G. A. BERTSCH.

FUEL MIXER.

APPLICATION FILED MAY 5, 1916.

1,216,403.

Patented Feb. 20, 1917.

4 SHEETS—SHEET 1.

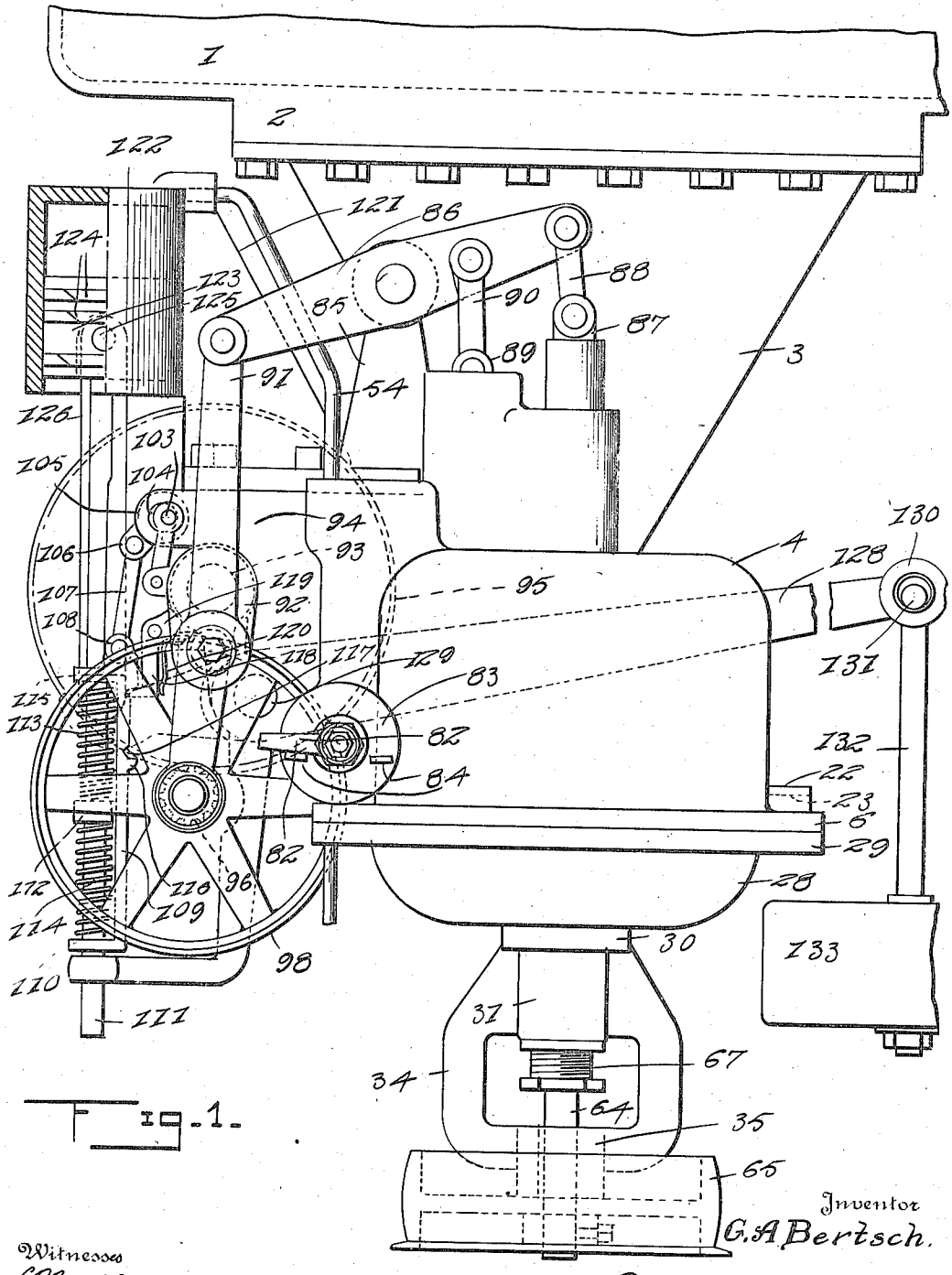


Fig. 1.

