April 16, 1929. N. V. HENDRICKS 1,709,016

HEATER FOR BITUMINOUS MATERIALS

Filed Feb. 11, 1925

FIG. 1

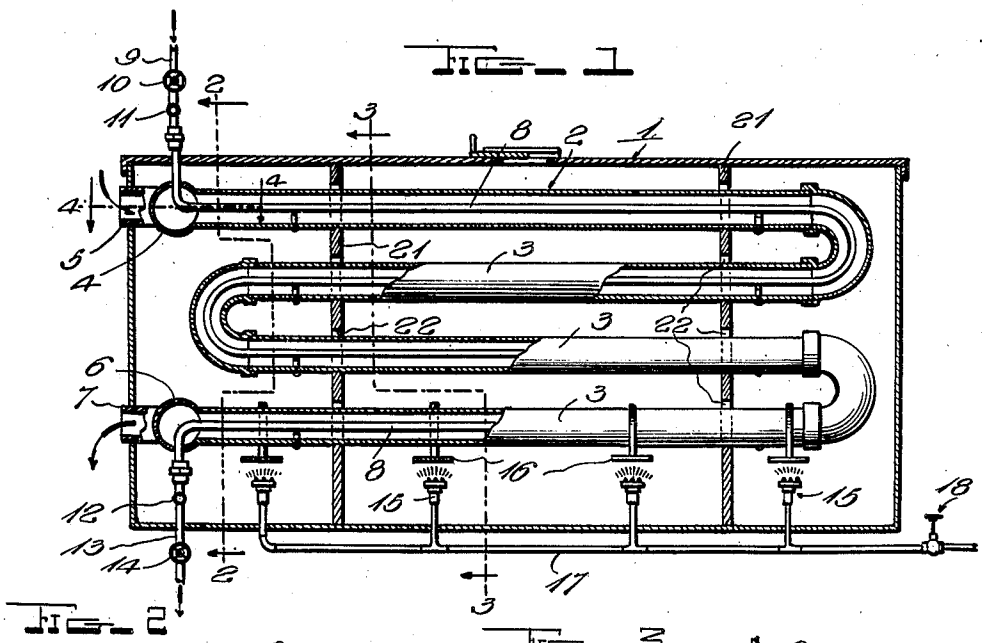


FIG. 2

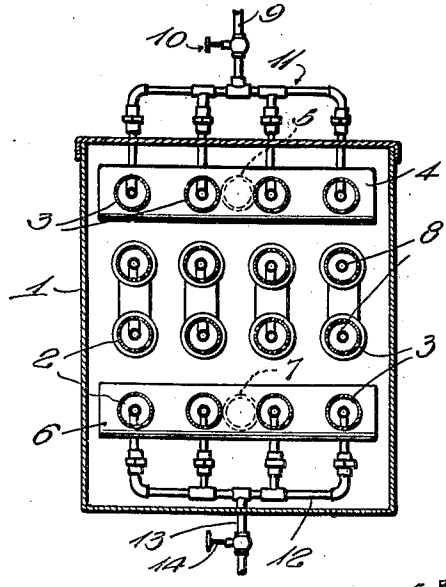


FIG. 3

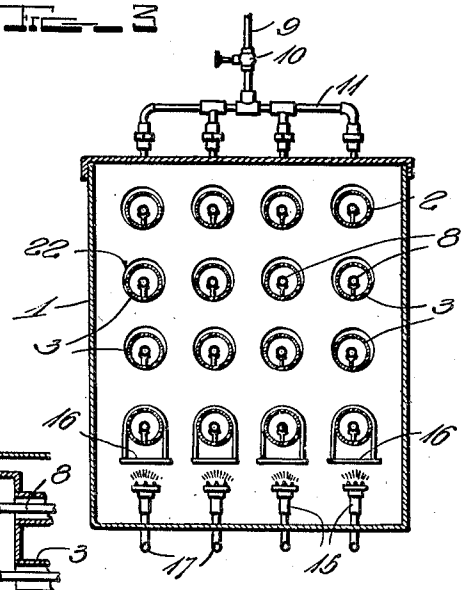


FIG. 4

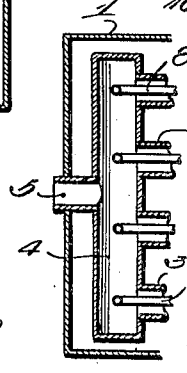
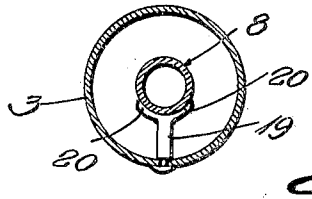


FIG. 5



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UNITED STATES PATENT OFFICE.

