A. E. CORNWALL AND C. D. ENOCHS.

DISH WASHING MACHINE.

APPLICATION FILED OCT. 2, 1916.

1,323,216.

Patented Nov. 25, 1919.

4 SHEETS—SHEET 1.

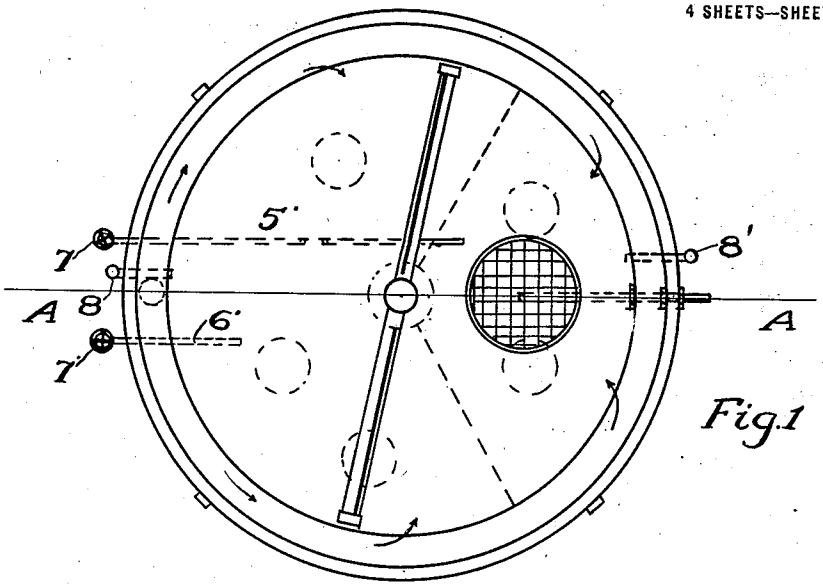


Fig.1

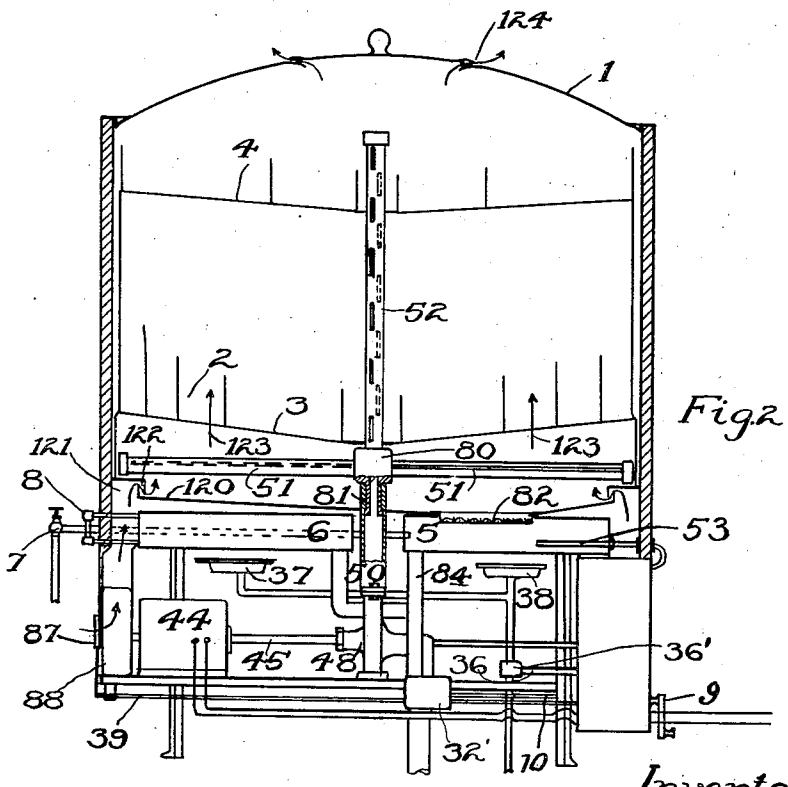


Fig.2

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Fig.4

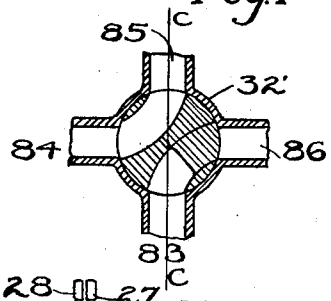


Fig.5

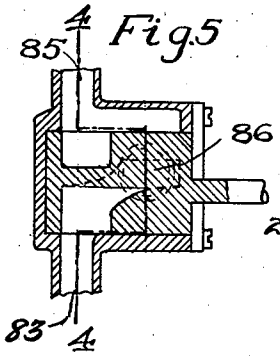
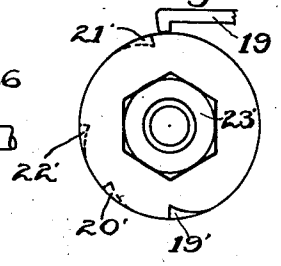