Witnesses

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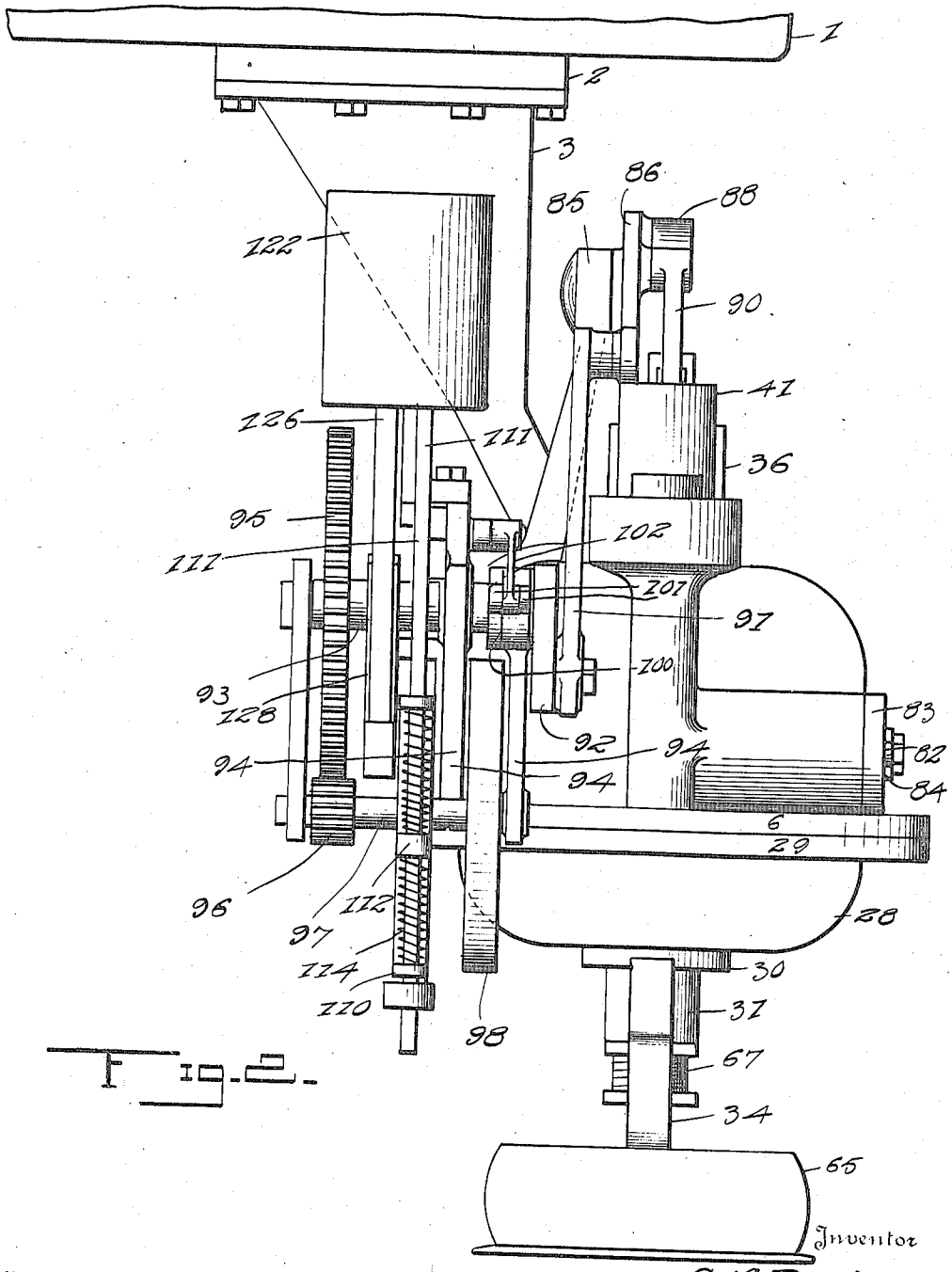


Fig. 2.

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4 SHEETS—SHEET 3.

