C. C. AND J. WILLIAMS.

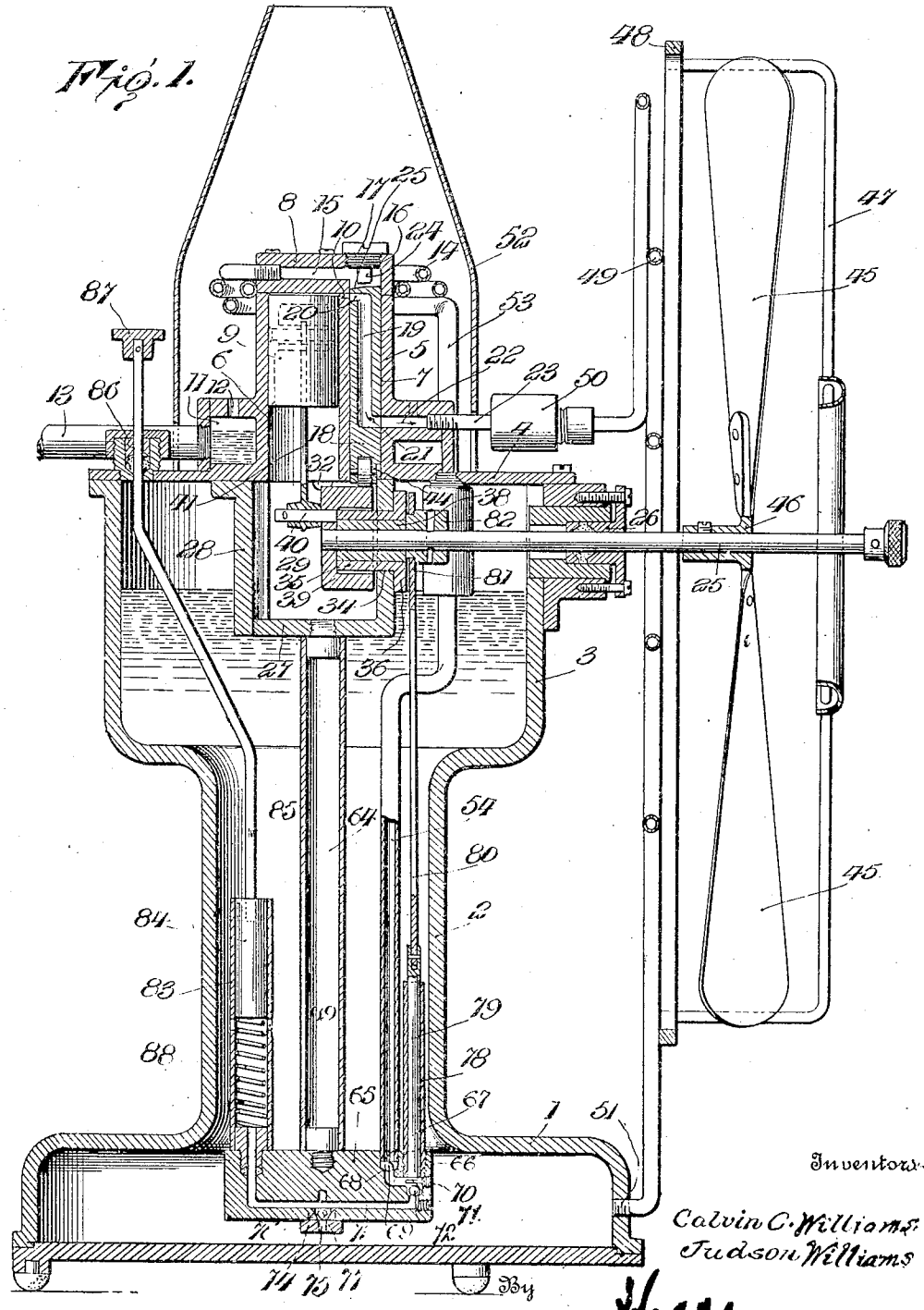
FAN MOTOR.

APPLICATION FILED JAN. 18, 1917. RENEWED JUNE 19, 1919.

1,330,827. Patented Feb. 17, 1920.

4 SHEETS—SHEET 1.

Fig. 1.