Fig.6



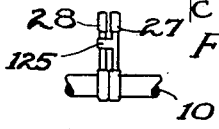
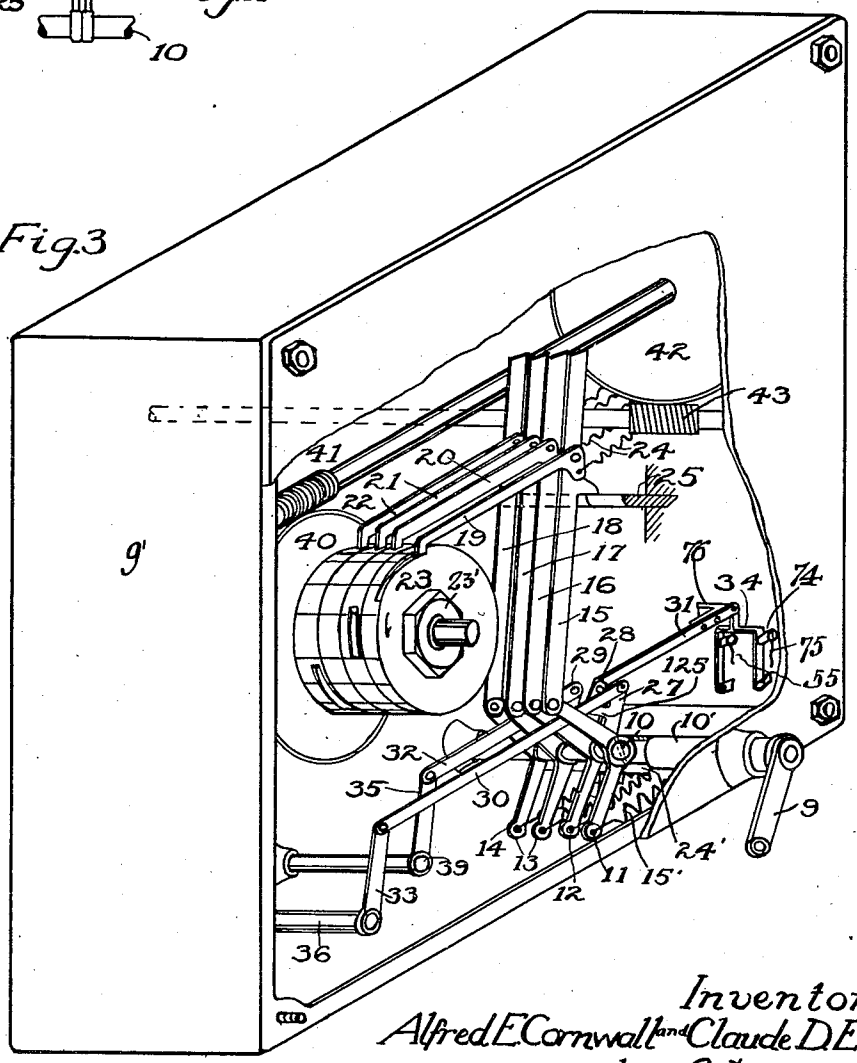


Fig.11

Fig.3



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4 SHEETS—SHEET 3.

