July 7, 1931. C. D. CHASE 1,813,728

MATERIAL TREATING APPARATUS

Filed Oct. 19, 1927 3 Sheets-Sheet 1

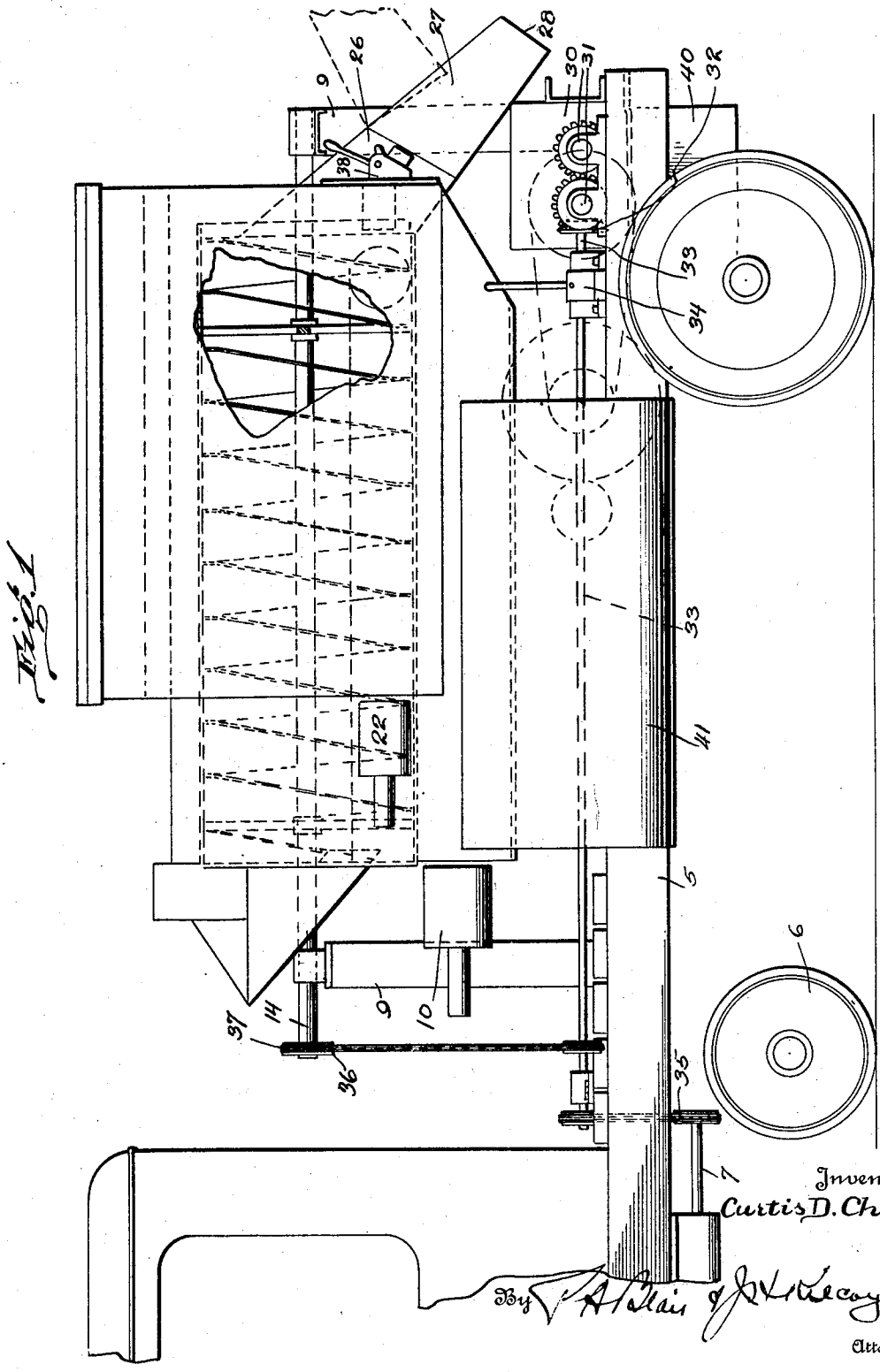


Fig. 1.