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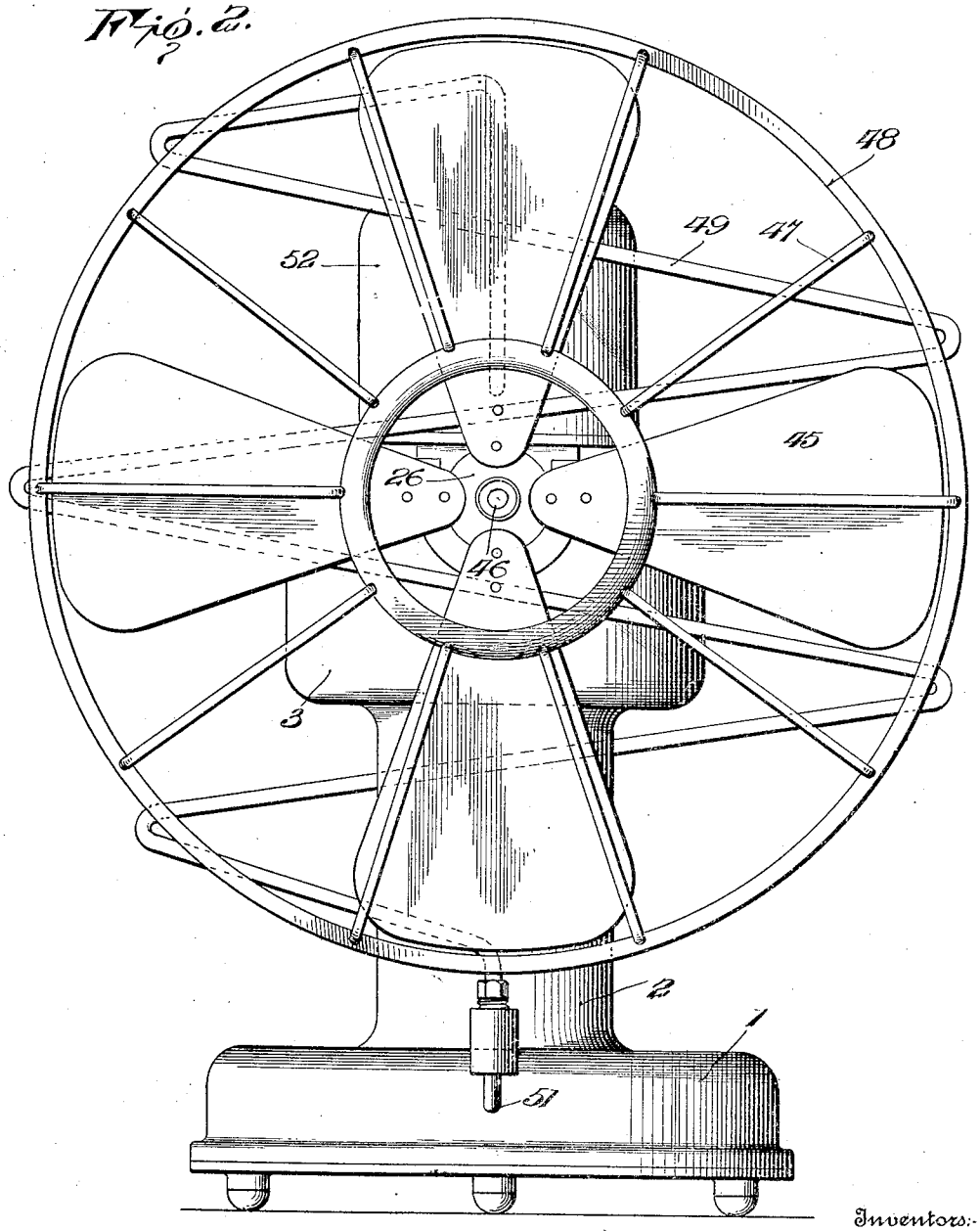
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