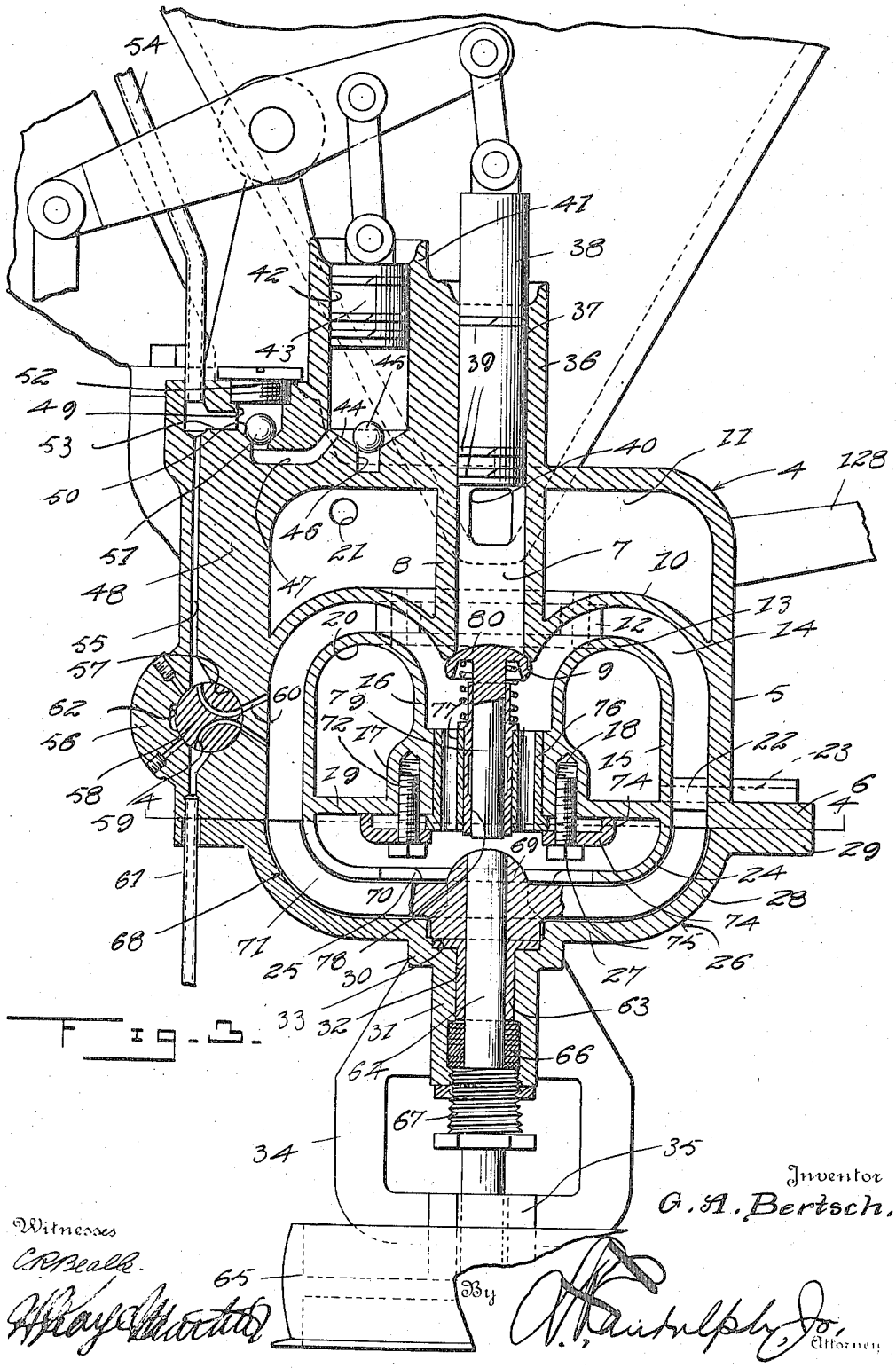


Fig. 5.

Witnesses

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4 SHEETS—SHEET 4.

Fig-4-

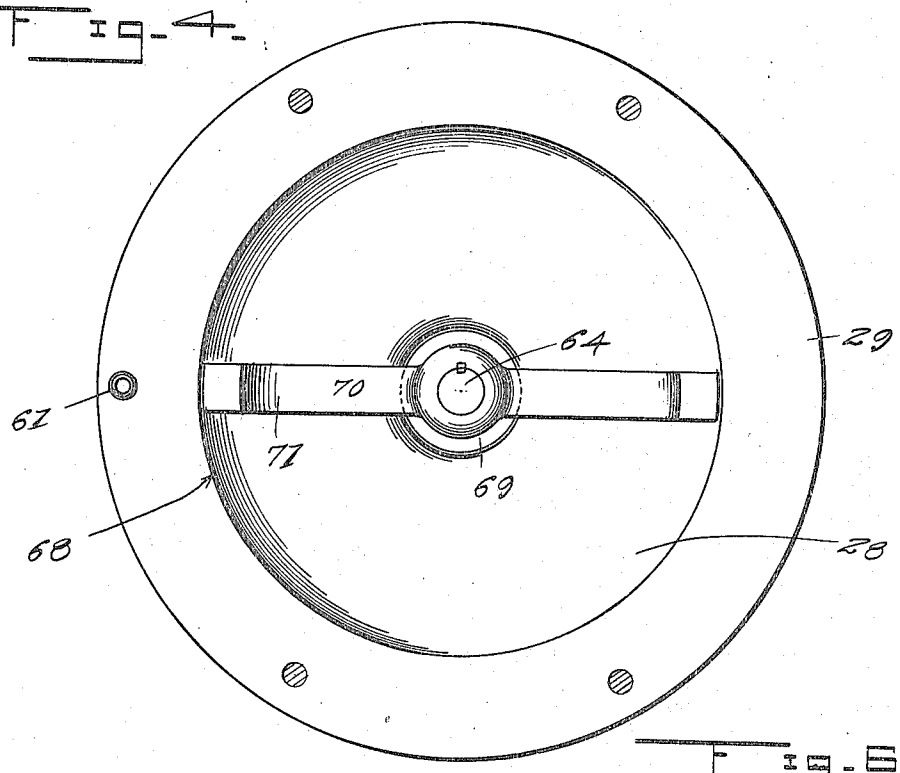


Fig-6-

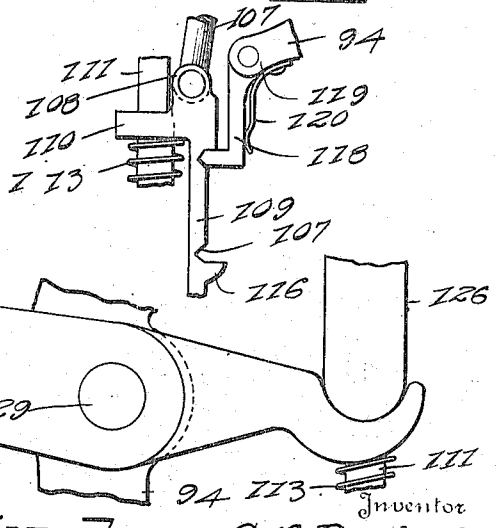


Fig-5-

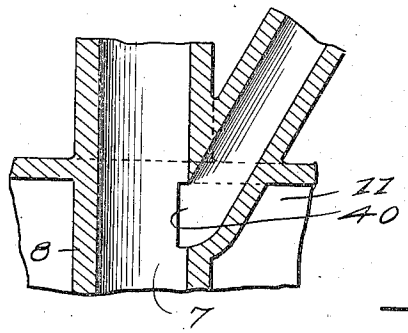


Fig-7-

Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE A. BERTSCH, OF PROVIDENCE, RHODE ISLAND.

FUEL-MIXER.

