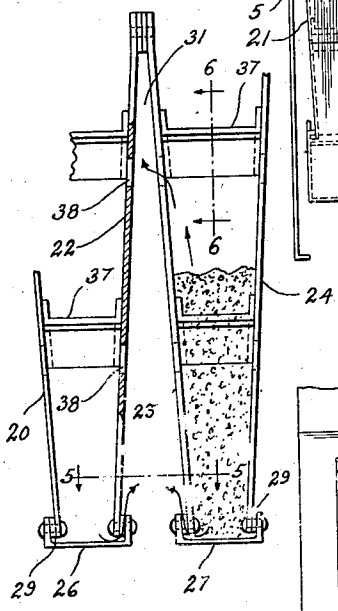


Fig. 2.

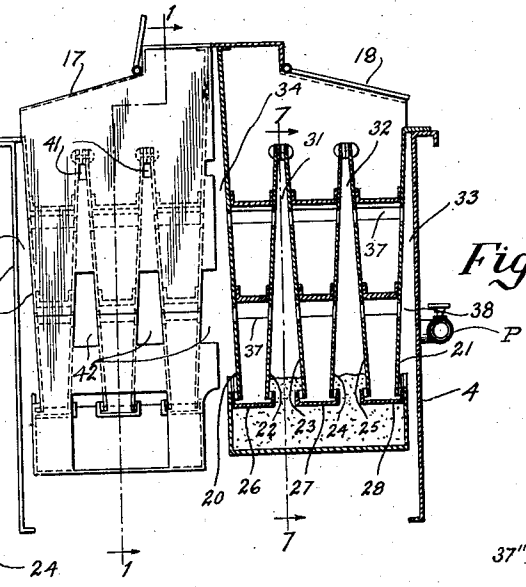


Fig. 9.

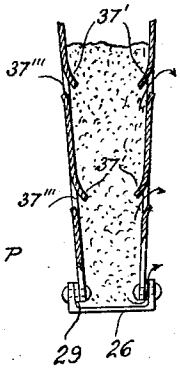


Fig. 3.

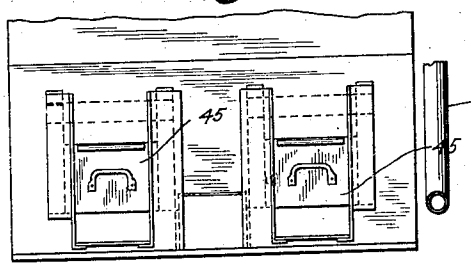
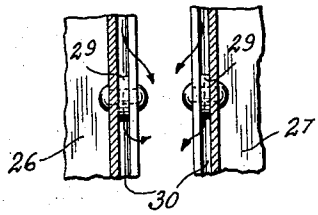


Fig. 5.



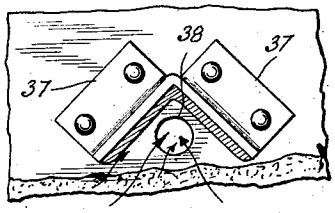


Fig. 6.

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Fig. 7.

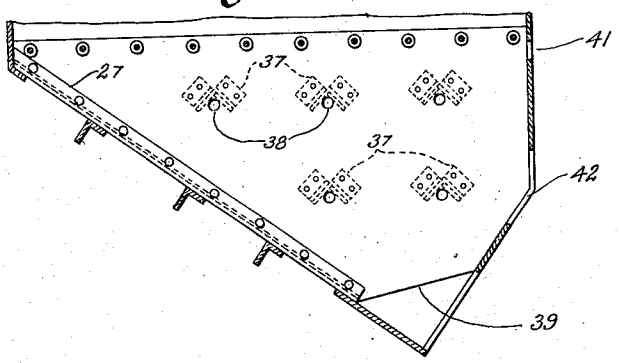
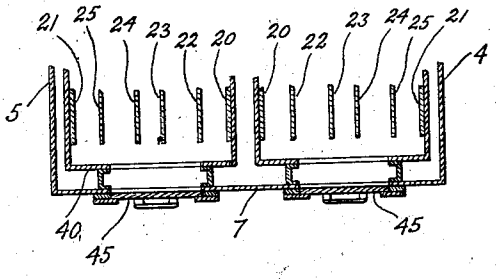


Fig. 8.



WITNESS.
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UNITED STATES PATENT OFFICE.

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COMBINATION HEATER AND MAINTENANCE APPARATUS.

Application filed January 21, 1922. Serial No. 530,782.

