C. F. HETHERINGTON.

COMBINED ASPHALT KETTLE AND STEAM GENERATING PLANT.

APPLICATION FILED JAN. 17, 1920.

1,350,502. **Patented Aug. 24, 1920.**

2 SHEETS—SHEET 1.

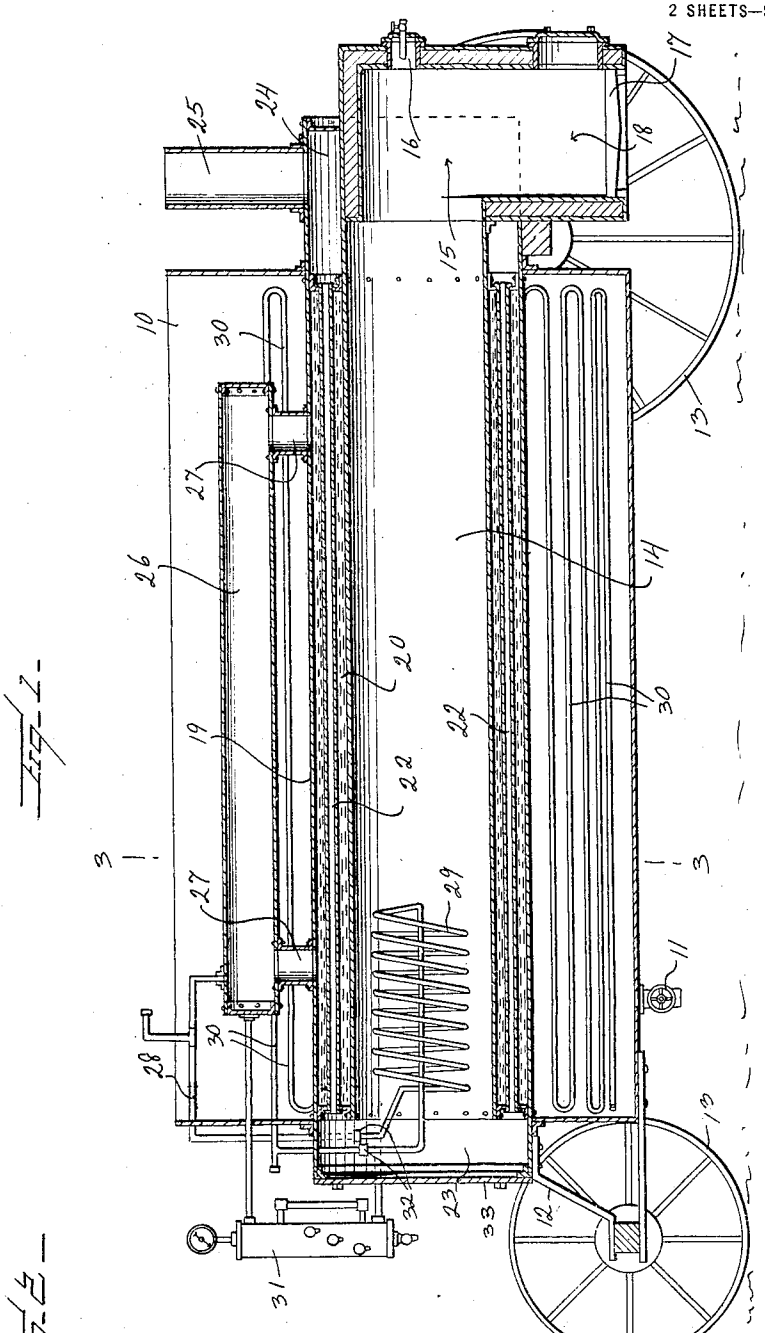


Fig. 1.

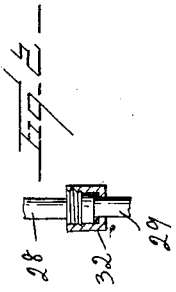


Fig. 2.