1,216,403. Specification of Letters Patent. Patented Feb. 20, 1917.

Application filed May 5, 1916. Serial No. 95,626.

To all whom it may concern:

Be it known that I, GEORGE A. BERTSCH, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Fuel-Mixers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to new and useful improvements in fuel mixers and the principal object of the invention is to provide a device for making a combustible mixture capable of being used in combustion engines and for other purposes.

Another object of the invention is to provide a fuel mixer using powered coal and mixing the same with a suitable oil to form a conveyer by which the coal is admitted to the engine or other consuming device in such a condition that it may be readily ignited.

A further object of the invention resides in the provision of a means for keeping the oil under pressure without the necessity of providing an elevated tank or a like pressure maintaining means.

Still another object of the invention resides in the provision of a device which will admit a predetermined quantity of coal and oil to the mixing chamber thereby insuring the proper mixture at all times.

A further object of the invention resides in the provision of a device which is capable of being used for forcing oil into the combustion chamber without the necessity of adding the coal thereto.

With these and other objects in view, the invention consists in the novel combination and arrangement of parts which will be fully set forth in the following specification and accompanying drawings, in which:—

Figure 1 is a side view of a fuel mixer constructed in accordance with this invention.

Fig. 2 is a view taken at right angles to Fig. 1.

Fig. 3 is a vertical sectional view of the device taken in the plane of Fig. 1.

Fig. 4 is a horizontal sectional view on line 4—4 of Fig. 1.

Fig. 5 is an enlarged detail section of the coal entrance.

Fig. 6 is a fragmentary detail view of the lift frame showing the pawl engaging the same and the stop by which the movements of the frame are controlled, and

Fig. 7 is a fragmentary enlarged view of the rear end of the lever showing the seat for the reception of the lower end of the push rod.

Referring to the drawings the numeral 1 designates the coal tank which may be of any suitable construction and is provided with the reduced neck 2 in its bottom wall. The neck 2 forms an outlet opening through which the coal passes and a suitable chute 3 is secured to the lower end of the neck and forms a passage for conveying the coal from the container into the mixer. As illustrated in the drawings the chute 3 tapers toward its lower end so that the mouth or outlet thereof is of considerably smaller capacity than the inlet thereby insuring the proper feeding of the material from the tank.

The mixer designated generally by the numeral 4 consists of the casing or shell 5 provided at its lower end with the outturned flange 6. The shell 5 is hollow as clearly illustrated in Fig. 3 and is provided with a central chamber 7 which extends from the upper end of the shell to a point substantially midway between the upper and lower terminals thereof. This chamber 7 is formed by the cylindrical wall 8 the lower end of which is beveled to form the valve seat 9 the use of which will be more fully hereinafter described. Joining the wall 8 at its lower end is an annular arched wall 10 which joins the shell as illustrated in Fig. 3 and this wall together with the wall 8 and shell forms the water circulating chamber 11. Formed integrally with the wall 10 and projecting downwardly therefrom at spaced intervals around the device are the hollow bosses 12 the lower ends of which join the arched wall 13 which is shaped to coöperate with the wall 10 in forming the mixing chamber 14 in which the oil is agitated. The wall 13 is annular in form as is the wall 10 and is joined at its outer edge with the wall 15 which extends in a plane parallel with the shell 5 but spaced inwardly there-

from in the manner illustrated in Fig. 3. Formed on the inner edge of the wall 13 and extending downwardly therefrom in a plane parallel with the wall 15 is a vertical wall 16 which is enlarged as at 17 at its lower terminal and provided with the internally threaded bores 18 the use of which will appear as the description proceeds. A horizontal annular wall 19 joins the lower terminals of the walls 15 and 16 and it will thus be seen that an annular chamber 20 is formed beneath the chamber 11 and spaced therefrom to form the chamber 14. A suitable water inlet port 21 is formed in the wall 5 and communicates with the chamber 11 near its upper end while a suitable hollow boss 22 communicates with the water outlet port 23 formed at the lower end of the chamber 20. It will thus be seen that a complete circulation of water through the chambers 11 and 20 may be had at all times. A suitable annular transversely curved wall 24 is formed at the outer edge of the annular wall 19 and projects downwardly therefrom and this wall is provided at spaced intervals on its lower inner edge with the inwardly extending portions 25 as clearly shown in Fig. 3.

The lower terminal of the mixer 4 is closed by the cover designated generally by the numeral 26 consisting of the bottom portion 27 provided with the upwardly curved edge 28 which terminates at its upper end in the flange 29 which coöperates with the flange 6 in receiving suitable bolts by means of which the cover is held on the mixer. A central boss 30 is formed on the wall 27 and has extending downwardly therefrom the reduced neck 31 which is provided with the axial bore 32, the lower end of which is internally screw threaded as illustrated in Fig. 3 while the upper end communicates with the enlarged bore 33 formed in the boss 30. Formed integrally with the boss 30 and the neck 31 is the depending frame 34, the lower end of which is provided with the enlargement 35 in which a suitable bearing for the mixer shaft is mounted.