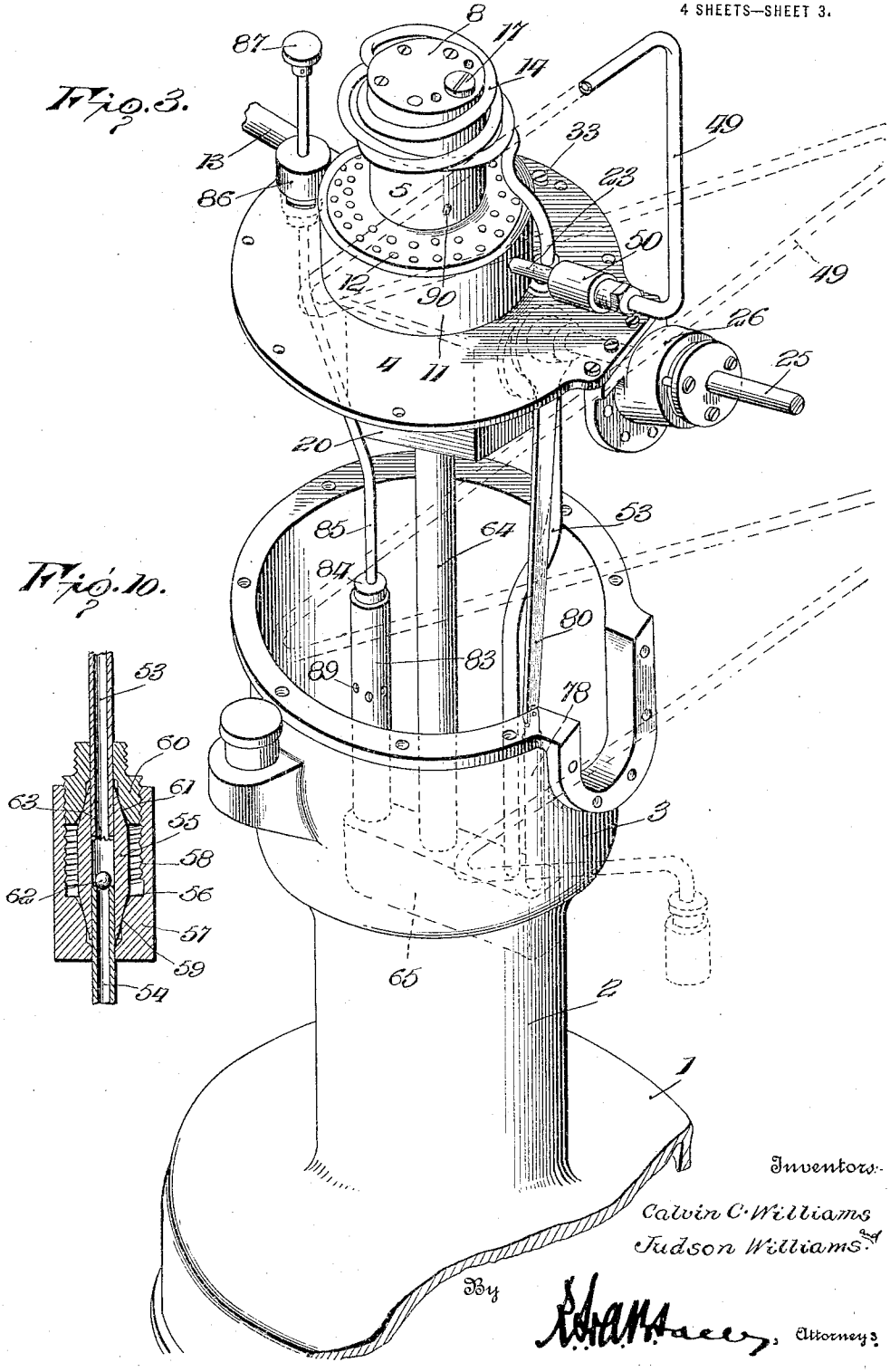


Fig. 10.

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4 SHEETS—SHEET 4.

Fig. 4.

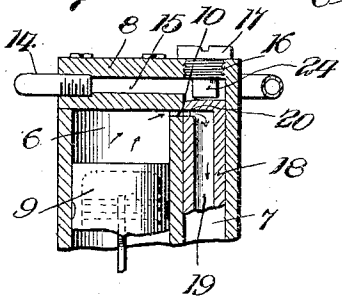


Fig. 5.