Fig.8

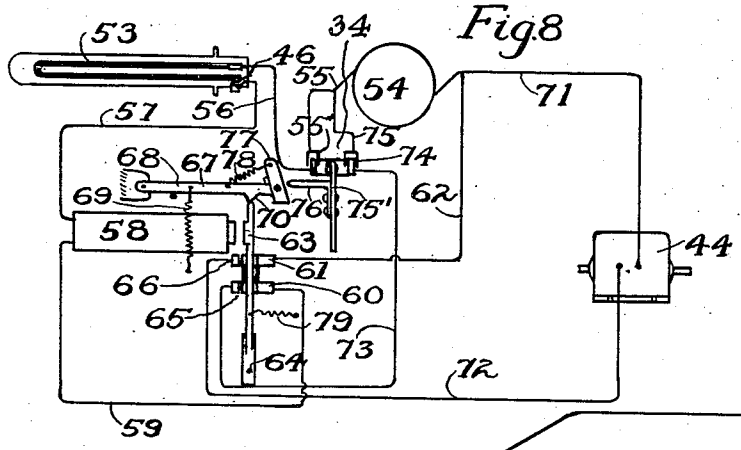
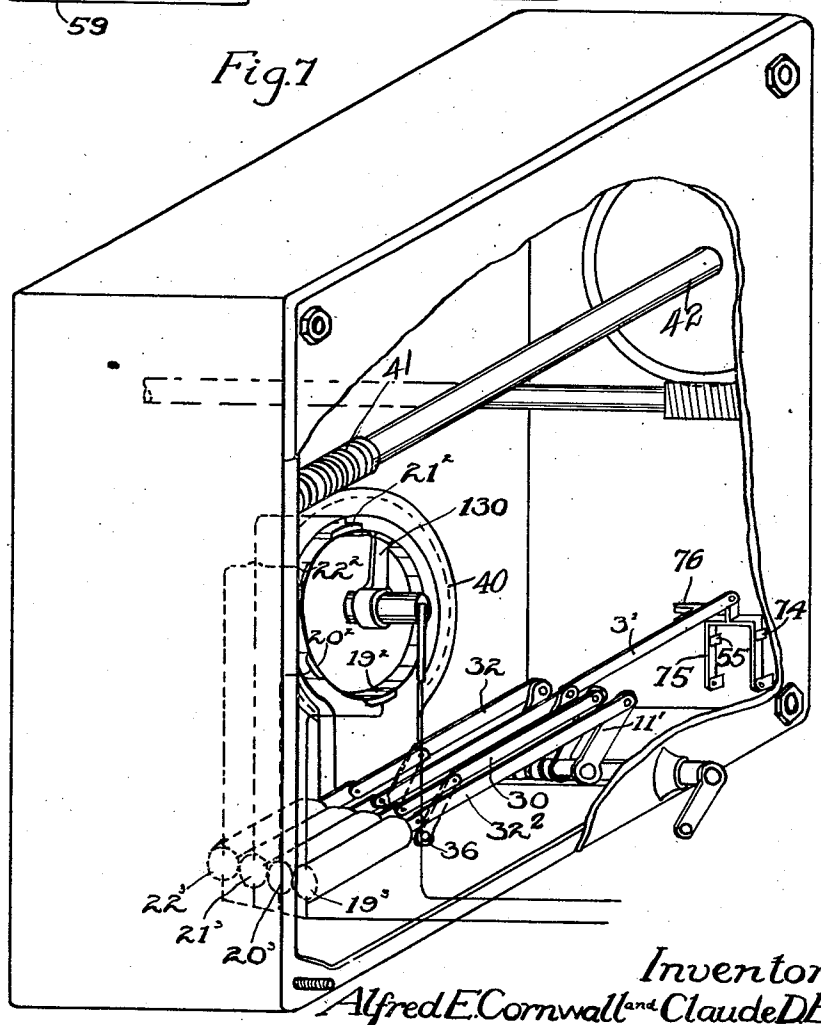


Fig.1



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4 SHEETS—SHEET 4.