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Filed Oct. 19, 1927 3 Sheets-Sheet 2

Fig. 2

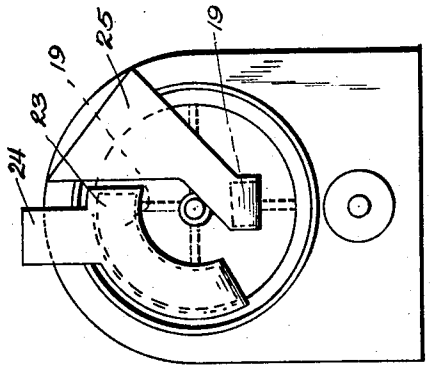
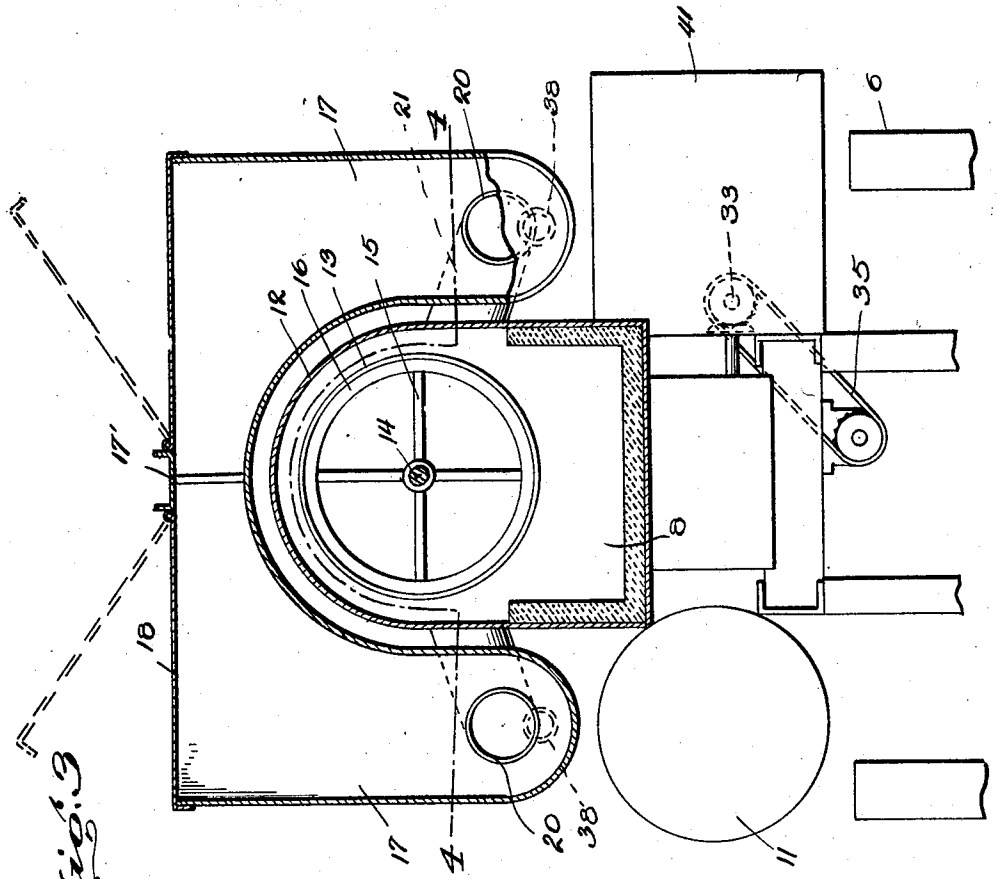


Fig. 3



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Filed Oct. 19, 1927 3 Sheets-Sheet 3