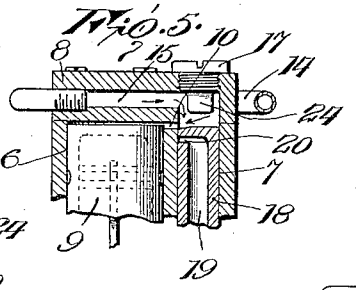


Fig. 6.

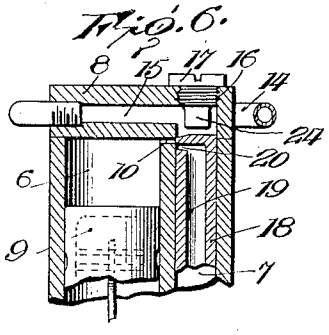


Fig. 7.

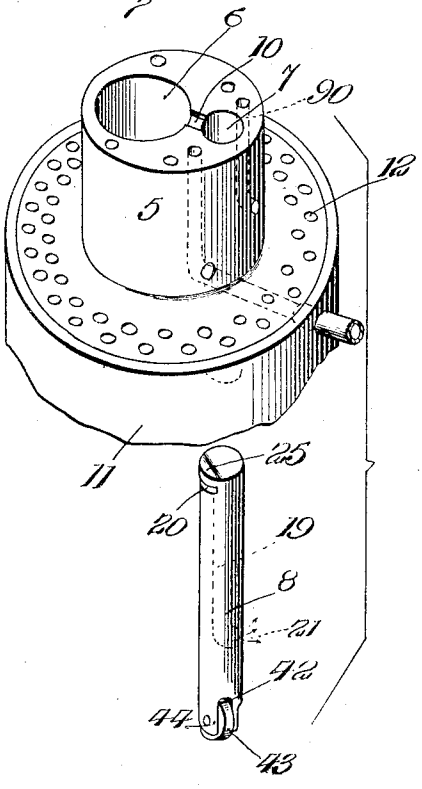


Fig. 8.

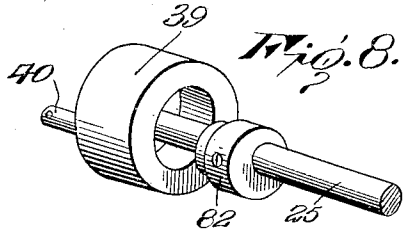
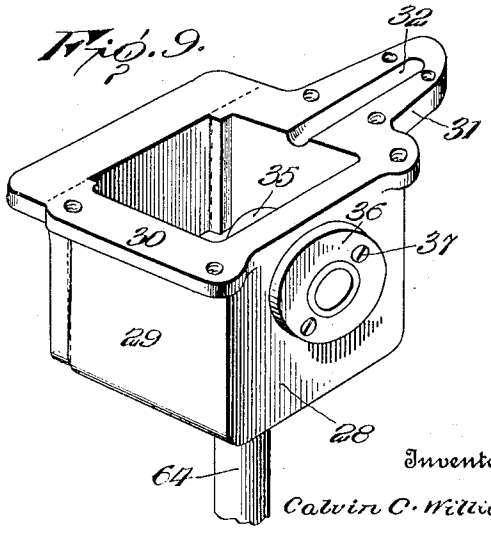


Fig. 9.



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UNITED STATES PATENT OFFICE.

CALVIN C. WILLIAMS AND JUDSON WILLIAMS, OF PHILADELPHIA, PENNSYLVANIA.

FAN-MOTOR.

1,330,827. Specification of Letters Patent. Patented Feb. 17, 1920.

Application filed January 18, 1917, Serial No. 143,138. Renewed June 19, 1919. Serial No. 305,395.

To all whom it may concern:

Be it known that we, CALVIN C. WILLIAMS and JUDSON WILLIAMS, citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Fan-Motors, of which the following is a specification.

This invention relates to motors employing steam as the motive fluid and while the motor embodying the invention is primarily designed for use in driving a desk fan, it will be understood that it may be put to various other uses and that the principles of the invention may be embodied in motors of various sizes.

