May 25, 1926. 1,586,131

M. J. TRUMBLE

APPARATUS FOR PRODUCING SOLID FUEL

Filed Feb. 9, 1924

Fig. 1.

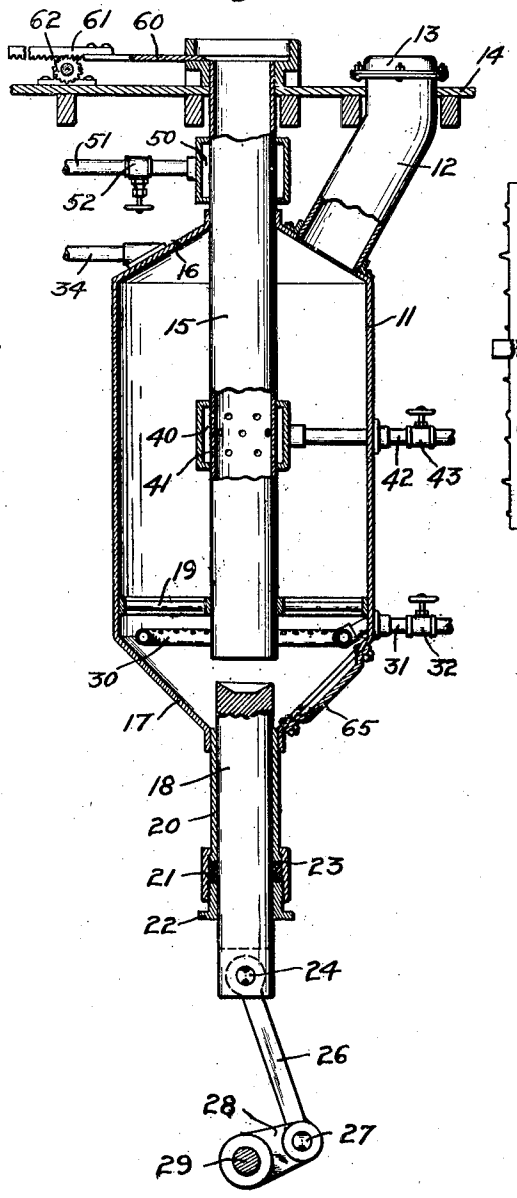


Fig. 2.

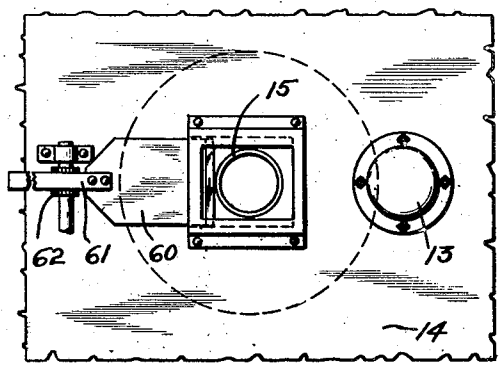
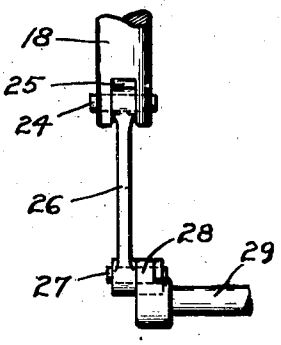


Fig. 3.



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APPARATUS FOR PRODUCING SOLID FUEL.

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There exist in nature large deposits of low grade coal and lignite which have a potentially high fuel value but which, being only partially carbonized, are not suitable for domestic uses and are only partially suitable for steam uses.

It is an object of my invention to provide an apparatus by which these low grade fuels can be treated to remove the volatiles and by which the carbonized residue may be converted into a valuable domestic fuel.

Further objects and advantages will be made evident hereinafter.

One embodiment of my invention is illustrated in the accompanying drawings in which:—

Fig. 1 is an elevation partly in section through one form of my apparatus.

Fig. 2 is a plan view thereof.

Fig. 3 is an elevation at right angles to the elevation of Fig. 1 showing the type of construction used in the crank and connection rod.