My invention relates generally to improvements in apparatus for heating materials, but relates more particularly to improvements in apparatus for heating materials required in road construction and maintenance work. In some of its aspects my invention relates particularly to portable heaters and maintenance devices.

In making, patching or repairing of roads of certain types, it is customary to use sand, stone, gravel and other aggregates. The aggregates are usually mixed with binders of one kind or another, such for example as asphalt, tar, etc. In order that the best results may be obtained it is necessary to dry the aggregates thoroughly, and as they are often quite wet when obtained it is necessary to apply heat thereto in order to drive off the moisture. In practice it is necessary, or, at least, highly desirable, that this be accomplished quickly, easily and at low cost, and that the aggregates be brought to a thoroughly dry and heated condition. Heretofore much difficulty has been encountered in drying the aggregate material so that the operation has been characteristically slow, laborious and expensive. This was so whether mechanical agitation, such for instance with use of revolving drums, was employed or not; as machines of the later type necessitate a large initial expense besides costly outlay for operating machinery.

In the study of the operation of mechanism for drying and heating material applicant discovered that greater efficiency in the heating and drying of materials such as sand, stone and other solid materials could be obtained by the withdrawal of the moisture as soon after it is converted into vapor, or steam, as possible. Naturally when cold, or cold and wet material is placed and heated in stationary heaters the material lying closest to the heating surfaces, such as the bottom and sides or flues, will first be heated and the vapor arising will necessarily have to pass through the cold part of the overlying material to escape. The natural result is that at least a part of the rising vapor would condense back into water on striking this cold material. Consequently, very little moisture is driven off before all the material is heated, with the result that the drying operation is a slow process.

One of the objects of this invention is to withdraw the vapors, or part of them, from the body of the material in close proximity to the place of formation or generation instead of necessitating the passage thereof through the cold material.

A second object of my invention is to accomplish this withdrawal of vapor or steam preferably by the suction created by the draft of the chimney, thereby obviating the necessity of fans or other mechanically operable machinery.

A third object of my invention is to have the flame or heated gases or products of combustion of the furnace pass over the top of that part of the heated material lying adjacent the point or place of discharge as a further aid in heating and in the withdrawal of moisture. As will be noted from the drawing the volume of material near the discharge outlet is comparatively small; hence, this material being heated underneath, along its sides, through its body and over its top surface, besides being subjected to suction for the removal of moisture in the form of vapor or steam, is discharged, when needed or desired, in a state best adapted for use.

Again it is an object of my invention to provide what in effect amounts to an automatic check or draft. In other words, as the heated material is withdrawn and the volume remaining in the apparatus is lessened the heat generated by the furnace is automatically decreased. This is automatically accomplished, for, as the heated material is withdrawn, the openings through which the vapors were previously withdrawn when the material lay adjacent to it, are now, in turn, exposed to the atmosphere as additional material is taken out with the result that outside air is now drawn through these openings direct to the chimney or stack, instead of being drawn through the fire or fuel on the grate bars. As more and more material is withdrawn, simultaneously less and less air is drawn through the furnace, thereby not only saving fuel, but increasing the life of the machine, for naturally steel plates subject to intense heat or flame will, in the course of time, burn out, and by reducing the intensity of the heat as soon as is consistent with the work to be performed, this destructive action is minimized.

I aim also to provide an apparatus for road building, repair and maintenance work, whereby all of these operations can be performed in less time, with less labor, at less

cost, and whereby the character of the work shall be uniformly good.

Another object of my invention is to provide an apparatus of the character mentioned, which shall be so formed as to be easy and inexpensive to manufacture and which shall be of durable character.

My invention consists generally in the method of operation, and in the form, arrangement, construction and co-operation of the parts, whereby the above named objects, together with others that will appear hereinafter, are attainable; and my invention will be more readily understood by reference to the accompanying drawings which will illustrate what I consider, at the present time, to be the preferred embodiment thereof.

In said drawings:

Fig. 1 is a vertical longitudinal sectional view substantially as though taken on the line 1—1 of Fig. 2.

Fig. 2 is a compound sectional view, the left half being viewed along the line 2—2 of Fig. 1, and the right half along the line 2′—2′ of Fig. 1.

Fig. 3 is a detail sectional view substantially along the line 3—3 of Fig. 1.

Fig. 4 is an enlarged detail sectional view illustrating the construction of the aggregate heating receptacles.