The invention aims primarily to provide a motor employing steam as the motive fluid which motor will be light in weight and compact so as to adapt it for use, for example, in driving a desk fan, and, incidentally, the invention aims to provide means for condensing the exhaust steam and utilizing the water of condensation so that it will seldom become necessary to replenish the water and undesirable results which would attend the escape of steam to the atmosphere will be avoided.

As concerns the means provided for condensing the exhaust steam, the invention aims to provide a condensing coil system which will be so arranged as to be cooled through the rotation of the fan driven by the motor.

Another aim of the invention is to provide means for maintaining a circulation of water through the water heating coils which comprise a part of the motor, which means will be operated directly from the motor shaft and will be housed in a compact manner within the base of the motor.

Another aim of the invention is to provide in a motor of this class a novel form of valve for controlling the admission and exhaust of steam to and from the cylinder and a compact arrangement of parts for actuating the said valve.

Another aim of the invention is to provide a motor so constructed that the parts of the same may be readily disassembled whenever it is desired to clean or repair the same.

Another aim of the invention is to so house and conceal the burner for heating the water coils of the motor that the device will not be unsightly and there will be no likelihood of one lifting the motor being burned, the burner and all parts likely to become heated to any high degree of temperature, being located considerably above the portion of the motor casing which is to be grasped and this latter portion of the casing constituting a part of the water reservoir so that the same will be maintained at a low temperature.

In the accompanying drawings:

Figure 1 is a vertical front to rear sectional view through the motor embodying the present invention;

Fig. 2 is a front elevation thereof;

Fig. 3 is a perspective view illustrating the parts of the motor in a more or less disassembled condition;

Fig. 4 is a vertical sectional view illustrating one position of the piston and valve of the motor;

Fig. 5 is a similar view illustrating another position of these parts;

Fig. 6 is a similar view illustrating still another position;

Fig. 7 is a perspective view of the burner of the motor and the cylinder and valve;

Fig. 8 is a perspective view of the inner end of the motor shaft;

Fig. 9 is a perspective view of the crank casing for the motor;

Fig. 10 is a detail sectional view through one of the combined couplings and check valve casings employed in the water circulating system of the motor.

The body of the casing for the motor constitutes also the water reservoir and the said casing includes a base 1 having an upstanding hollow standard portion 2 sufficiently small in diameter to permit of the same being readily grasped when it is desired to move the motor from place to place, and an enlarged hollow upper portion 3 closed by a cover plate 4. The cover plate either directly or indirectly supports all of the parts comprising the motor and, consequently, when the cover plate is removed the said component parts of the motor will be exposed to view and may be readily cleaned or repaired. The plate 4 is provided centrally upon its upper side with an integral boss 5 which is exteriorly cylindrical and which is bored to provide the steam cylinder 6 of the motor and the valve chest 7 for the valve which controls the admission and exhaust of steam. The bores 6 and 7 are both cylindrical and both open at their lower ends at the underside of the plate 4

and at their upper ends the said bores are closed by a head 8. The piston of the motor is indicated by the numeral 9 and has operative connection with the motor shaft in a manner which will presently be described in detail, the said piston working in the usual manner within the cylinder 6. At its upper end the cylinder is provided with a combined inlet and exhaust port 10 which, at times, communicates with the interior of the valve chamber 7, and at other times communicates with an exhaust passage formed in the valve which works in the said chamber and which also will hereinafter be fully described. The steam is generated in pipe coils which are preferably arranged to surround the upper end of the boss 5 and which coils are heated by a burner surrounding the lower end of the said boss and preferably formed integrally therewith. The burner comprises a fuel font 11 which, as stated, is integral with the lower end of the boss 5 and surrounds the same and is located immediately above the plate 4. In fact, the font 11 is in the nature of an annular chamber, the exterior surface of the boss 5 constituting the inner wall of the said chamber and the plate 4 constituting the bottom wall thereof. The top wall of the chamber is formed with an annular series of perforations 12 and as fuel, fed to the chamber by a pipe 13, issues through the perforations 12, it is ignited and the jets of flame impinge upon the coils mentioned above and convert the water therein into steam.