Formed integrally with the top wall of the shell 5 is an upwardly extending cylinder 36 provided with the axial bore 37 which alines with the chamber 7 as illustrated in the drawings and receives the piston 38. As shown in Fig. 3 this piston is provided with suitable packing rings 39 and is slidable in the cylinder so that upon the admission of a charge of coal through the inlet port 40 and the downward movement of the piston 38 the coal will be forced downwardly through the chamber 7 and into the annular chamber 14. A suitable cylinder 41 is positioned beside the cylinder 36 and is provided with the annular bore 42 in which the piston 43 is slidable. This cylinder 43 forms the oil pump and is provided at its lower end with the inclined wall 44 forming a valve seat for the ball valve 45. This ball valve forms a closure for the oil inlet port 46 which is connected by a suitable pipe with any desired source of oil supply. A suitable passage 47 is formed in the enlargement 48 formed to one side of the shell 5 and this passage communicates at one end with the bore 42 of the cylinder 41 while the opposite end communicates with the bore 49 formed in the enlargement. This bore 49 is provided with an inclined bottom wall 50 forming a valve seat for the ball valve 51 and it will thus be seen that when the piston 43 moves downwardly the oil flowing through the passage 47 will lift the valve 51 from the seat thereby filling the bore or chamber 49. The upper end of this chamber or bore is closed by a suitable plug 52 as clearly illustrated in the drawings. A suitable outlet passage 53 is formed to the side of the chamber 49 and communicating therewith is the lower end of the pipe 54 which leads to the oil pressure cylinder which will be more fully hereinafter described. A vertical passage 55 extends from the under side of the bore 53 out through the lower end of the enlargement 48 and forms the outlet passage for the oil from the pressure cylinder as will be clearly seen upon referring to Fig. 3.

Formed near the lower terminal of the shell 5 on the side with the enlargement 48 is a suitable transversely extending enlargement 56 having formed therein the tapered bore 57 in which the turning plug 58 is mounted. This turning plug is provided with the arcuate passages 59 for allowing the passage of the oil therethrough as shown in Fig. 3. Suitable passages 60 establish suitable communication between the bore 57 and the annular chamber 14 so that when the turning plug 58 is in the position shown in Fig. 3 the oil passing through the passage 55 will flow through the uppermost opening 59 of the turning plug 58 and thence into the chamber 14 through the uppermost passage 60 where after being mixed with the coal it will then enter the lower passage 60 and through the lowermost passage 59 of the turning plug will enter the lower terminal of the passage 55 and thence flow out through the fuel pipe 61. In event that the use of coal and the oil is to be eliminated it will be seen that the turning plug is turned to the opposite position and then the oil flowing through the passage 55 will enter the uppermost passage 59 and flow through the by-pass 62 into the lower passage 59 and thence out through the pipe 61. In this way it will be seen that the fuel may be changed at the will of the user.

Mounted in the openings 32 of the neck

31 is the bushing 63 the upper end of which is flanged to fit within the bore 33 of the boss 30. This bushing 63 forms a bearing for the shaft 64, the lower end of which is journaled in the bearing carried by the enlargement 35 and carries the pulley 65 by means of which the shaft is driven. A suitable packing 66 is positioned in the lower end of the neck and held in place by the plug 67 which is threaded into the threaded portion of the neck 31 and it will thus be seen that an oil tight joint is made between the shaft 64 and the neck 31 to prevent the escape of the liquid in the mixing chamber 14. The upper end of said shaft projects up between the fingers 25 of the wall 24 and carries the stirrer designated generally by the numeral 68 consisting of the hub portion 69 which is formed with the radiating arms 70, the outer ends of which are upturned as at 71 to conform to the shape of the portion 28 of the wall 27 and the curved wall 24. As illustrated in Fig. 3 the upturned portions 71 of the stirring arm 70 terminate in a plane with the upper face of the flange 29 so that the cover 26 may be readily removed. From the foregoing it will be seen that upon rotation of the pulley 65 the contents of the mixing chamber 14 will be agitated and by the passage of the heating liquid through the chambers 11 and 20 it will be seen that the mixing chamber 14 will also be heated so that the contents thereof will be more readily and thoroughly mixed.

Extending into the internally threaded bores 18 in the enlargement 17 formed at the lower end of the wall 16 are the cap screws 72 which hold the clamps 73 in clamping position. These clamps 73 consist of a suitable clamping body formed at one end with the angular extension 74 and near the opposite end with the opening 75 for the reception of the cap screw. The end of the clamp member 73 opposite the angular extension 74 is adapted to engage the flange on the bushing 76 which is fitted within the passage formed by the enlargement 17 and is provided with the vertical openings 77 which establish communication between the upper and lower portions of the chamber 14. A suitable bearing bushing 78 is mounted within the bushing 76 and this bushing 78 forms the bearing for the valve stem 79 the upper end of which has formed integrally therewith the valve head 80 which bears against the valve seat 9 to close the lower end of the cylindrical chamber 17. A suitable compression coil spring 81 bears against the under side of the head 80 and the upper end of the bushing 78 so as to normally force the head 80 against the valve seat and thus close the inlet to the chamber 14.

In order to control the position of the turning plug 58 the handle 82 is provided and is operable over the plate 83 on the outer end of the enlargement which carries the stop 84, the outer faces of which bear suitable characters to designate the oil and the coal positions of the valve.