Fig. 5 is a fragmentary detail sectional view substantially on the line 5—5 of Fig. 4; and

Fig. 6 is a detail view substantially on the line 6—6 of Fig. 4.

Fig. 7 is a detail sectional view substantially on the line 7—7 of Fig. 2.

Fig. 8 is a detail sectional view, substantially on the line 8—8 of Fig. 1; and

Fig. 9 is a detail sectional view of a bin of modified form embodying my invention.

Apparatus of this character is of especial value in making and repairing roads and pavements of a bituminous nature, such as asphalt, tar bound aggregate, and so forth, and for this reason, I shall describe the apparatus with especial reference to such work. This, it should be understood, however, is by way of illustration and not by way of limitation.

The apparatus here shown is a wagon and comprises a front axle 1 and a rear axle 2 upon which suitable road wheels are mounted for travel upon the ground 3. Upon the wheels a superstructure of novel form is mounted. As here shown, this is composed of side plates 4 and 5 which are spaced apart and which, together with the front plate 6, rear plate 7 and the bottom plates 8 and 9 form a box-like enclosure hereinafter termed a fire box. At the forward end of the fire box, I arrange a vessel 11 in which material 12, usually a bituminous material, such as tar, asphalt and the like, is contained. The material 12 must be brought to proper temperature and as described hereinafter is discharged upon a mixing board where other materials are also discharged for mixing purposes. The vessel 11 is supported upon the bottom plate 8 a distance sufficient to form a passage for the gases of combustion which may pass out through the smoke stack 15 that leads from the front plate 6. A damper 16 is provided for regulating the effective size of the smoke-stack 15.

At the rear of the apparatus I have provided a plurality of bins or containers, in the present instance two in number, and which, as a whole, bear the reference characters 17 and 18. These bins or containers 17 and 18 ordinarily hold the aggregates used in road making, such for example, as gravel, sand, stone and the like, indicated at 19. Relatively more of the aggregate material is used in repair work than of the tar, asphalt, or binder material and the aggregates are often quite wet when placed in the bins 17 and 18. Hence, it is necessary, before this material can be used, that it be first heated and then dried by driving off the moisture and then raised to proper temperature. This must not be too hot as otherwise when mixing with bituminous materials the latter will be burned or ruined for the purpose intended. As discussed in the opening of the specification, the proper drying of the aggregates has proven to be a difficult, uncertain, and expensive operation.

I aim to provide means whereby this can be effectively accomplished without the use of mechanically operated machinery at reasonable speed and at low cost, and whereby the aggregates can be heated and discharged upon the mixing board or trough in form best suited for use with the tar, asphalt or other binding material, as the case may be.

Two bins are provided, but inasmuch as they are alike in construction and operation, a description of one will suffice for both.

The aggregate bin is composed of side plates 20 and 21, which are slightly inclined, and a plurality of oppositely inclined intermediate plates 22, 23, 24 and 25. The lower ends of the plates 20 and 22 are disposed within upstanding flange portions of a channel member 26, the plates 23 and 24 within a channel member 27, and the plates 25 and 21 within a channel member 28. These channel members form a dual purpose, that is to say, they close the bottom of the bin, and, at the same time, they are made heavier than the sheets and thus form a protection against the destructive action of the products of combustion impinging against and scouring the bottom portions of the bins. These channel members furthermore have thickened corners which are well adapted to stand the action of the fire. Instead of securing

the respective plates 20, 22, 23, 24, 25 and 21 directly to the flanges of the respective channel members, I space them therefrom by means of washers 29 as best shown in Figs. 4 and 5. As a result, there is provided an elongated narrow slot 30 between the plate and the channel member which, as will be shown shortly, serves to permit the escape of the water vapor or steam as it is formed in heating the aggregates.

The upper parts of the plates 22 and 23 are likewise secured together as are the upper parts of plates 24 and 25. There is thus provided a plurality of vertical longitudinal spaces or ducts 31 and 32, as well as spaces 33 and 34, between the side sheet and the adjacent sheet 21 of the bin 17, and between the sheet 20 of the bin 17 and the adjacent sheet of the bin 18.