In the form of the invention illustrated, I provide a retort 11 which may be filled with the material to be treated through a chute 12 having a tight cover 13. This cover may conveniently extend above a charging floor 14. Extending centrally down into the retort 11 through the top 16 thereof is an eduction pipe 15, this pipe also extending above the charging floor 14. The eduction pipe 15 extends down nearly to the bottom 17 of the retort 11 and has an open end into which a plunger 18 fits loosely, this open end being held centrally in the retort 11 by means of a spider 19. The plunger 18 extends downwardly through a plunger pipe 20 and through packing 21 held in place by a gland 22 which fits tightly in the stuffing box 23. A wrist pin 24 is provided in a slot 25 in the bottom of the plunger 18, this wrist pin being engaged by a connecting rod 26. The connecting rod 26 also engages a crank pin 27 carried on a crank 28 which is driven by means of a shaft 29 from any convenient source of power, not shown. Situated in the bottom of the retort 11 is a perforated steam pipe 30 which is supplied with superheated steam through a pipe 31 having a valve 32. A vapor takeoff pipe 34 is connected into the top of the retort. Surrounding the eduction pipe 15, at some distance above its lower end, is a binder chamber 40 which communicates with the interior of the eduction pipe 15 through small holes 41. The binder, which is preferably a tarry substance, is introduced into the chamber 40 through a pipe 42 having a valve 43. The eduction pipe 15 may be given a supplemental heating by means of a steam chamber 50 supplied with steam through a pipe 51 having a valve 52. A knife 60, having a rack 61 driven by a pinion 62, is provided at the upper end of the eduction pipe 15, this knife being so constructed that it may be driven to the right from the position shown for the purpose of cutting off compressed material extruded from the eduction pipe 15. A manhole closed by a manhole cover 65 is provided near the bottom of the apparatus.

The method of operation is as follows:

The retort being charged with lignite or low grade coal through the chute 12, the top of the chute is closed by the cover 13. The eduction pipe 15 is held full of compressed solid material left from previous operations. Super-heated steam is then delivered to the mass of coal in the retort, the top of the eduction pipe being closed by the knife 60 which fits tightly on the top of the pipe and acts as a cover to restrain the material. The superheated steam raises the temperature of the mass of coal in the retort to such an extent that all of the volatiles are driven off through the pipe 34 and the coal in the retort is reduced to a mass of coke. The shaft 29 is then turned to reciprocate the plunger 18 up and down, the coke on the down stroke of the plunger settling into the space above the plunger and being pushed up into the eduction pipe 15 on the up stroke. The coke may be supplied with a binder such as a tar or asphaltum through the openings 41. The knife 60 is moved back to the position shown in Fig. 1 and the movement of the plunger 18 forces the briquetted coke upwardly so that it projects above the top of the eduction pipe 15. The briquettes so produced are then cut off by the knife 60, forming an irregular mass which may be used as a domestic or steam fuel. The steam chamber 50 may be employed to harden the briquettes by heating them just prior to their extrusion from the eduction pipe 15. The volatiles taken off through the pipe 34 contain light oils and other valuable products, such as ammonium chloride and the

like. These by-products may all be saved by suitable condensers and other well known apparatus, not shown.

I claim as my invention:

1. An apparatus for producing solid fuel comprising: a retort having an opening through which carbonaceous material may be introduced into said retort; means for effecting a gas tight closure of said opening; an eduction pipe extending through one end wall of said retort and having an open end adjacent to the other end of said retort; means for heating the material in said retort; and a plunger so placed as to force material from the interior of said retort into the open end of said eduction pipe.

2. An apparatus for producing solid fuel comprising: a retort having an opening through which carbonaceous material may be introduced into said retort; means for effecting a gas tight closure of said opening; an eduction pipe extending through one end wall of said retort and having an open end adjacent to the other end of said retort; a steam pipe through which steam is forced into the carbonaceous material in said retort; and a plunger so placed as to force material from the interior of said retort into the open end of said eduction pipe.