Secured to the upper side of the shell 5 and extending upwardly therefrom is a bracket 85 having pivotally mounted at its upper end the walking beam 86. The piston 38 carries at its upper end a pair of spaced ears 87 between which the lower end of the connecting rod 88 is pivoted while the upper end of said connecting rod is pivoted to the extreme end of the walking beam 86. A suitable pair of ears 89 are formed on the upper end of the piston 43 and form pivotal connections for the connecting rod 90 which is pivoted at its upper end to the walking beam intermediate the connecting rod 88 and the pivotal support of said walking beam. Pivotally connected to the opposite terminal of the walking beam is the connecting rod 91, the lower end of which is pivoted to the crank 92 which is mounted on the shaft 93. This shaft 93 is journaled in a suitable bearing bracket 94 which is secured to the shell 5 and carries at the end opposite the crank a toothed gear wheel 95 which meshes with the pinion 96 of the drive shaft 97 on which the drive pulley 98 is mounted. The forward end of the shaft 97 is mounted in the lower terminal of the swinging bracket 99, the upper end of which is journaled on the shaft 93. A suitable hub member 100 is formed at the upper terminal of the bracket 99 and has formed on its periphery a pair of outwardly extending ears 101 between which is pivotally mounted the length 102 the upper end of which is in turn pivoted to the eccentrically mounted stud 103 on the end of the shaft 104 which is rotatably mounted in the forwardly extending gear 105 of the bracket 94. The shaft 104 is formed with the crank arm 106 having pivoted near its free end the connecting rod 107, the lower end of which is pivoted between a pair of ears 108 carried by the vertically slidable frame 109. This frame is provided at its upper and lower ends with the forwardly extending arms 110 which are provided with alining openings for the reception of the rod 111, the upper end of which is connected to the piston of the oil pressure cylinder to be more fully hereinafter described. Secured to the rod 111 intermediate the arms 110 of the frame 109 is a set collar 112 forming the lower and upper abutment of the compression coil springs 113 and 114 respectively. The upper end of the compression coil spring 113 bears against the under side of the upper arm 110 while the lower terminal of the spring 114 bears against the lower arm 110.

It will thus be seen that the collar 112 will be normally centrally disposed between the arms 110. Formed on the rear edge of the frame 109 is a stop 115 while a similar stop 116 is formed at a point substantially two-thirds above the lower end of the rear edge of the frame 109. Suitable depressions 117 are formed in the rear edge of the frame immediately adjacent the stops 115 and 116 and these depressions 117 are provided with the inclined bottom walls in connection with which the latch member 118 operates. This latch member is pivoted to the arm 119 formed on the bracket 94 and is normally forced toward the frame 109 by means of the spring 120 so that its pointed end will engage in the notch 117.

Secured to the upper end of the bracket 94 is a suitable bracket 121 which extends upwardly and supports the cylinder 122. This cylinder is provided near its upper end with an inlet port to which the pipe 54 is connected. It will thus be seen that communication is established between the interior of the cylinder 122 and the passage 53. A piston 123 is slidable in the cylinder 122 and is provided with suitable packing rings 124 to prevent the escape of the oil between the inner wall of the cylinder and the wall of the piston and pivoted on a suitable wrist pin 125 within the piston is the upper end of the rod 111. A suitable arm 126 is pivoted on the wrist pin 125 beside the upper end of the rod 111 and the lower end of said push arm 126 is rounded as illustrated in the drawings to fit within the curved seat 127 formed in the upper edge of the short end of the lever 128. As shown in the drawings this lever is pivoted at 129 to the wall 94 and is provided at its free end with an eye 130 in which the hook 131 of the supporting stem 132 of the weight 133 is positioned. It will thus be seen that the weight 133 will be suspended on the free end of the lever 128 so as to normally tend to move the piston 123 upwardly and thereby keep the oil in the cylinder 122 and pipe 54 under pressure.

It will be apparent from the foregoing that in use the tank 1 is filled with a mixture of oil and coal dust or powdered coal which will flow down through the chute 3 into the chamber 7 until said chamber is filled. The port 46 is then connected with the oil supply and it will be seen that when the wheel 98 is rotated the pinion 96 will drive the gear 95 thus rotating the shaft 93 and the crank 92 thereby causing the connecting rod 91 to operate the walking beam 86 so as to cause the pistons 38 and 43 to operate in respective cylinders thus causing the charge of coal and oil filling the chamber 7 to be forced into the mixing chamber 14. Simultaneously the piston 42 will draw the oil from the inlet port 46 into the cylinder 41 and thence force the same out through the passage 47 into the passage 53 and up through the pipe 54 into the cylinder 122. The pulley 65 is simultaneously rotated so as to cause the agitator 68 to revolve in the lower portion of the chamber 14 thereby causing the contents of said chamber to be continuously stirred. Through the passage of water through the chambers 11 and 20 it will be evident that the contents of the chamber 14 will be heated simultaneously with the stirring operation and such stirring will cause the oil flowing through the pipe 54 and passage 55 to be intermixed with the oil and coal already admitted to the chamber 14 and thence pass out through the pipe 61 to the motor or other appliance in which the oil is to be used. The oil flowing out from the cylinder 122 through the pipe 54 is displaced by the upward movement of the piston 123 which is caused by the descent of the weight 133. The upward movement of said piston will cause the collar 112 on the rod 111 to compress the spring 113 until such time as the latch 118 will be forced out of the upper notch 117 by the inclination of the wall of said notch at which time the frame 109 will fly upwardly under the influence of the spring 113 thereby causing the crank arm 106 to rotate the shaft 104 and cause the eccentric 103 to move the length downwardly thereby causing the hub 100 to partially rotate and swing the arm 99 so that the belt passing around the pulley wheel 98 will be tightened thereby driving said pulley and setting the walking beam in motion. During the recharging of the device it will be seen that the oil flowing into the pipe 54 will cause the piston 23 to descend thus raising the weight 133 and causing the spring 113 to be compressed so that after the compression of said spring has reached a predetermined point the latch 118 will disengage the lower notch 117 thus causing the spring 109 to move downwardly under the influence of the compressed spring 113 so that the link 107 will cause the lever 106 to move into the position shown in Fig. 1 and swing the arm or bracket 109 into such a position as to release the tension on the belt of the belt wheel 98 thereby allowing said wheel to come to rest until the oil in the cylinder 122 has again been forced outwardly to such a point as to require the refilling of the cylinder.