Fig. 9

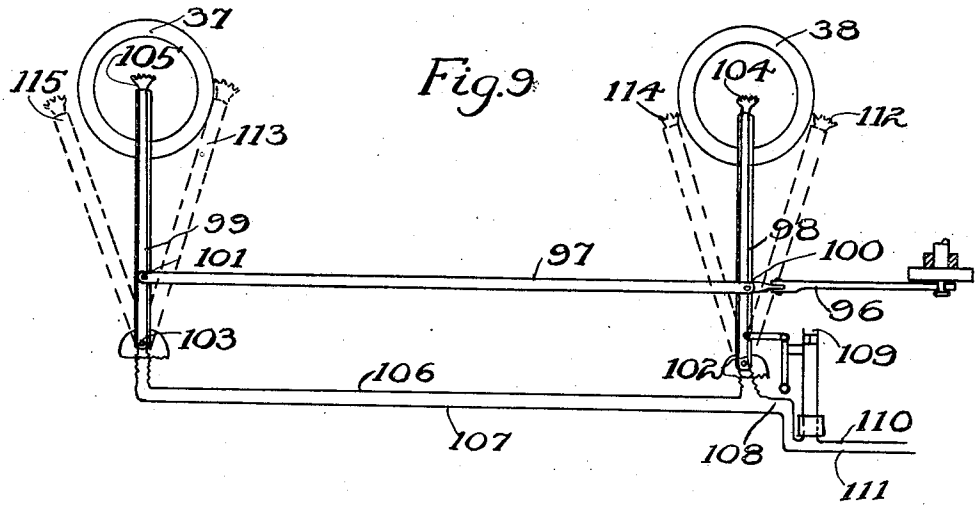


Fig. 10

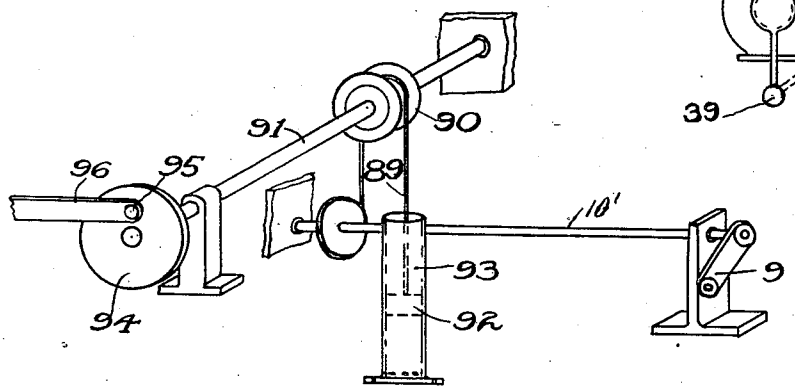
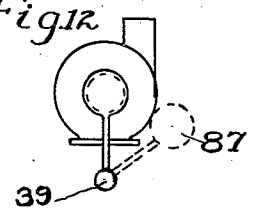


Fig. 12



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UNITED STATES PATENT OFFICE.

ALFRED E. CORNWALL, OF ST. PAUL, AND CLAUDE D. ENOCHS, OF EAST SHORE PARK, MINNESOTA; SAID ENOCHS ASSIGNOR TO SAID CORNWALL.

DISH-WASHING MACHINE.

1,323,216. Specification of Letters Patent. Patented Nov. 25, 1919.

Application filed October 2, 1916. Serial No. 123,281.

To all whom it may concern:

Be it known that we, ALFRED E. CORNWALL, a citizen of the United States, and a resident of St. Paul, in the county of Ramsey and State of Minnesota, and CLAUDE D. ENOCHS, likewise a citizen of the United States, and a resident of East Shore Park, in the county of Washington and State of Minnesota, have invented certain new and useful Improvements in Dish-Washing Machines, of which the following is a specification.

This invention relates particularly to that class of dish washing machine designed for the use of private families, although as will be evident from the specification and drawings, the same machine can with slight modifications be used for hotels and the like.

One object of this invention is to provide in a dish washing machine, means for applying the cleansing and also the rinsing water over the entire surface of the dishes to be cleaned.

Another object of this invention is to provide means for heating the water used to substantially the boiling point.

Another object of this invention is to provide means for beginning the dish washing operation automatically when the water has reached a temperature considerably below the boiling point to avoid breakage of glassware, continue the operation, and at the same time raise the temperature of the water.

Another object of this invention is to provide means for quickly drying the dishes after they have been washed and rinsed.

Another object of this invention is to provide automatic means for changing from the washing operation to the rinsing operation, and from the rinsing operation to the drying operation.

Another object of this invention is to provide automatic means for lighting the fuel used in heating water.

Another object of this invention is to provide automatic means for allowing a definite length of time to elapse after the fuel has been turned on before the lighting means is applied thereto.

Another object of this invention is to provide means for varying the duration of the different operations.

With these and incidental objects in view the invention consists of certain novel features of construction and combination of parts, the essential elements of which are hereinafter described with reference to the drawings which accompany and form a part of this specification.

In the drawings, Figure 1 is a plan view of our improved dish washing machine with the cover removed.

Fig. 2 is a section taken on the line "A A," Fig. 1.

Fig. 3 is an isometric view of the preferred form of mechanism used in automatically controlling the operation of the machine.

Fig. 4 is a sectional view of the valve controlling the washing and rinsing water taken on the line "B B," Fig. 5.

Fig. 5 is a sectional view of the same taken on the line "C C," Fig. 4.

Fig. 6 is an end view of the multiple cam used to operate the levers shown in Fig. 3. Fig. 7 is an isometric view showing an alternate construction of the operating mechanism shown in Fig. 3.

Fig. 8 is a wiring diagram of the thermostatic controlling means. Fig. 9 is a plan view of the fuel lighting mechanism. Fig. 10 is an isometric view of the means for controlling the lighting means shown in Fig. 9, and Fig. 11 is a detail of the safety catch making a positive shut-off of the gas whenever the motor switch is opened. Fig. 12 is a detail of the air admission shutter.

Starting the machine.