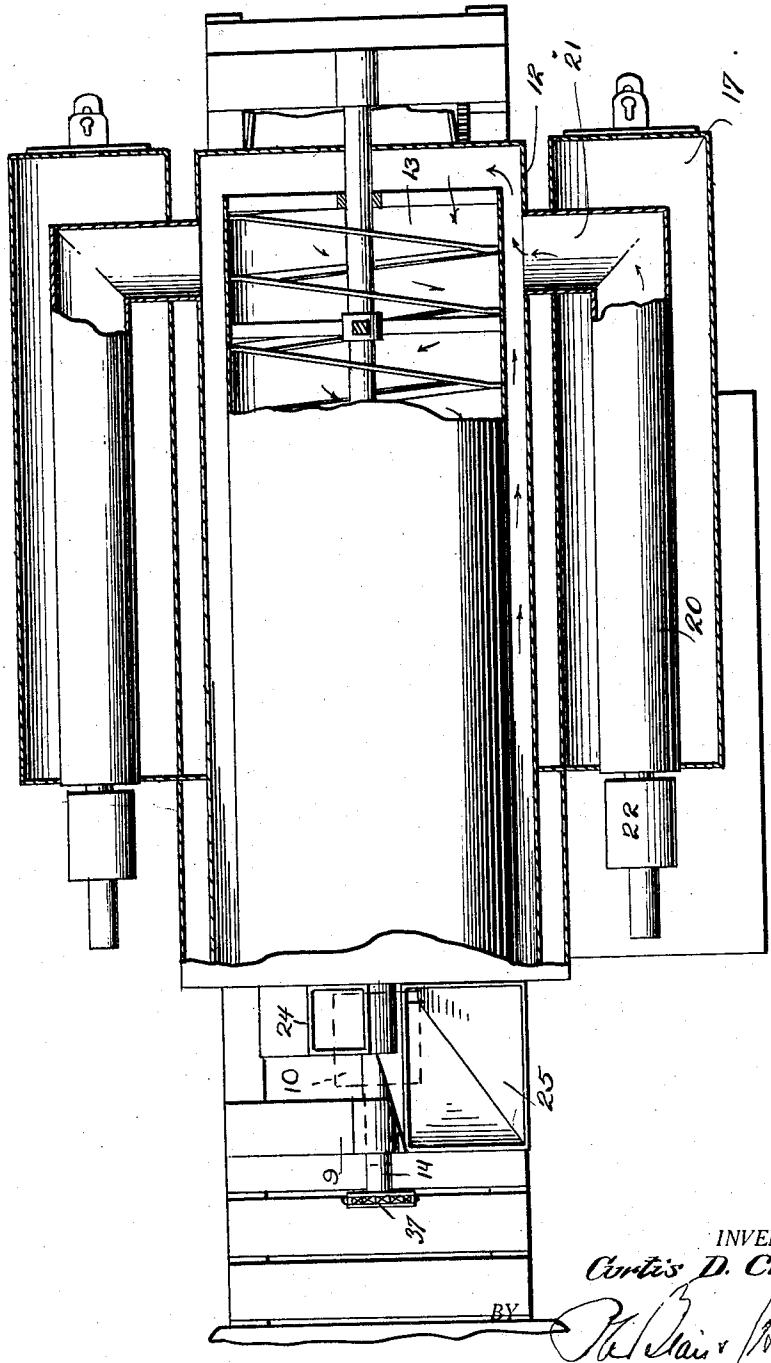


Fig. 11.

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UNITED STATES PATENT OFFICE

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MATERIAL TREATING APPARATUS

Application filed October 19, 1927. Serial No. 227,339.