Inventor

C. F. Hetherington

By Watson E. Coleman

Attorney

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2 SHEETS—SHEET 2.

Fig. 2.

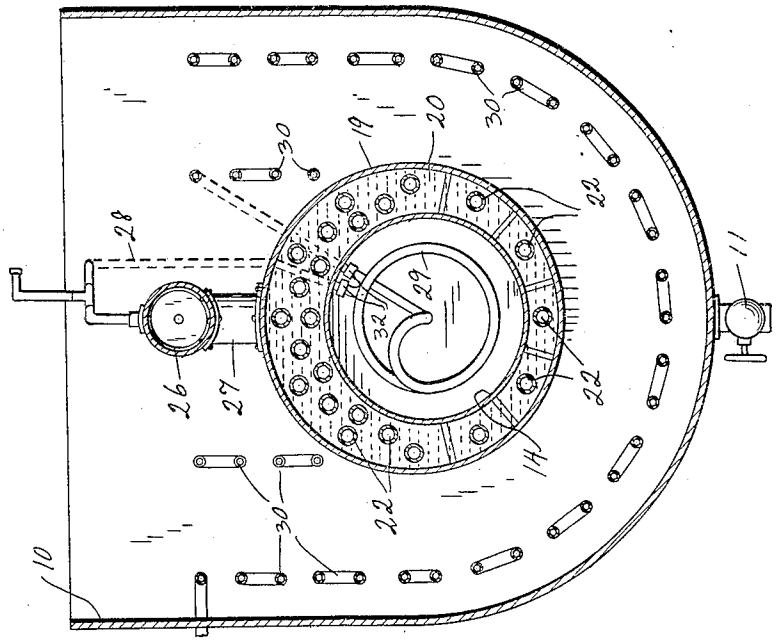
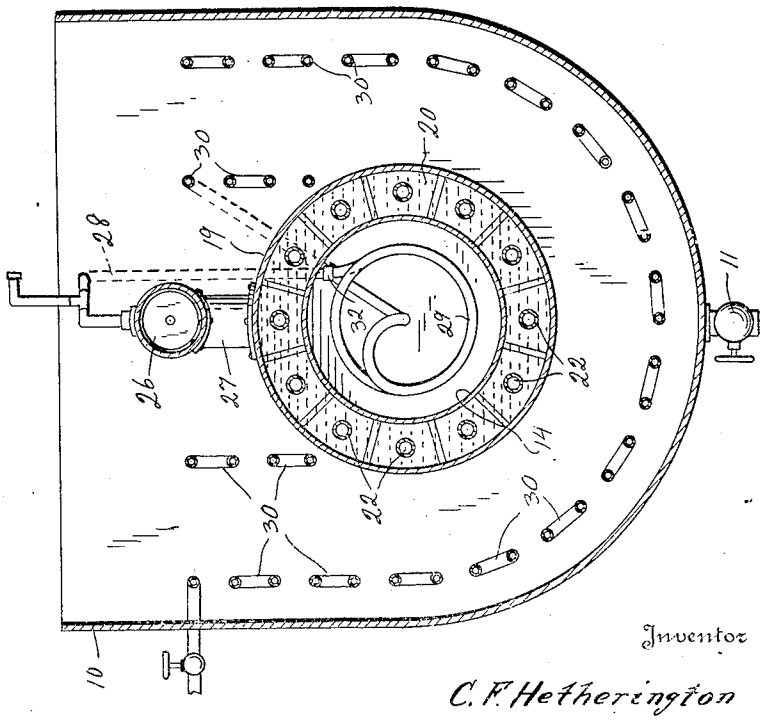


Fig. 3.



Inventor

C. F. Hetherington

By Watson E. Coleman

Attorney

UNITED STATES PATENT OFFICE.

CARL F. HETHERINGTON, OF INDIANAPOLIS, INDIANA.

COMBINED ASPHALT-KETTLE AND STEAM-GENERATING PLANT.