In operating the machine, the cover 1, Fig. 2, is removed, the dishes placed in the rack 2, the silverware placed at 3, while cups and glasses are placed substantially horizontally in the rack 4. Water is then introduced into the washing boiler 5 and rinsing boiler 6 through pipes 5′ and 6′, respectively, Fig. 1, controlled by valves 7 and 7′, the proper level in the boilers being indicated by the water gages 8 and 8′.

The lever 9, Figs. 3 and 10, is then turned in a clock-wise direction, setting the automatic mechanism contained in the box 9′.

The bell crank 11 is pinned to the shaft 10, while the bell cranks 12, 13 and 14 are journaled on the shaft 10, and the sleeve 10′ to which the lever 9 is pinned, is also journaled on the shaft 10.

The bell cranks 11, 12, 13 and 14 have vertical latches 15, 16, 17 and 18, respectively, hinged thereto and adapted to latch

on the common catch 25. These latches carry triggers 19, 20, 21 and 22, respectively, the trigger ends of which are normally held against the surface of the multiple cam 23 by springs 24.

The sleeve 10′ has rigidly attached thereto an arm 24′ so the operation of the lever 9 turns the journaled bell cranks 12, 13 and 14, as well as the pinned bell crank 11, thus lifting their respective latches, and latching them over the common catch 25, the lever 9 returning to its normal position, by gravity with a retarded speed, as will be hereinafter described.

The bell cranks 12, 13 and 14 have extensions 27, 28 and 29 carried thereon to which are hinged links 30, 31 and 32, respectively, while shaft 10 to which the bell crank 11 is pinned, controls directly the valve 32′, Fig. 2, controlling the washing water, rinsing water and drain, as will be hereinafter described.

The links 30, 31 and 32, respectively, are hinged to levers 33, switch 34 and lever 35, respectively.

The lever 33 is pinned to the shaft 36 and controls a valve 36′ of ordinary construction, which admits gas to the burners 37 and 38, Fig. 2, while the switch 34, Fig. 3, is directly in the motor circuit, as hereinafter described, and the lever 35 pinned to the shaft 39 controls the admission of air into the washing chamber, as will be hereinafter described.

The multiple cam 23 is driven through the worm gear 40 from the worm 41, which in turn is driven by the worm gear 42 from worm 43 through shaft 45 by the motor 44, Fig. 2.

In our preferred construction, we utilize a motor running 1800 R. P. M. and gear it down through the double worm gear reduction, so the multiple cam 23 makes one revolution in four minutes.

Washing.

When the water has been heated by the burners 37 and 38, Fig. 2, which are lighted in a manner hereinafter described, until it has reached a temperature of 150 degrees, the thermostat 53, Fig. 8, of ordinary construction, closes the contact 46, which starts the motor through the following circuit:

Source of power 54, wire 55, switch contact 55′, wire 56, contact 46, wire 57, relay 58, wire 59, switch contact 60, switch contact 61, wire 62, to the other side of the current supply 54.

The relay 58 attracts the armature 63 hinged at 64, opening switch contacts 60 and 61, and closing switch contacts 65 and 66 and as soon as the armature, in its forward motion, allows the projection 70 to drop behind the end of the armature 63, this projection will cam the armature forwardly under tension of the spring 69 thus insuring a positive closing of the switch contacts 65 and 66 until the lever 67 has been lifted out of engagement with the armature by the projection 76 of the switch impinging on the lower edge of the trigger 77 as the switch is closed for the next operation of the machine.

The motor operating circuit is traced as follows: current supply 54, wire 75, switch contact 74, wire 73, switch contacts 65 and 66, wire 72, motor 44, wire 71, to the other side of current supply 54.

It will be noted that the switch plate 75′, Figs. 3 and 8, carries an extension 76, which when the switch is opened rides freely past the latch 77, hinged on the lever 67 and controlled by the spring 78, but when the switch is closed, this extension will strike the under part of the latch 77, swinging the lever 67 upwardly and releasing the armature 63 if the contact 46 is at that time open and allowing the spring 79 to return the armature 63 to its normal position.

The motor which is now running drives a centrifugal pump 48, which takes water from the boiler 5, Fig. 2, through pipe 84, control valve 32′ and forces it upwardly through the pipe 50, and from there upwardly to the apertures in the horizontal arms 51, and also forces the water out horizontally through the apertures in the vertical pipe 52.

The pipes 51 and 52 are carried by a support 80 journaled at 81, and the spraying water leaves the pipes in such a direction that the reaction of the water spins the pipes about, thus spraying water upwardly against the faces of the dishes.

Rinsing.