This invention relates to material treating apparatus and more particularly to that type of apparatus known as "hot mix plants" for mixing bituminous concrete, such as asphalt or tar, with sand and stone for the construction and maintenance of bituminous roads and bituminous floors. As is well known to those familiar with the art, bituminous material, and more especially asphalt and tar, must be in a fluid condition for efficient use, and in order to maintain this condition, it is necessary to heat the material to the melting point or above and maintain it at a heated temperature until ready for use. Otherwise, there is a decided tendency for the asphalt to cool and solidify, making it exceedingly difficult to handle or mix with other materials prior to laying.

It is therefore one of the objects of the present invention to provide a portable, self-contained hot mix plant particularly adapted for the use above described.

A further object is to provide an apparatus of the above general character of compact and simple construction, which will be a substantially complete and self-contained unit.

A further object is to provide an apparatus of the above general character with simple and practical means for heating the bituminous material and the aggregate with which it is mixed, wherein the materials may be most rapidly and efficiently treated.

A further object is to provide an apparatus, such as above described, having relatively few parts, and which may be inexpensively manufactured and assembled.

Other objects will be in part obvious from the annexed drawings and in part hereinafter indicated in connection therewith by the following analysis of this invention.

This invention accordingly consists in the features of construction, combination of parts and in the unique relation of the members and in the relative proportioning and dispositioning thereof, all as more completely outlined herein.

To enable others skilled in the art to fully comprehend the underlying features thereof that they may embody the same by the numerous modifications in structure and relation contemplated by this invention, drawings depicting a preferred form of the invention have been annexed as part of this disclosure, and in such drawings, like characters of reference denote corresponding parts throughout all of the views, in which—

Fig. 1 is a side elevation, more or less diagrammatic, and showing in section or dotted lines the various essential features entering into the construction;

Fig. 2 is an end elevation, partly in section, of the parts shown in Fig. 1; and

Fig. 3 is a detail in section, taken near one end of the apparatus, showing the inlet and outlet passages.

Fig. 4 is a partial section along lines 4—4 of Fig. 3.

Referring to the drawings in detail and more particularly to Figure 1, 5 indicates a supporting frame, preferably an automobile chassis, mounted from wheels 6 and driven by any suitable source of power, such as the automobile engine, whereby the entire apparatus may be conveniently transported from one place to another, as necessary. The driving mechanism of the automobile is not shown except for the power take-off or stub shaft 7, the purpose of which will be later described. Mounted upon the frame of the chassis, is a main combustion chamber 8 of general rectangular construction and preferably lined with fire brick. One or more sources of heat, such as indicated diagrammatically by the fuel oil burners 10, are located at the forward or front end of this chamber to direct their flame rearwardly. These burners are supplied from a fuel supply tank 11 at one side of the combustion chamber. This form of heating means may be of any desired type and the details of construction thereof are immaterial for the purpose of description.

The upper part of this combustion chamber 8 is enclosed by an inverted U-shaped hood 12 as shown more clearly in Fig. 2 thereby to house a rotatable cylindrical drum 13 mounted upon a shaft 14 journaled in front and rear supports 9 and held in position on the shaft by end spiders 15. Intermediate spiders may be provided if neces-

sary, depending upon the size of the drum or cylinder 13 and the load which it is adapted to carry. The interior of the drum is provided with a material advancing means preferably in the form of a continuous spiral vane 16, thereby to gradually convey the material to the discharge end thereof.