As the gases of combustion rise from the fire 35 they pass on their way to the chimney 36, through the various passages or ducts just mentioned and underneath and along the sides, as well as the back of the bins, and because of the abundant heating area thus provided serve very quickly to bring the aggregates in the bin to the desired working temperature. The bins are usually provided with a large amount of aggregate material and the first action operates to bring the lower strata of aggregate material to a temperature sufficient to drive off the moisture. Ordinarily, this moisture in vapor form would pass upwardly through the aggregate material and upon striking the colder upward strata would recondense, and be again turned to water, thereby in effect nullifying the previous heating result. In the structure which I have provided, however, this action does not occur, because the gases rushing through the various passages serve to create a partial vacuum and as soon as any vapors are generated, they first pass under the plates and out through the slots 30, eventually finding their way out through the smoke stack 36. This entirely prevents the recondensation of the vapors and permits the raising of the material to working temperature as quickly as is possible by the heat generated to accomplish this result. As more and more of the material is heated and the upper strata is approached, the vapors formed are now, to a certain extent, drawn through the voids of the dry material that had previously been filled with water, and in addition I have provided means for eliminating the vapors as they arise from such material. To this end, I have provided in each section of the bin a plurality of inverted angle members 37 which extend between the side plates of that particular compartment, and in the side plates are provided openings 38 for the escape of the water vapor. Obviously, the fire box draft serves to withdraw the vapors.

In Fig. 9 I have illustrated a modified construction of the material bin wherein special construction provides for the withdrawal of the vapors as they are formed. In this construction, the bottom of the bin is formed as already described, and similar parts have been given similar reference characters. The side walls, however, are provided with openings by severing the side walls at spaced points and pressing inwardly portions of the wall, as indicated at 37′. There is thereby formed a plurality of vents or openings 37‴ through which the vapors generated can very quickly and easily escape. Because of the downwardly and inwardly extending portions 37′, the material is prevented from flowing or dropping through the vent openings.

It is desirable to present as much of the aggregate material to direct contact with the products of combustion as possible, and for this purpose I have cut away the lower parts of the plates 22, 23, 24, and 25, as indicated at 39. The lower parts of the channel members 26, 27 and 28 are likewise stopped short of the end plate 40 of the bin. Thus there is provided a transversely disposed triangular portion at the lower part of the bin where the material extends from side plate 20 to side plate 21. The hot gases passing through the ducts 31 and 32, therefore, pass over in direct contact with the upper surface of so much of the aggregate material as is disposed directly under the said ducts. The hot gases also pass underneath the same and in addition, the material is subjected to suction of draft immediately over the discharge opening at A″. Thus the material is brought to a high temperature and brought to the proper condition just before it is discharged upon the mixing board about to be described.

To permit escape of the products of combustion from the openings or spaces 31 and 32 the end plate 40 is provided with openings 41 and 42 which communicate, with the chamber 43 which, in turn, directly communicates with the outlet or stack 36. The stack 36 is provided with a damper 44 whereby the flow of the products of combustion in the fire box may be controlled. That is to say, by the use of the damper 16 in pipe 15 and the damper 44 in pipe 36, a very nice disposition of the flow of the gases and movement thereof around the various receptacles within the fire box can be had.

The aggregate material may be discharged through suitable discharge gates 45 directly upon a mixing trough or board 46, and when they are so discharged from the appartus here described, the aggregates are entirely freed from undesirable moisture and have been brought to the necessary working temperature. Likewise the material 12 from tank 11 can be discharge upon

the mixing board by means of a pipe, P, and because of the proper condition of the aggregate material can be properly mixed to form the best composite product for road purposes. The pipe P is carried throughout upon the outer side of the fire box, because in this manner all danger of coking or forming the material in the pipe is eliminated, and when it is brought to proper working temperature the material can be discharged in that condition. I run the pipe P close to the furnace wall so that it will receive sufficient heat therefrom to maintain it at desired temperature.

The appartus is obviously of very simple construction, is one which is extremely efficient in operation and, at the same time, is one which, because of the novel form and disposition of the parts, particularly those subjected to the direct contact of the fire box gases, is well able to withstand service conditions over a long period of time.

The many advantages of the apparatus which I have shown and described, and the method of ridding the aggregate material of its moisture will be apparent to those skilled in this art without further comment. The present disclosure, however, will also suggest modified constructions to such persons whereby the substantial objects and purposes of my invention may be attained, and I do not, therefore, wish to be limited to the specific construction herein shown and described except only as may be necessary by limitations in the hereunto appended claims.

I claim:

1. A material heating bin including upstanding solid walls and a bottom wall, both forming direct action heating surfaces, said walls being so connected as to provide vents adjacent the junction of said walls.

2. A material heating bin including upstanding solid walls having vent openings therein, and means extending transversely of and between said walls and shielding said vent openings from above.