When the dishes have been washed a predetermined period which is a sufficient length of time to insure their being thoroughly clean, the valve 32′ is automatically turned from the position shown in Fig. 4, in which it connects the wash boiler with the pump, through 90 degrees in an anticlockwise direction, when it connects the rinsing water in the boiler 6 with the pump, and the rinsing water is sprayed over the dishes in the same manner as was the washing water, in each case the water returning through the screen 82, Fig. 2, but in the case of the washing water, the water continually circulates, while in the case of the rinsing water, the waste drain 83 is now open and the rinsing water passing through the removable screen 82 and wash boiler 5, runs out through the pipe 84 to valve 32′ Fig. 4, and to drain pipe 83, so that no rinsing water passes over the dishes more than once.

As will be seen from Figs. 4 and 5, the valve is adapted to connect either the pipe

from the wash boiler at the point 84 to the pump at 85, or the water from the rinsing boiler from the point 86 to the pump at 85 and either closes the drain while in the position shown in the drawing or opens it from the wash boiler 84 to the point 83, while the rinsing operation is taking place.

The valve 32′ is turned from the washing position to the rinsing position as follows: The trigger 19, Fig. 2, is caught by its individual portion of the multiple cam 23 during the rotation of the cam at the end of a predetermined period and carried in an anti-clockwise direction, thus releasing latch 15 from the common catch 25, and allowing the spring 15′ to return the bell crank 11 with the shaft 10 to its normal position, and as the valve 32′ is directly connected to this shaft, the valve is turned as heretofore described.

Drying.

When the rinsing water is about used up, the further rotation of the multiple cam 23 picks up the trigger 20 and carries it forward in a similar manner as 19 was carried, unlatching the latch 16, thus shutting off the gas controlled by the shaft 36. During the further rotation of the multiple cam 23, the trigger 22 is similarly pulled forward, the latch 18 released and air is admitted into the washing chamber by opening the shutter 87, Figs. 1 and 12, thus allowing the air to be circulated through the dish washing chamber by means of the fan 88, which is driven constantly while the motor 44 is running.

The circulation of the air is best shown in Figs. 1 and 2, the air being forced from the fan 88, Fig. 2, upwardly and inwardly, passing between the boiler 6 and the drain pan 120, where it is heated, then passing freely about the inner wall of the dish washer in the annular space 121 and through the annular passage 122 upwardly, as indicated by the arrows 123 through the dishes and out through the annular opening 124.

The final operation is the releasing of the latch 17, Fig. 3, by the forward travel of the trigger 21, which opens the switch 34, cutting off the motor and restoring the thermostat control circuit to its normal position, as heretofore described, all of the mechanism being now in its normal position and ready to be started again by the movement of the lever 9.

It will be noted that the extension 28 on the motor control will strike and carry back with it when the motor switch is opened, the finger 125 carried by the extension 27 of the gas control, as better shown in Fig. 11, so that it is impossible for the motor switch to be opened without the gas having been entirely shut off.

The time of the coöperation between the various triggers and their coacting cam sections is plainly shown in Fig. 6, in which the notches in the cam sections are shown in their proper angular positions, the notches 21′, 22′, 20′ and 19′ coacting with triggers 21, 22, 20 and 19, respectively.

The multiple cam 23 is made of disk sections, as shown, clamped firmly together by the nut 23′, so the relative time of the different functions may be easily and quickly varied.

Gas ignition.

In starting the dish washing machine when the gas is turned on, as heretofore described, it is automatically lighted as follows:

The lever 9, shown conventionally in Fig. 10, when it is moved in a clockwise direction winds the cord 89 around the drum 90 on the shaft 91, thereby rotating the shaft and also lifting the weighted plunger 92 in the tube 93, which together with the plunger forms an air dash pot.

The shaft 91, which is suitably journaled, carries a disk 94, on which a crank pin 95 carries a connecting rod 96, better shown in Fig. 9, and this connecting rod is hinged to a multiple control link 97, which in turn is hinged to igniter arms 98 and 99 at the points 100 and 101, respectively.

The igniter arms are mounted with a hinged connection at 102 and 103, respectively, and carry igniter coils 104 and 105, respectively, which are connected by wires 106, 107, 108, contact 109, wires 110 and 111 to the source of current supply.

As the rotation of the disk 94 carries igniter coils 104 and 105 across the burners 38 and 37, respectively, to the position shown dotted at 112 and 113, the contact 109′ is closed and remains closed as the igniter sweeps back over the burners, the weight 92, Fig. 10, returns to the bottom of the dash pot, the dash pot giving a retarded effect to the motion of the igniters, so the igniter coils have become heated to incandescence and the gas burners have been charged with the normal supply of gas, so that they can be lighted when the charge is normal and will not fire back due to the ignition of a lean mixture of gas and air.