Mounted above the hood 12 and combustion chamber 8 are saddle tanks 17 comprising two longitudinally extending compartments spaced by a center wall 17' and which are slightly spaced from the hood 12, yet are sufficiently close thereto to absorb heat from the combustion chamber without danger of carbonizing or burning the material contained therein. These tanks are preferably filled with bituminous material, such as asphalt, and are provided with hinged cover plates 18. It will also be noted that the lower legs of these tanks 17 are provided with cylindrical flues 20 open at their forward ends and connecting at their rear ends with inwardly directed outlets 21, passing thru the walls of the tanks 17 and hood 12 and delivering to the rear of combustion chamber 8. At the forward ends, the flues 20 are provided with fuel oil burners 22, as shown in Fig. 1, similar to the burners 10 and supplied from the same sources of fuel and air. Thus, the flame and products of combustion pass thru the tubes 20, out thru the extension flues 21 and into the combustion chamber where they mix with the flame and products of combustion from the burners 10. The combined stream of combustion products then returns thru the drum 13, and performs two functions, namely, that of heating the bituminous material or asphalt within the tanks 10 to a sufficient temperature to maintain them in fluid condition, and on exhaust, assist in heating the drum 13 and the aggregate, such as sand and stone, passing therethru. The products of combustion from both sets of burners finally pass thru the front open end 19 of the mixing drum 13 in intimate contact with the material feeding therethru but in an opposite direction, and thence out thru a flue 23 and stack 24.

The flue 23 embraces a relatively large portion of the forward open end of the drum, while the remaining portion is blocked off by means of the inlet hopper 25 receiving the sand and crushed stone to be fed into the heating drum 13.

At the rear end of the heating drum 13 is positioned a discharge chute 26 preferably rearwardly and downwardly inclined and having a hinged portion 27 closed by a sliding door 28, which hinged portion may act as a measure for properly proportioning the sand, for example, to be fed to a pug mixer 30 positioned immediately beneath the said discharge spout. In other words, the sliding closure 28 when in closed position, will permit the accurate measuring of a predetermined number of pounds of sand, for example, which may be discharged into the pug mixer by merely raising the part 27 upwardly to its dotted line position, or if preferred, the closure 28 may be opened allowing the sand to directly fall into some other mixing or measuring device.

This pug mixer which may be of any desired type preferably comprises two shafts 31 geared to each other, whereby the paddles carried by these shafts rotate in opposite directions. The shafts are driven by beveled gearing meshing with a gear 32 fixed on a drive shaft 33 provided with an intermediate clutch 34, shaft 33 being connected in any desired manner, as by means of sprocket chain 35, to the take-off shaft 7. Likewise, a second chain and sprocket mechanism 36 drives a sprocket 37 upon one end of the shaft 14, thereby to rotate the heating drum 13.

At the rear of each of the legs of the saddle tank 17, there is provided a tap-off or outlet 38 thru which the melted asphalt or bituminous material may be withdrawn. The tap-offs are located rearwardly of and adjacent the bent flues 21, so that material to be drawn off is in a highly fluid condition. There is also provided a discharge spout 40 beneath the pug mixer, whereby the contents thereof may be distributed directly upon the roadway.

While the operation of this device is doubtless well known to those familiar with the art, it may be briefly described as follows. Assuming the tanks 17 to be filled with bituminous material or asphalt from a suitable source of main supply, the burners 22 are started to maintain the same in a heated and fluid condition if atmospheric conditions or distance from the place of use require. These burners also aid in heating the mixing drum 13, and the products of combustion pass out thru the stack 24. When the unit arrives at the place of use where the asphalt is to be mixed with sand, crushed stone or other material, the burner 10 is started and thus heats the mixing drum 13 to a relatively higher temperature, the products of combustion from all of the burners passing back thru drum 13 and out thru the stack 24.

When it is ready to mix the materials, the clutch mechanisms are actuated, whereby the shaft 14 is rotated as well as the pug mixer mechanism. The sand or other materials are fed into the hopper 25 and are engaged by the helical vane 16 within the drum 13, thereby to progressively feed the same towards the rear end of the mixer against the return stream of the products of combustion. In this manner, the aggregate is heated to a high temperature, and when the measuring device 27 has been filled, this is dumped into the pug mixer by raising the same to the dotted line position. The desired quantity of melted asphalt is then drawn off thru the

cock 38 and delivered to the mixer 30, where all of the materials are thoroughly mixed, after which they are discharged thru the chute 40 directly upon the roadway. This operation is repeated in a substantially continuous manner as the unit progressively moves along the road.