3. A material heating bin including upstanding solid walls having vent openings therein, and an inverted angle bar member extending transversely of and between said walls in line with and vertically above said vent openings.

4. A material heating bin including upstanding solid walls and a channel member coacting with the bottom margins thereof to form the bottom of the bin, and means securing the bottom margins of said walls and the flanges of said channel member together in a manner forming elongated vent openings at the bottom of the bin.

5. A material heating bin having upstanding walls, a channel member arranged at the lower edges of the walls with its side flanges upstanding, and means securing the walls and side flanges of the channel together in spaced relation to form a vent.

6. Apparatus of the class described embodying therein a fire box, a material heating bin positioned therein and having its walls which provide heating surfaces spaced from the walls of the fire box, said material heating bin having a vapor vent therein below the normal upper material level.

7. Apparatus of the class described embodying therein a fire box, a material heating bin positioned therein and having its walls which provide heating surfaces spaced from the walls of the fire box, said material heating bin having a vapor vent therein adjacent its bottom.

8. Apparatus of the class described embodying therein a fire box, a material heating bin positioned therein and having side and bottom walls which provide heating surfaces that are spaced from the walls forming the fire box, said bin having a vent therein adjacent the puncture of the sides and bottom.

9. Apparatus of the class described embodying therein a fire box, a material heating bin positioned therein and having side and bottom walls which provide heating surfaces that are spaced from the walls forming the fire box, said bin having vents in opposite sides, and a housing extending between and shielding said openings.

10. A multiple compartment heating bin embodying therein, side walls, solid walls between said side walls and dividing the bin into spaced apart material compartments, and plates closing the bottoms of said compartments, said plates and walls providing direct action heating surfaces, said side walls having openings therein communicating with the spaces between said compartments at points below the normal high level of the material contained in the bin.

11. A multiple compartment heating bin embodying therein, side walls, solid walls between said side walls and dividing the bin into spaced apart material compartments, and plates closing the bottoms of said compartments, said plates and walls providing direct action heating surfaces, there being vent openings provided along the bottom portions of said solid walls.

12. A multiple compartment heating bin embodying therein side walls, upstanding spaced intermediate walls forming compartments and bottom plates closing said compartments, the lower corners of said intermediate plates being cut away as and for the purpose specified.

13. A multiple compartment heating bin embodying therein side walls, upstanding spaced intermediate walls forming compartments and bottom plates closing said compartments, the lower corners of said intermediate plates being cut away as and for the purpose specified, and means adjacent

the cut away part of the bin for controlling the discharge of material.

14. An apparatus of the class described embodying therein a firebox, a material heating bin therein having walls forming direct action heating surfaces, there being an opening in one wall of the bin communicating with the firebox, which acts when the material is at one level in the bin as a vent for the vapor formed therein and which when the material in the bin reaches a level below said opening, acts to permit the entrance of atmospheric air to the firebox to check the fire therein.

15. An apparatus of the class described embodying therein a fire box, a material bin therein, having a discharge opening, part of said bin structure being cut away adjacent the discharge opening, and means for directing part of the heating gases into proximate relation to said cut-away portion of the bin.

16. An apparatus of the class described embodying therein a fire box, a material bin therein having a discharge opening, a mixing pan arranged adjacent said discharge opening, part of said bin structure being cut away adjacent the discharge opening, and means for directing part of the heating gases into proximate relation to said cut-away portion of the bin and across said discharge opening, whereby said material is additionally heated just prior to its discharge upon the mixing pan.

17. An apparatus of the class described embodying a casing providing a firebox and a stack connected thereto, a plurality of substantially vertically disposed material bins in said firebox and spaced apart to form heating chambers therebetween, which are in communication with the firebox, there being vents formed in said bins which after the material has been discharged in part act as a draft check for the firebox.

18. An apparatus of the class described embodying a casing providing a firebox and a stack connected thereto, a plurality of substantially vertically disposed material bins in said firebox and spaced apart to form heating chambers therebetween, which are in communication with the firebox, there being vents formed in said bins through which vapor formed in the material in said bins is withdrawn therefrom into the said chambers between said bins.

19. An apparatus of the class described embodying a casing providing a firebox and a stack connected thereto, a plurality of substantially vertically disposed material bins in said firebox and spaced apart to form heating chambers therebetween, which are in communication with the firebox, there being vents formed in said bins through which vapor formed in the material in said bins is withdrawn by suction of the draft in the firebox.

In testimony whereof, I have hereunto set my hand this 3rd day of January, 1922.

HERMAN P. ANDRESEN.