From the foregoing it will be seen that an efficient means is provided for forming a combustible liquid from a mixture of coal and oil which is particularly effective when used in coöperation with my copending application.

While in the foregoing there has been shown and described the preferred embodiment of this invention, it is to be understood that such changes may be made in the combination and arrangement of parts as will fall within the spirit and scope of the appended claims.

What is claimed is:—

1. A fuel mixing apparatus comprising a mixing chamber provided with an outlet port, a liquid fuel receptacle discharging into the chamber, a solid fuel receptacle discharging into the chamber, an agitator in the chamber, and means controlling the outlet port.

2. A fuel mixing apparatus comprising a mixing chamber having an outlet port, a liquid fuel receptacle discharging into said chamber, a solid fuel receptacle discharging into said chamber, an agitator in said chamber, means controlling the outlet port and means controlling the admission of the liquid and solid fuels.

3. A fuel mixing apparatus comprising a mixing chamber having an outlet port, a liquid fuel receptacle discharging into said chamber, a solid fuel receptacle discharging into said chamber, an agitator in said chamber, means controlling the outlet port and means for automatically controlling the admission of the liquid and solid fuels.

4. A fuel mixing apparatus comprising a mixing chamber having a fuel outlet, a liquid fuel receptacle discharging into said chamber, a solid fuel outlet discharging into said chamber, a water jacket surrounding the chamber and adapted to contain a heated liquid for heating the contents of the chamber and facilitating the mixing thereof.

5. A fuel mixing apparatus including a mixing chamber, a liquid fuel receptacle discharging into the chamber, a solid fuel receptacle discharging into said chamber, an agitator in the chamber and means to keep the liquid in the liquid fuel receptacle under pressure.

6. A fuel mixing apparatus including a mixing chamber, a liquid fuel receptacle discharging into the chamber, a solid fuel receptacle discharging into the chamber, an agitator within the chamber, means to keep the liquid in the liquid fuel receptacle under pressure and means to intermittently control the feeding of solid fuel into the chamber and liquid fuel into the receptacle.

7. In a fuel mixing apparatus, a mixing chamber, a solid fuel receptacle discharging into the chamber, a liquid fuel receptacle discharging into the chamber, a liquid fuel supply for feeding the liquid fuel receptacle and means to simultaneously admit the solid fuel to the mixing chamber and the liquid fuel to the receptacle.

8. A mixing apparatus including a mixing chamber, a solid fuel receptacle discharging into the chamber, a liquid fuel receptacle discharging into the chamber, a liquid fuel supply, means to simultaneously admit solid fuel to the chamber and liquid fuel to the receptacle and means to keep the fuel in the liquid fuel receptacle under pressure.

9. In a fuel mixer, a mixing chamber, an agitator in said chamber, a solid fuel receptacle discharging into the chamber, a liquid fuel receptacle discharging into the chamber, a liquid fuel supply for the receptacle, pumps for controlling the admission of solid fuel to the chamber and the admission of liquid fuel to the receptacle and means to hold the fuel in the liquid fuel receptacle under pressure.

10. A fuel mixing apparatus including a mixing chamber, a solid fuel receptacle discharging into the chamber, a liquid fuel receptacle discharging into the chamber, a liquid fuel supply for the liquid fuel receptacle, means to control the admission of solid fuel to the chamber and liquid fuel to the chamber, a water jacket surrounding the chamber for maintaining a heating agent around the chamber to cause the contents thereof to be heated, the chamber being provided with an outlet port and means to control the flow of mixed fuel through the outlet port.

11. A fuel mixing apparatus including a mixing chamber, a solid fuel receptacle discharging into said chamber, a liquid fuel receptacle discharging into said chamber, a liquid fuel supply, pumps simultaneously admitting solid fuel to the chamber and liquid fuel to the liquid fuel receptacle, means to heat the chamber to facilitate the mixing of the fuels and means to hold the fuel in the liquid fuel receptacle under pressure.

12. A fuel mixing apparatus including a mixing chamber, a solid fuel receptacle discharging into the chamber, a liquid fuel receptacle discharging into said chamber, a liquid fuel supply, a pump for controlling the admission of solid fuel to the chamber, a pump for controlling the admission of liquid fuel to the receptacle and means to intermittently control the operation of the pumps.

13. A fuel mixing apparatus including a mixing chamber, a solid fuel receptacle discharging into the chamber, a liquid fuel receptacle discharging into said chamber, a liquid fuel supply, a pump for controlling the admission of solid fuel to the chamber, a pump for controlling the admission of liquid fuel to the receptacle and means to intermittently and simultaneously control the operation of the pumps.