From the above, it will be seen that the apparatus as a whole contemplates a compact, self-contained unit particularly adapted for use in road construction. Its operation may be considered substantially continuous and progressive, thereby rendering the same highly efficient in operation. In view of the fact that there are relatively few parts, the complete apparatus may be inexpensively manufactured and assembled.

No attempt has been made to illustrate and describe various minor details of the apparatus, for these will be apparent to those familiar with the subject. The compartment 41, for example, at the right of the chassis in Fig. 2, may be utilized for carrying tools, spare parts or even a small air compressor (not shown) for supplying compressed air to the fuel oil burners, which may be driven from an independent engine or a chain and sprocket drive connected with the stub shaft 7 or shaft 33.

Without further analysis the foregoing will so fully reveal the gist of this invention that others can by applying current knowledge readily adapt it for various applications without omitting certain features that, from the standpoint of the prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore such adaptations should and are intended to be comprehended within the meaning and range of equivalency of the following claims.

1. In an apparatus of the character described, in combination, a supporting frame, a combustion chamber mounted thereon, a material feeding drum mounted in said chamber, a source of heat in said chamber for heating the drum and from which the exhaust products of combustion are adapted to return through the drum, and openings at one end of said drum, thru one of which the material to be heated is adapted to be fed and thru the other of which the products of combustion are adapted to exhaust from the drum.

2. In an apparatus of the character described, in combination, a supporting frame, a combustion chamber mounted thereon, a material feeding drum mounted in said chamber, a source of heat in said chamber for heating the drum and from which the exhaust products of combustion are adapted to return through the drum, openings at one end of said drum, thru one of which the material heated is adapted to be fed and thru the other of which the products of combustion are adapted to exhaust from the drum, and additional sources of heat outside of said combustion chamber adapted to direct the products of combustion to said combustion chamber and thru the said drum.

3. In an apparatus of the character described, in combination, a combustion chamber, a source of heat mounted at one end of said chamber, a material feeding drum mounted in said chamber and subjected to the products of combustion from said source of heat, a tank surrounding said chamber adapted to contain material to be heated, heating flues extending through said tank, sources of heat directly associated with said flues and passages leading from said flues to said combustion chamber, whereby the products of combustion from said sources of heat are discharged into said chamber.

4. In an apparatus of the character described, in combination, a combustion chamber, a material feeding drum mounted therein thru which material to be heated is adapted to be progressively fed, a source of heat in said chamber, the products of combustion from which are adapted to pass thru said drum in a direction counter to that of the material fed therethru, a tank enclosing the upper part of said chamber, individual sources of heat for heating the contents of said tank, and means for conducting the products of combustion from said last named sources of heat to said combustion chamber.

5. In an apparatus of the character described, in combination, a rotatable drum thru which material to be heated is adapted to be progressively fed, means in said drum for causing the material to be moved along the drum as the same is rotated, and a discharge spout for receiving the contents of the drum, said spout including a portion constituting a measuring device for the material received therein.

6. In an apparatus of the character described, in combination, a material feeding drum thru which heated material is adapted to be progressively fed, means in said drum for causing the material to be moved along the drum, and a discharge spout for receiving the contents of the drum, said spout having a pivotally mounted, closed receptacle adapted to receive and measure the material to be heated and to subsequently discharge the same when moved about its pivotal mounting.

7. In an apparatus of the character described, in combination, a rotatable drum thru which material to be heated is adapted to be fed, means for heating the material as it is fed thru said drum, a discharge spout for receiving the contents of said drum after being heated, said spout having a portion constituting a measuring device for the material received therein.

8. In an apparatus of the character described, in combination, a material feeding drum thru which material to be heated is

adapted to be fed, means for heating the material as it is fed thru said drum, a discharge spout for receiving the contents of said drum after being heated, and a measuring device directly associated with said spout and comprising a hinged portion having a normally closed outlet, whereby the material measured therein may be discharged from said hinged portion when the same is moved about its hinge connection.