3. An apparatus for producing solid fuel comprising a retort having an opening through which carbonaceous material may be introduced into said retort; means for effecting a gas tight closure of said opening; an eduction pipe extending through one end wall of said retort and having an open end adjacent to the other end of said retort, said eduction tube and retort being cylindrical and concentric about a vertical axis; means for heating the material in said retort; and a plunger so placed as to force material from the interior of said retort into the open end of said eduction pipe.

4. An apparatus for producing solid fuel comprising: a retort having an opening through which carbonaceous material may be introduced into said retort; means for effecting a gas tight closure of said opening; an eduction pipe extending through one end wall of said retort and having an open end adjacent to the other end of said retort, said eduction tube and retort being cylindrical and concentric about a vertical axis; a steam pipe through which steam is forced into the carbonaceous material in said retort; and a plunger so placed as to force material from the interior of said retort into the open end of said eduction pipe.

5. An apparatus for producing solid fuel comprising a retort having an opening through which carbonaceous material may be introduced into said retort; means for effecting a gas tight closure of said opening; an eduction pipe extending through one end wall of said retort and having an open end adjacent to the other end of said retort, said eduction tube and retort being cylindrical and concentric about a vertical axis and said open end of said eduction pipe being adjacent to the bottom of said retort; means for heating the material in said retort; and a plunger so placed as to force material from the interior of said retort into the open end of said eduction pipe.

6. An apparatus for producing solid fuel comprising: a retort having an opening through which carbonaceous material may be introduced into said retort; means for effecting a gas tight closure of said opening; an eduction pipe extending through one end wall of said retort and having an open end adjacent to the other end of said retort, said eduction tube and retort being cylindrical and concentric about a vertical axis and said open end of said eduction pipe being adjacent to the bottom of said retort; a steam pipe through which steam is forced into the carbonaceous material in said retort; and a plunger so placed as to force material from the interior of said retort into the open end of said eduction pipe.

7. An apparatus for producing solid fuel comprising: a retort having an opening through which carbonaceous material may be introduced into said retort; means for effecting a gas tight closure of said opening; an eduction pipe extending through one end wall of said retort and having an open end adjacent to the other end of said retort; means for heating the material in said retort; means for supplying a binder to said eduction tube; and a plunger so placed as to force material from the interior of said retort into the open end of said eduction pipe.

8. An apparatus for producing solid fuel comprising: a retort having an opening through which carbonaceous material may be introduced into said retort; means for effecting a gas tight closure of said opening; an eduction pipe extending through one end wall of said retort and having an open end adjacent to the other end of said retort; means for cutting off the material extruded through said eduction pipe; means for heating the material in said retort; and a plunger so placed as to force material from the interior of said retort into the open end of said eduction pipe.

9. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; and means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe.

10. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; and means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe, and also for com-

pressing the material in said eduction pipe.

11. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe; and means for heating material in said eduction pipe.

12. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe; and means for introducing a binding material into said eduction pipe.

13. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe; and means for cutting off the material extruded from said eduction pipe.

14. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe; means for introducing a binding material into said eduction pipe; and means for cutting off the material extruded from said eduction pipe.

15. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe, and also for compressing the material in said eduction pipe; and means for introducing a binding material into said eduction pipe.

16. In an apparatus of the characater described: a retort; an eduction pipe extending into said retort; means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe, and also for compressing the material in said eduction pipe; means for introducing a binding material into said eduction pipe; and means for cutting off the material extruded from said eduction pipe.

17. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe; and means for cutting off the material extruded from said eduction pipe, said means for cutting off the material functioning also to close the outer end of said eduction pipe.

18. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; and means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe, said means comprising a reciprocating plunger.

19. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; and means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe, and also for compressing the material in said eduction pipe, said means comprising a reciprocating plunger.

20. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe, said means comprising a reciprocating plunger; and means for introducing a binding material into said eduction pipe.

21. In an apparatus of the character described: a retort; an eduction pipe extending into said retort; means for transferring material from said retort into said eduction pipe and for extruding the material from said pipe, said means comprising a reciprocating plunger; means for introducing a binding material into said eduction pipe; and means for cutting off the material extruded from said eduction pipe, the last mentioned means functioning also to close the outer end of said eduction pipe.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 31st day of January, 1924.

MILON J. TRUMBLE.