1,350,502. Specification of Letters Patent. Patented Aug. 24, 1920.

Application filed January 17, 1920. Serial No. 352,150.

To all whom it may concern:

Be it known that I, CARL F. HETHERINGTON, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Combined Asphalt-Kettles and Steam-Generating Plants, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to means for melting asphalt, and particularly to means of this character in which the asphalt is melted by steam heat.

One of the objects of this invention is the provision of a combined steam generating and asphalt melting plant.

And a further object in this connection is to provide a combination asphalt kettle and steam boiler so constructed that one fire will be used for the purpose of both generating steam and melting the asphalt, thus doing away with the necessity now common in plants of this character of providing a separate steam generating plant and a separate asphalt kettle.

A further object is to provide a construction of this character wherein a water leg, as it may be termed, immediately surrounds the flue leading from the fire box, as in the type of boiler known as the Cornish boiler, and wherein the asphalt melting kettle surrounds this water leg so that thus this water leg is interposed between the flue and the asphalt to thereby prevent the asphalt from being heated by direct fire beneath the kettle and to thus eliminate the danger of coking the asphalt, that is driving off the volatile oils and carbonizing the asphalt in the bottom of the melting kettle.

A further object is to provide a dry pipe of steam dome mounted upon the water leg or boiler proper disposed within the asphalt kettle and connected to the water space of the boiler by the usual connections.

And a further object is to provide means for superheating steam taken from this dry pipe or steam dome by the provision of a superheating coil disposed within the boiler flue and subjected to the heat thereof, thus permitting the heating of the asphalt to about 320° F. with steam at a pressure below 250 pounds, when desirable.

And a further object is to provide a construction for melting asphalt which will permit the asphalt to be brought to the correct temperature for use within a period of ten hours, that is which will permit the kettle to be charged at night and the melting of the asphalt to the proper temperature by morning.

A further object is to provide means whereby this superheating coil may be readily removed if it is not desirable to use it.

And still another object is to provide a boiler of this character which will properly heat and melt the asphalt in an asphalt kettle while at the same time the steam may be used for other purposes, as for instance, for the purpose of melting and bringing to proper temperature the asphalt contained in asphalt tank cars.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a longitudinal sectional view of an asphalt melting and steam generating plant constructed in accordance with my invention;

Fig. 2 is a fragmentary detail section of the coupling between the superheating coils and the pipes leading therefrom;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a section similar to Fig. 3 but showing a slight modification in the form of boiler.

Referring to these drawings, it will be seen that my combined steam boiler and asphalt melting kettle comprises the kettle proper, which is designated 10, and which is approximately U-shaped in cross section and is open at the top, and is provided with a draw-off cock 11 in its bottom. This kettle is mounted upon a suitable supporting frame of any desirable character, this supporting frame being designated generally 12 and being provided with forward and rear supporting wheels 13.

Extending longitudinally entirely through the forward and rear ends of the kettle is a flue 14 which, at its rear end, opens into the upper portion of a fire box 15 supported in any suitable manner upon the truck frame. This fire box may be provided with means for injecting oil or gas flames into the flue or may be provided with the usual grate, ash pit, ash box, etc. I have illustrated the outer wall of the fire box as being provided with openings 16 through which oil burners may be projected, and as provided in its bottom

with a grate 17 and a fire pot 18. I do not wish to be limited to any particular means for generating heat therefor.