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HEATER FOR BITUMINOUS MATERIALS.

Application filed February 11, 1925. Serial No. 8,514.

This invention relates to a heater for asphalt and other bituminous materials, the main object of the invention being to provide a heater of maximum simplicity and efficiency whereby asphalt and other similar bituminous materials may be superheated, or heated to a very high degree, for use in the construction of street and road surfaces and for various other purposes.

A further object of the invention is to provide a heater whereby asphalt or other similar material may be highly heated without danger of burning or coking the same.

A still further object of the invention is to provide a heater of coil type through which the material to be heated is conducted, and whereby the material is subjected in its course of flow to internal and external heat, whereby a rapid and efficient heating of the material to the desired degree is secured.

A still further object of the invention is to provide a heater of the character described embodying means whereby a tube or annular column of the material will be subjected to external heat from the flames of a burner or burners and to internal heat from superheated steam, and wherein the thickness of the annular column of flowing material will be evenly maintained for an even and regulated application of the heat thereto, whereby excessive heating will be avoided.

A still further object of the invention is to provide a novel construction of coil heater, means for applying the external heat, and means for applying the internal heat, combined with means for automatically regulating the flow of the material, whereby maximum efficiency of operation will be secured.

The invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawing, in which:—

Figure 1 is a vertical longitudinal section through a heater constructed in accordance with my invention.

Figure 2 is a vertical transverse section on the line 2—2 of Figure 1.

Figure 3 is a vertical transverse section on the line 3—3 of Figure 1.

Figure 4 is a horizontal transverse section on the line 4—4 of Figure 1.

Figure 5 is a detail transverse section through one of the coil members, showing particularly the means for supporting the steam conducting pipe therein.

In carrying my invention into practice I provide a heating drum or casing 1, of suitable form and size for the purpose, a casing of oblong rectangular form being shown in the present instance. This casing is made of metal provided, if desired, with an external cover or jacket of insulating material for confining the heat therein.

Arranged within the casing is an external heating coil 2, forming a conductor for the asphalt or other bituminous material to be treated. This is shown in the present instance as comprising a series of parallel, equidistantly spaced coil units 3, each of zig-zag form for the back and forth circulation of the material longitudinally of the heater in its course of transit. Each of these coil units, as shown in the present instance, consists of an upper limb, a lower limb and two intermediate limbs, joined by return bends of proper curvature to ensure easy flow of the material without undue resistance.

The upper or inlet limbs of the coil units are connected at their receiving ends by a horizontal transverse intake header 4, arranged at one end of the casing 1, with which header connects an inlet 5 through which the material to be heated is introduced thereinto in any suitable manner and from any suitable source of supply. The lower or discharge limbs of the coil units are similarly connected to a horizontal transverse outlet or discharge header 6, arranged below the header 4, and from which leads a discharge pipe or outlet 7 through which the heated material is ejected into any suitable receptacle provided for the purpose.

Extending through each external heating coil unit 3 is a heating coil 8, which is similar in form thereto, and which extends through the unit 3 concentric therewith and in spaced relation thereto. The coil 3 is provided for the circulation of superheated steam furnished through a supply pipe 9 from a suitable steam generator, in which pipe 9 is arranged a controlling and cut off valve 10. The inlet ends of the several coils 8 within the several coils 3 project upwardly and outwardly through the top of the header 4 and the top of the casing 1 and are connected by a union or manifold pipe

11 with the pipe 9, whereby a proper distribution of the steam to all the coils 8 is effected. The outlet ends of the coils 8 project downwardly through the bottom of the header 6 and the bottom of the casing 9 and are connected by a union 12 with a pipe 13 having a controlling and cut off valve 14 therein. Through this pipe 13 the exhaust steam and water of condensation are discharged after transfer of all of the available heat units therefrom to the material. By means of the valve 10 the amount of steam supplied to the internal heating coil may be regulated, and by means of the valve 14 the steam may be checked or retarded in its flow so as to secure a desired degree of condensation of the superheated steam into water, making it possible to utilize to a very high degree all the available heat units of the steam for heating purposes.