14. A fuel mixing apparatus including a

mixing chamber, a solid fuel receptacle discharging into the chamber, a liquid fuel receptacle discharging into said chamber, a liquid fuel supply, a pump for controlling the admission of solid fuel to the chamber, a pump for controlling the admission of liquid fuel to the receptacle and means to automatically control the operation of the pumps when the fuel in the liquid fuel receptacle becomes exhausted.

15. A fuel mixing apparatus including a mixing chamber, a solid fuel receptacle, a liquid fuel receptacle, the solid and liquid fuel receptacles discharging into said chamber, a liquid fuel supply, a pump controlling the discharge of solid fuel into the chamber, a pump controlling the flow of liquid fuel into the receptacle, means to hold the fuel in the liquid fuel receptacle under pressure, means to automatically operate the pumps when the fuel in the liquid fuel receptacle becomes exhausted, an agitator in the chamber, the said chamber being provided with a mixed fuel outlet and a valve controlling the flow of the fuel through the outlet.

16. In a fuel mixing apparatus, a mixing chamber, a solid fuel receptacle discharging into said mixing chamber, a liquid fuel receptacle discharging into said chamber, the lower end of said receptacle being open, a piston slidable in the receptacle and means tending to force the piston upwardly to place the liquid in said receptacle under pressure.

17. In a fuel mixing apparatus, a mixing chamber, a solid fuel receptacle discharging into said chamber, a liquid fuel receptacle discharging into said chamber, the lower end of said last named receptacle being open, a piston slidable in the receptacle, a push rod connected to the piston, a weight actuated means tending to urge the push rod and piston upwardly and thereby place the liquid within the liquid receptacle under pressure.

18. In a fuel mixer, a mixing chamber, a solid fuel receptacle communicating with said chamber, a liquid fuel receptacle communicating with the chamber, the lower end of the liquid fuel receptacle being open, a piston forming a closure for the lower end of said liquid fuel receptacle, a pump controlling the discharge of solid fuel from the receptacle into the mixing chamber, a liquid fuel supply, a pump for controlling the supply of liquid fuel to the receptacle, means to urge the piston in the receptacle upwardly to place the contents under pressure and means controllable by the upward movement of the piston to operate the pumps to replenish the supply of liquid fuel within its receptacle.

19. A fuel mixing apparatus including a mixing chamber, a solid fuel receptacle discharging into the chamber, a liquid fuel receptacle discharging into the chamber, means for keeping the liquid within the liquid fuel receptacle under pressure, a pump controlling the supply of liquid to the liquid fuel receptacle, a pump controlling the supply of solid fuel to the chamber and means controlled by the quantity of liquid within the liquid receptacle to actuate the pumps and replenish the supply.

20. In a fuel mixing apparatus, a mixing chamber, a solid fuel receptacle, a liquid fuel receptacle, both solid and liquid fuel receptacles discharging into the chamber, pumps adapted to control the flow of solid fuel into the chamber and the flow of liquid fuel into the liquid fuel receptacle, a piston operable in the liquid fuel receptacle, a push rod connected to the piston, a pivoted lever, the short end of said pivoted lever engaging the lower end of the push rod, a weight at the opposite end of the lever to normally tend to urge the push rod and piston upwardly to keep the contents of the liquid fuel receptacle under pressure and means to operate the pumps when the piston moves upwardly beyond a predetermined point.

21. In a fuel mixing apparatus, a drive shaft, a bracket swingably mounted on said shaft, a gear wheel on the shaft, a crank at one end of the shaft, a shaft journaled in the bracket, a belt wheel mounted on the last named shaft, a pinion mounted at the opposite end of the shaft and meshing with the gear wheel whereby upon rotation of the belt wheel the drive shaft will be actuated, and means to swing the bracket and cause the drive belt passing over the belt wheel to be tightened.

22. In a fuel mixing apparatus, a liquid fuel receptacle, a drive shaft, a gear on said drive shaft, a bracket swingably mounted on the shaft, a shaft journaled in the bracket, a belt wheel on the last named shaft, a pinion on the last named shaft meshing with the gear and means controlled by the quantity of liquid fuel within the liquid fuel receptacle for swinging the belt wheel into operative or inoperative position.

23. In a fuel mixing apparatus, a liquid fuel receptacle, means within said receptacle to keep the liquid under pressure, a pump to replenish the supply of liquid fuel in the receptacle when the quantity of said fuel is reduced beyond a predetermined point, a sliding frame, the movements of said frame being controlled by the movement of the pressure retaining means and a belt actuated driving mechanism for operating the pump when the quantity of liquid in the liquid fuel receptacle is reduced.

24. In a fuel mixing apparatus, a mixing chamber, a solid fuel receptacle discharging into the chamber, a liquid fuel receptacle

discharging into the chamber, pumps controlling the supply of liquid to the liquid fuel receptacle and the supply of solid fuel to the mixing chamber, a pressure retaining means within the liquid fuel receptacle for forcing the liquid fuel into the mixing chamber under pressure, a pump actuating mechanism, a vertically sliding frame, the movements of said frame being controlled by the movements of the pressure retaining means and means connected to the sliding frame for controlling the operation of the pump actuating mechanism.

In testimony whereof I affix my signature in presence of two witnesses.

GEO. A. BERTSCH.

Witnesses:
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