As the igniters continue their motion and assume the position shown at 114 and 115, respectively, the contact 109 is broken and the automatic igniter is ready for use when the machine is next put into operation.

As an alternate construction for the automatic control means shown in Fig. 3, we sometimes employ that shown in Fig. 7, in which the same sequence of operations are effected electrically instead of mechanically.

In Fig. 7 the brush 130 is rotated in the same manner as the multiple cam 23 and segments 21^2, 22^2, 20^2 and 19^2 make contact

with the brush 130 during its rotation, actuating solenoids 21^3, 22^3, 20^3, 19^3 similarly as the latches were actuated in the mechanical construction, and these solenoids act directly on the links, except that the solenoid 19^3 acts on the link 32^2, which controls the lever 11' corresponding with the bell crank 11 in the mechanical construction, Fig. 3, the links being attached by hinged connections to the solenoid plungers, and the actual operation of the dish washer is exactly the same, except that the control is electrical instead of mechanical.

While we have described our invention and illustrated it in two particular designs, we do not wish it understood that we limit ourselves to these constructions, as the application of our invention may be varied in many ways within the scope of the following claims.

Claims:

1. In a dish washing machine, the combination of a washing chamber, a boiler for wash water, means for heating said boiler, means for circulating water from said boiler to said washing chamber, a thermostat actuated by the temperature of water in said boiler, and means controlled by said thermostat for actuating said circulating means.

2. In a dish washing machine the combination of a water receptacle, a washing chamber having means of communication with said water receptacle, means for heating water in said water receptacle, a thermostat actuated by the temperature of the water in said receptacle, means for circulating water through said washing chamber, means controlled by said thermostat for starting the said water circulating means, and timing means for rendering said circulating means inoperative at the end of a predetermined period.

3. In a dish washing machine the combination of a washing chamber, a boiler, means for heating water in said boiler, means for applying water to dishes placed in said washing chamber, means for applying circulating air to dishes placed in said washing chamber, timing means controlling said second named means, and timing means controlling said air application, whereby said air application is effected a predetermined interval after said water application is effected.

4. In a dish washing machine the combination of a washing chamber, a boiler for washing water, a boiler for rinsing water, connecting pipes and valves whereby said boiler for washing water may be connected to said washing chamber, or said boiler for said rinsing water may be connected to said washing chamber, and timing means for actuating the connection of said boiler for rinsing water to said washing chamber at a predetermined period after said boiler for washing water has been connected to said washing chamber.

5. In a dish washing machine the combination of a washing chamber, a boiler for washing water, a boiler for rinsing water, means for circulating water through said washing chamber from either of said boilers selectively, a prime mover, means actuated by said prime mover for actuating the means for circulating water through said washing chamber from said washing boiler, timing means, and means actuated by said prime mover through the instrumentality of said timing means for actuating the means for circulating water from said boiler for rinsing water through said washing chamber.

6. In a dish washing machine the combination of a washing chamber, a boiler for washing water, a boiler for rinsing water, a drain pipe, a multiple valve co-acting with said boilers, pump, drain pipe, and washing chamber, for allowing water from either of said boilers to be forced through said washing chamber by said pump, a motor for driving said pump, means controlled by said motor for connecting said valve, boiler for washing water, pump, and washing chamber in operative relation, and means controlled by said motor for connecting said boiler for rinsing water, valve, pump and washing chamber in operative relation.

7. In a dish washing machine the combination of a washing chamber, a boiler for washing water, a boiler for rinsing water, a water circulating pump, a drain pipe, a valve co-acting with said pump, drain, and boilers through pipe connections whereby said washing chamber and said boiler for washing water may be connected in circulating operative relation; or said washing chamber, boiler for rinsing water, and drain may be connected in operative relation, a motor for driving said pump, means controlled by said motor for positioning said valve, and including timing means operated by said motor whereby the connection of said rinsing water boiler to said washing chamber is effected a predetermined period after the connection of said boiler for washing water to said washing chamber.

8. In a dish washing machine the combination of a washing chamber, a boiler for washing water, a boiler for rinsing water, a pump, a drain, pipes connecting said pump, drain and boilers, a motor for driving said pump, a thermostat positioned in said boiler for washing water, hand operated means for connecting said pump, boiler for washing water and washing chamber in operative relation, said motor being started by said thermostat, means controlled by said motor for connecting said washing chamber, boiler for rinsing water, pump and drain in operative relation, and timing means driven by said motor for actuating

said last named connecting means a predetermined time after said motor is started.