Surrounding the flue, though not necessarily disposed concentrically thereto, is an outer boiler sheet 19, the flue constituting the inner boiler sheet, and the space between the flue and the outer boiler sheet constituting a water leg, designated generally 20. This water leg may be supplied with water in any suitable manner, and has preferably a length equal to the length of the asphalt melting kettle. Extending longitudinally through this water leg and preferably between the usual braces 21, are a plurality of boiler tubes or fire tubes 22. These open at their forward ends into a smoke box 23 and at their rear ends into a smoke box 24, this smoke box having a smoke stack 25, as is usual. It will be obvious now that the products of combustion will pass through the central flue 14 into the forward smoke box 23 and will then pass back through the boiler tubes or fire tubes 22 to the smoke box 24 and out through the flue 25. Disposed above the boiler and extending longitudinally thereof below the level of the top of the asphalt kettle is a dry pipe 26 (or a steam dome may be used) which is connected by tubes 27 to the water leg 20. Preferably a pipe 28 leads from one end of the dry pipe and extends horizontally through the kettle, then downward through the smoke box 23, and into the flue 14 at one end thereof. There it is coiled to form a superheating coil 29.

From this superheating coil the steam may pass into a plurality of longitudinally extending coils 30 disposed preferably as illustrated in Figs. 3 and 4 so as to extend at intervals throughout the length of the asphalt kettle. The pipe may then extend out of the asphalt kettle to any desired point or steam may be taken directly from the dry pipe out through the asphalt kettle or from the superheating coil 29 directly out to any suitable point of discharge without passing in the form of coils 30 to the asphalt kettle. I have illustrated the usual water column and gage 31 attached to the boiler and dry pipe, these parts performing their obvious functions.

While I have illustrated the flue 14 as being concentric to the boiler sheet 19, I do not wish to be limited to this, as it is obvious that the space between the upper portion of the flue and the upper portion of the boiler sheet might be greater than the space between the lower portion of the flue and the lower portion of the boiler sheet, as in the Scotch-marine boilers of common type in which the axis of the boiler shell and the furnace flue are not coincident. This construction will afford greater space above the flue for boiler tubes. This construction is illustrated in Fig. 4.

The construction which has been above described is particularly designed to provide a plant which may be operated some distance from railway facilities, that is to say a plant small enough and light enough to be readily moved upon its own wheels over the usual roads and which will provide for melting the asphalt by steam and which will not be so heavy that it cannot be transported over the average country roads and across the usual culverts and bridges. It is to be noted that asphaltic cement must be heated to about 320° F. in order to properly prepare it for mixing with sand, stone dust, etc., in a mechanical pugmill mixer. To properly melt the asphalt with steam at 100-pound pressure is out of the question and it is, therefore, necessary to either use steam at 250 or 300 pounds pressure or else to superheat the steam at a lower pressure. Furthermore, it is a practical necessity, due to the fact that the melting of asphalt is usually done at night, that the asphalt be brought to the correct temperature within a period of ten hours from the time of charging the kettle. In my construction, the shell of the boiler furnishes a portion of the heating surface necessary for melting the asphalt and the remainder of the necessary heating surface is made up of steam coils usually formed of 1¼ and 1½″ extra heavy pipe. These steam coils might be connected directly to the dry pipe, but preferably, as before stated, they extend from a superheating coil to permit steam to be used at a lower pressure. If steam at 120 pounds pressure be used, there may be about 150 lineal feet of pipe in the superheater coil, thus making the coil for a kettle 11½′ long by 5′ 6″ wide and 6′ deep probably 7 or 8′ long. It is desirable that the pipes leading to and from this superheating coil be made detachable so that the coil may be removed within a few minutes provided it gives too much heat when being used with high pressure steam.

To this end, the superheating coil 29 is connected to the pipes 30 and the pipe 28 by couplings 32, and the smoke box 23 is provided with a door 33 which is constructed similar to the door on the front end of a locomotive type boiler. This permits connections to be made between the coil and the dry pipe and the superheated coil and the asphalt heating coils or connections to be made directly to the dry pipe and the asphalt heating coils and the superheating coil removed. It will be understood, of course, that the dimensions of this plant will vary according to the capacity desired, particularly in view of the fact that I design that the steam from this combined boiler and asphalt kettle shall be used for other purposes than merely melting down the asphalt. In other words, my construction provides a steam generating plant as well as an