9. In an apparatus of the character described, in combination, a material feeding drum thru which material to be heated is adapted to be fed, means for heating the material as it is fed thru said drum, a discharge spout for receiving the contents of said drum after such heating, a measuring device directly associated with said spout and comprising a hinged portion having a normally closed outlet, whereby the material measured therein may be discharged from said hinged portion when the same is moved about its hinge connection, and a mixing device adjacent the discharge spout adapted to receive the heated material.

10. In an apparatus of the character described, in combination, a portable frame having a combustion chamber mounted thereon, a mixer mounted adjacent one end of said chamber, tanks for containing fluid material arranged about said chamber, heating flues extending through said tanks, a conveyor within the chamber thru which the aggregate to be heated is progressively passed, and means to discharge the fluid contents and the aggregate into said mixer.

11. In an apparatus of the character described, in combination, a portable frame having a combustion chamber mounted thereon, a mixer mounted adjacent one end of said chamber, tanks for containing fluid material arranged about said chamber, heating flues extending through said tanks, a conveyor within the chamber thru which the aggregate to be heated is progressively passed, means to discharge the fluid contents and the aggregate into said mixer, and independent heating means associated with said flues and with said heating chamber.

12. In an apparatus of the character described, in combination, a portable frame having a combustion chamber mounted thereon, a mixer mounted adjacent one end of said chamber, tanks for containing fluid material arranged about said chamber, heating flues extending through said tanks, a conveyor within the chamber through which the aggregate to be heated is progressively passed, independent heating means associated with said flues and said heating chamber, and means for uniting the products of combustion from said two independent sources of heat and conducting them over the aggregate in a direction counter to that of the aggregate passing thru said conveyor.

13. In an apparatus of the character described, in combination, a portable frame having a combustion chamber mounted thereon, a material feeding drum within the chamber, a tank adjacent said chamber adapted to contain fluid material, a heating flue extending through said tank, a mixer adjacent the discharge end of said drum for receiving the materials discharged from said tank and drum, independent sources of heat comprising burners directly associated with said combustion chamber and with said flues, and a flue outlet communicating with said combustion chamber whereby the products of combustion from the burners associated with the tanks may combine with the products of combustion in the combustion chamber and be discharged thru said drum, said drum having a stack at its forward end for exhausting the products of combustion.

14. In an apparatus of the character described, in combination, a portable frame having a combustion chamber mounted thereon, a material feeding drum within the chamber, a tank adjacent said chamber adapted to contain fluid material, heating flues extending through said tank, independent sources of heat comprising burners directly associated with said combustion chamber and said flues, flue outlets communicating with said combustion chamber whereby the products of combustion from the burners associated with the tanks may combine with the products of combustion in the combustion chamber and be discharged thru said drum, said drum having a stack at its forward end for exhausting the products of combustion, an inlet hopper for receiving the materials to be heated in said drum, and a mixer at the opposite end of said drum adapted to receive and mix the heated materials discharged from the drum and tank.

15. In an apparatus of the character described, in combination, a combustion chamber, a source of heat therefor, a material conveying means extending thru said chamber and subjected on all sides to the heat from said heat source, a tank extending about a portion of said chamber and adapted to contain other material to be heated, heating means for said tank, and passages leading from said heating means to said chamber, whereby the products of combustion from said heating means pass into said chamber.

16. In an apparatus of the character described, in combination, a combustion chamber, a source of heat therefor, material conveying means extending thru said chamber and subjected to the heat from said heat source, the products of combustion from the heat source being adapted to pass thru said conveying means in a direction counter to that of the material fed therethru, a tank extending about a portion of said chamber and adapted to contain other material to be

heated, heating means for said tank, and passages leading from said heating means to said chamber, whereby the products of combustion from said heating means pass into said chamber and thru the conveying means.

Signed at Washington, D. C., this 9th day of September, 1927.

CURTIS D. CHASE.