9. In a dish washing machine the combination of a washing chamber, a boiler for washing water, a pump, a motor for driving said pump, a fan, a thermostat in said boiler for washing water, means controlled by said thermostat for starting said motor, means controlled by said motor for allowing said fan to circulate air through said washing chamber, and timing means controlled by said motor for effecting said last named operation a predetermined period after the starting of said motor.

10. In a dish washing machine the combination of a washing chamber, a boiler for wash water, a boiler for rinsing water, a two way valve opening a communication between said washing chamber and said boiler for washing water in one position, and between said washing chamber and said boiler for rinsing water in the other position, a pump for circulating water through said valve, said washing chamber and either of said boilers, a motor for driving said pump, a starting lever, a thermostat in said boiler for washing water, an electrical circuit including said motor and thermostat, said starting lever closing said circuit and passing the control for the starting of said motor to said thermostat, connecting means whereby said starting lever connects said valve in operative relation with said washing chamber and said boiler for washing water, means controlled by said motor for placing said valve in operative relation with said washing chamber and said boiler for rinsing water and timing means controlled by said motor whereby said last named means is actuated at a predetermined period after the starting of said motor.

11. In a dish washing machine, the combination of a washing chamber, a washing boiler, means for discharging water from said washing boiler into said chamber, a motor, a positively driven fan, a movable closure for the intake of said fan, timing means controlled by said motor and means controlled by said timing means for opening said closure at a predetermined period after the starting of said motor.

12. In a dish washing machine, the combination of a washing chamber, a boiler for wash water, means for heating water therein, means for circulating water from said boiler for washing water through said washing chamber, and means for forcing a draft of air over said heated boiler through said washing chamber.

13. In a dish washing machine, the combination of a washing chamber, a dish rack positioned within said chamber, a boiler for wash water, a boiler for rinsing water, means for heating said boilers, means for circulating water from either said boiler for washing water or said boiler for rinsing water through said washing chamber, means for forcing a draft of air through said washing chamber, a motor, timing means driven by said motor, a valve for switching the circulating water circuit through said washing chamber from said boiler for washing water to said boiler for rinsing water, means controlled by said motor for positioning said valve for said rinsing water connection, said means being controlled by said timing means.

14. In a dishwashing machine, the combination of a dish chamber, rotatably mounted spray pipes positioned therein, a pump adapted to force water through said rotatably mounted pipes, a boiler for wash water, a boiler for rinsing water, a drain, a valve coacting with said boiler for wash water, boiler for rinsing water, pump and drain and having suitable pipe connections therewith for allowing a circulation of water from said boiler for wash water through said discharge pipes and said dish chamber back to said boiler for wash water and having connections therewith when said valve is turned for allowing the discharge, by said pump, of water from said boiler for rinsing water through said discharge pipes, said dish chamber and out through said drain, and means operating at the end of a perdetermined period for turning said valve from its washing position to its rinsing position.

15. In a dish washing machine the combination of a washing chamber, a boiler for washing water, a boiler for rinsing water, means for forcing a draft of air over one of said boilers and through said washing chamber, a motor, timing means driven by said motor and means controlled by said timing means for effecting the circulation of heated air through said washing chamber a predetermined period after the starting of said motor.

16. In a dish washing machine the combination of a washing machine, a boiler for washing water, means for heating said boiler, means for forcing a draft of air across said boiler through said washing chamber whereby said air may be heated before it reaches said washing chamber, a motor, means driven by said motor for circulating water from said boiler for washing water through said washing chamber, said air forcing means also being driven by said motor, timing means driven by said motor and means controlled by said timing means for effecting said air circulation a predetermined time after said water circulation.

17. In a dish washing machine the combination of a water receptacle, a washing chamber, means for applying water from

said water receptacle to said washing chamber, a prime mover for operating said means, means for starting said prime mover, and timing means driven by said prime mover and controlling the actuation of said water applying means by said prime mover.

18. In a dish washing machine the combination of a washing chamber, a boiler for washing water, a boiler for rinsing water, a prime mover, a pump driven by said prime mover for passing water from either of said boilers to said washing chamber, water circulating switching means for changing the water connection from said washing chamber and said boiler for washing water to said washing chamber and said boiler for rinsing water, and timing means actuated by said prime mover controlling said water circulation switching means.

19. In a dish washing machine, the combination of a washing chamber, a boiler for wash water, a boiler for rinsing water, means for heating said boilers, means for forcing a draft of air across said boilers through said washing chamber, whereby said air may be heated by said boilers before it reaches said washing chamber, means for circulating water from each of said boilers through said washing chamber, and automatic means for determining the sequence of operation of washing, rinsing and drying.

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