asphalt melting kettle, and in this connection I desire to state that the steam from the steam boiler may be used for the purpose of melting the asphalt in asphalt carrying tank cars, that is that steam may be generated in excess of the requirements of the kettle itself, thus furnishing a supply which may be introduced into the steam coils of the tank cars. Asphalt refineries ship the asphalt from the refineries in tank cars equipped with steam coils so that the asphalt may be melted in the cars at the destination and pumped from them to the plant kettles. Where steam for the tank cars has been taken from the power boiler of an asphalt plant, it has been found that it interfered materially with the power requirements of the plant and, therefore, it is usual for the contractor to secure additional boiler power to take care of the tank cars alone. Some of these cars will hold 18,000 gallons of asphalt. Of course, if the plant which I have designed is to be used for generating excess steam sufficient to melt the asphalt in cars of this capacity, the boiler would have to have a relatively great horse power. For ordinary purposes, however, and to generate excess steam for the purpose of melting asphalt in a tank car of ordinary size, a boiler of 30 or 35 horse power would be sufficient.

I do not wish to be limited to the details of construction or the exact arrangement of the various parts of the kettle and boiler, as it is obvious that these might be varied in many ways without departing from the spirit of the invention.

While I have illustrated a dry pipe as disposed within the kettle, and into which steam generated within the boiler is carried, I do not wish to be limited to this, as an ordinary steam dome might be used in some cases in place of the dry pipe, and it is to be understood that the phrase "steam chamber" as used in the claims is intended to include either a dry pipe, a dome, or equivalent element. It is also to be understood that the statement previously made as to the number of lineal feet in the superheating coil is merely illustrative, as it is obvious that the superheating coil would be varied to suit the kind of asphalt to be handled, the use to which the excess steam is to be used, etc. While the construction described is particularly intended for the melting of asphalt, yet it is obvious that it might be used for the purpose of refining asphalt or the distillation of oils and like uses, and I do not wish to be limited, therefore, to the use of this device merely as an asphalt melting kettle.

I claim:

1. A heating kettle and steam generator comprising a kettle proper, a flue extending through the same, means for carrying products of combustion into and through said flue, a water leg entirely surrounding that portion of the flue disposed within the kettle and constituting a steam generator, and ducts leading from the steam generator to the exterior of the kettle.

2. A heating kettle and steam generator comprising a kettle proper, a flue extending through the same, means for carrying products of combustion into and through said flue, a water leg entirely surrounding that portion of the flue disposed within the kettle, and steam pipes extending from the water leg through the kettle.

3. A combined heating kettle and steam generator comprising a kettle proper, a flue extending through the same, means for carrying products of combustion into and through that portion of the flue disposed within the kettle, a water leg entirely surrounding that portion of the flue disposed within the kettle, a steam collecting member disposed within the kettle and connected to the water leg, and steam pipes leading from said collecting member and extending through the kettle.

4. A heating kettle and steam generator comprising a kettle proper, a flue extending through the same, means for carrying products of combustion into and through said flue, a water leg entirely surrounding that portion of the flue disposed within the kettle, a steam chamber disposed within the kettle and connected to the water leg, a superheating coil disposed in the flue and connected to receive steam from the chamber, and steam coils disposed in the kettle and with which said flue is connected.

5. An asphalt melting and steam generating plant including an asphalt kettle, a fire box mounted in connection therewith, a flue leading from the fire box and extending through the kettle, a water leg disposed within the kettle and entirely surrounding the flue, fire tubes receiving products of combustion from the flue and extending through the water leg, a stack into which the fire tubes discharge, a steam chamber operatively connected to the water leg, and a steam pipe leading from the chamber.

6. An asphalt melting and steam generating plant including an asphalt kettle, a fire box mounted in connection therewith, a flue leading from the fire box and extending through the kettle, a water leg disposed within the kettle and entirely surrounding the flue, fire tubes receiving products of combustion from the flue and extending through the water leg, a stack into which the fire tubes discharge, a steam chamber operatively connected to the water leg, and a steam pipe leading from the chamber, said steam pipe extending into the kettle and being formed to provide a plurality of coils.