The arrangement of the coils 8 concentrically within the coils 3 causes the material traversing each coil 3 to flow in the form of an annular stream, which stream is heated from the inside by the steam heat and from the outside by external heat applied to the coil units 3. The external heat employed may be of any suitable character. As shown in the present instance a row of burners 15 is arranged beneath each coil unit 3, the flames from which impinge against spreaders 16 whereby such flames are spread so that the coil units will be directly and indirectly heated therefrom the burners in addition to directly heating the coil units also maintaining a high general temperature within the casing 1. These burners are supplied with gas or other fuel from a service pipe 17 having a controlling and cut off valve 18 therein whereby the flow of fuel may be cut off when desired and the amount of fuel regulated for a desired heating action. As the asphalt or other bituminous material flows through the coils it is therefore heated by the steam heat and externally by the burner heat resulting in a rapid and even heating of the material to the intended high temperature during its course of transit and prior to its discharge.

The pipe elements 8 are supported in the coil units 3 by bracket members 19 provided with saddles 20 in which the pipes 8 rest and to which they may be suitably secured, said brackets being arranged at proper intervals and serving to support the pipes 8 from sagging and to maintain them in fixed relationship to the walls of the coils 3, thereby always maintaining an even and given thickness of the material in its flow through the coils 3. This is a very desirable and important feature of my invention inasmuch as, by thus maintaining the even thickness of the flowing tubular column of material, any lessening in the thickness of the material at any point in its course of travel is prevented, thus allowing the material to be heated to an intense degree without liability of burning or coking the same, which would be liable to occur in the event of the thinning out of the material from a predetermined thickness at any point. A high degree of efficiency of operation is obtained by the construction described, as the brackets effectually prevent the coils 8 from moving out of a gaged position under their own weight and their tendency to expand and contract under temporary temperature fluctuations.

In practice the coil units 3 may be of any given effective length for the travel of the material in a flowing column of given thickness for a required predetermined distance during a predetermined time period to effect the rapid and uniform heating of the material to the highest possible degree without burning or coking. By properly governing the supply of the material so as to maintain the thickness of the tubular column, regulating the heat of the flames from the burners 15 and adjusting the valve 14 to regulate the condensation of the superheated steam in the coils, a continuous flow of the material may be secured and a rapid heating of the material to a high degree obtained without burning or coking the same and in a substantially automatic manner, but little time or attention on the part of the operator being required to maintain the apparatus in proper working order after the fuel and steam controlled valves have been adjusted to the right degree.

Any suitable means may be employed for supporting the coil units in position within the drum or casing 1. Provided for this purpose in the present instance are sheet metal headers or plates 21, having openings 22 through which the limbs of the coil units extend. The limbs of the coil units normally rest upon the bases of the walls of these openings, which openings are of elliptical or other elongated form in a vertical direction, so as to permit the coil limbs to spread in such direction to a certain degree under the action of heat, thus relieving them and the supporting headers from twisting strains and distortion.

The mode of use of the device will be readily understood from the foregoing description, taken in connection with the drawing, and it will be seen that the invention provides a heater of the character described which is simple of construction and ensures rapidity and efficiency of operation, the described construction allowing the material to be uniformly heated to the intended high temperature without burning or coking the same. In practice, the heater may be made of any given size dependent upon the intended rated output within a given period

of time. No particular means for supplying the asphalt to the heater is shown, as any suitable type of power feed mechanism or gravity feeding means may be employed.

Having thus fully described my invention, I claim:

In an apparatus for heating asphalt or like bituminous substances for the purpose of preparing the same for use as road surfacing or repair material, the combination of horizontal transverse intake and discharge headers disposed in superposed relation, the intake header having an inlet centrally of its length for the introduction of the material to be treated thereinto and the discharge header having an outlet centrally of its length for the discharge of the treated material therefrom, a series of vertically disposed zigzag heater units arranged side by side in equally spaced relation, each unit comprising an outer coil communicating respectively at its inlet and discharge ends with the intake and discharge headers and an inner coil having its inlet and discharge ends extending respectively into the intake and discharge headers and thence projecting outward through the headers, the inner coil of each unit being concentrically arranged within and in spaced relation to the outer coil thereof and the opposed surfaces of said coils being smooth surfaced for direct sliding contact of the material therewith and so as to form a substantially unobstructed channel for the free flow of a compact annular body of the material through said channel and between said surfaces, a casing enclosing the headers and coils and having an end wall through which both the inlet of the intake header and outlet of the discharge header externally project, means in said casing for externally heating the outer coils of the heater units, and valved conductors connected to the inlet and discharge ends of the inner coils of the heater units whereby a heating fluid in regulated amount may be admitted to said coils at their inlet ends and the rapidity of exhaust of such fluid governed at their discharge ends.

In testimony whereof I affix my signature.

NATHAN V. HENDRICKS.