7. An asphalt melting and steam generat-

ing plant including an asphalt kettle, a fire box mounted in connection therewith, a flue leading from the fire box and extending through the kettle, a water leg disposed within the kettle and entirely surrounding the flue, fire tubes receiving products of combustion from the flue and extending through the water leg, a stack into which the fire tubes discharge, a steam chamber operatively connected to the water leg, a steam pipe leading from the chamber, a superheating coil disposed within the flue, one end of the coil being connected to the steam chamber, and longitudinally extending steam coils disposed within the kettle and connected to the other end of the superheating coil.

8. An asphalt melting and steam generating plant including an asphalt kettle, a fire box mounted in connection therewith, a flue leading from the fire box and extending through the kettle, a water leg disposed within the kettle and entirely surrounding the flue, fire tubes receiving products of combustion from the flue and extending through the water leg, a stack into which the fire tubes discharge, a steam chamber operatively connected to the water leg, a steam pipe leading from the chamber, a superheating coil disposed within the flue, one end of the coil being connected to the chamber, and longitudinally extending steam coils disposed within the kettle and connected to the other end of the superheating coil, said superheating coil being detachably connected to the chamber and to the asphalt heating coils, and the heating plant being provided with a door at one end whereby access may be had to the superheating coil to remove it or replace it.

9. An asphalt heating plant comprising a kettle having supporting wheels, a fire box associated with the kettle and supported by said wheels, a flue leading from the fire box through the kettle, a smoke box into which the flue discharges, a water leg entirely surrounding the flue and disposed within the kettle, a smoke box disposed at the other end of the flue from the first named smoke box, fire tubes connecting the smoke boxes, a stack leading from the second named smoke box, a chamber disposed within the kettle and operatively connected at its ends to the water leg, and a steam pipe leading form the chamber.

10. An asphalt heating plant comprising a kettle having supporting wheels, a fire box associated with the kettle and supported by said wheels, a flue leading from the fire box through the kettle, a smoke box into which the flue discharges, a water leg entirely surrounding the flue and disposed within the kettle, a smoke box disposed at the other end of the flue from the first named smoke box, fire tubes connecting the smoke boxes, a stack leading from the second named smoke box, a steam chamber disposed within the kettle and operatively connected at its ends to the water leg, a superheating coil disposed within the flue and connected at one end to the chamber, and heating coils disposed within the kettle and connected to the other end of said steam coil.

11. An asphalt heating plant comprising a kettle having supporting wheels, a fire box associated with the kettle and supported by said wheels, a flue leading from the fire box through the kettle, a smoke box into which the flue discharges, a water leg entirely surrounding the flue and disposed within the kettle, a smoke box disposed at the other end of the flue from the first named smoke box, fire tubes connecting the smoke boxes, a stack leading from the second named smoke box, a steam chamber disposed within the kettle and operatively connected at its ends to the water leg, and a steam pipe leading from the chamber, extending in the form of heating coils through the kettle, and extending out of the kettle whereby the steam generated within the boiler may be carried away.

12. In combination, a material heating kettle, a steam generating boiler disposed within the heating kettle, a heating chamber extending through the kettle and arranged to generate steam within the boiler, a fire box associated with the heating chamber, and steam ducts leading from the boiler to the exterior of the kettle.

13. In combination, a material heating kettle, a heating chamber disposed therein, and a water inclosing and steam generating chamber surrounding the heating chamber and disposed within the kettle and having steam ducts leading to the exterior of the kettle.

14. In combination, a material heating kettle, a heating chamber disposed therein, a fire box associated with the heating chamber, a boiler associated with the heating chamber and disposed within the kettle, a steam receiving chamber disposed within the kettle and into which steam from the boiler is led, and pipes leading from said steam chamber through the kettle to the exterior thereof.

In testimony whereof I hereunto affix my signature.

CARL F. HETHERINGTON.