The pipe coils above referred to are indicated by the numeral 14 and the said coils may be of any desired number and, as before stated, surround the upper end of the boss 5. The head 8 is formed with a passage 15 which extends diametrically thereof and which opens at one end at the periphery of the head and at its other end at the underside of the head, the end of the coil 14 being fitted into the first-mentioned end of the passage 15, as clearly shown in Fig. 1 of the drawings, and the passage at its other end communicating with the upper end of the valve chamber 7 also as clearly shown in the said figure. At its last-mentioned end the passage 15 is of the same diameter as the upper end of the chamber 7 and above the said end of the passage the head 8 is formed with a threaded opening 16 through which the valve may be inserted and removed, the said opening being normally closed, however, by means of a plug, indicated by the numeral 17. The valve above referred to comprises a cylindrical body 18 which is slidably and yet snugly fitted in the chamber 7 and this body is formed with a longitudinally extending passage 19 provided at its upper end with a branch 20 designed at times to register with the port 10, as shown in Figs. 1 and 4 of the drawings. At its lower end the passage 19 is provided with a laterally extending branch 21 designed to register with a passage 22 extending radially within the upper wall of the burner and opening at the periphery of the said burner casing where it receives one end of an exhaust conducting pipe, indicated by the numeral 23. The valve 18 is reciprocated through rotation of the motor shaft, as will be presently explained, and the upward movement of the valve is limited by the engagement of its upper end with a stud 24 which projects downwardly from the plug 17 and the said upper end of the valve is beveled or provided with an inclined surface 25 which permits of steam passing more readily into the cylinder 6 through the port 10 when the valve is in the position shown in Fig. 5 of the drawings. By reference now to Figs. 4, 5 and 6 of the drawings it will be observed that the branch 20 of the passage 19 may register with the port 10 so as to permit of exhaust of steam from the cylinder 6 and that the said port may be closed, as shown in Fig. 6 by that portion of the valve between its upper end and the branch 20 of the passage 19, this said portion corresponding in dimensions to the dimensions of the said port.

The motor shaft is indicated by the numeral 25 and the said shaft is mounted between its ends for rotation in a bearing 26 which is removably secured upon the side of the upper portion 3 of the body or casing for the motor. At its inner end the shaft extends into a crank casing which comprises a bottom 27, sides 28 and ends 29, this casing being closed at its bottom and open at its top and being secured to the underside of the plate 4 by means of bolts or other suitable securing elements which are passed through flanges 30 formed at the upper edges of the side and end walls of the said casing. One end wall of the casing is provided with a lateral extension 31, which is also secured to the underside of the plate 4, and the upper face of this extension is formed with an oil duct or groove 32, which communicates with the interior of the casing and at its outer end registers with an oil inlet opening in the plate 4, this opening being normally closed by a cap or plug 33 which is removable to permit of oil being introduced into the crank casing by way of the said duct. In one of its side walls the crank casing is formed with an opening 34 into which is fitted a bushing 35, the bushing being of any suitable antifriction metal and being provided at its outer end with an annular flange 36, secured by means of screws or other suitable fastening elements 37 to the outer face of the said side wall of the casing. The bushing affords a relative long bearing for the shaft 25 and in order to reduce friction incident to rotation of the shaft, a sleeve 38 of

anti-friction metal is secured upon the shaft and is rotatably fitted within the said bushing. The inner end of the shaft 25 projects slightly beyond the inner end of the bushing 35 and fixed upon the projecting end of the shaft is a cam 39 and this cam carries a crank pin 40 to which is connected the lower end of the rod 41 for the piston 9. It will now be understood that in the operation of the motor the reciprocation of the piston 9 will result in rotary motion of the shaft 25. By reference to Fig. 1 of the drawings it will be observed that the cam 39 is located below the lower end of the valve chamber 7 and the valve 18 at its lower end is bifurcated, as at 42, and a roller 43 is mounted in the bifurcation 42 and rests upon the working surface of the cam 39. In order to prevent rotation of the valve within its casing, the lower end of the valve is flattened, as at 44, and its flattened side works against the inner face of that side wall 28 of the crank casing in which the bushing 35 is fitted. It will now be understood that steam generated within the coils 14 will enter the passage 15 and when the valve 18 is in the position shown in Fig. 5 of the drawings, will enter the cylinder 6 moving the piston 9 on its down stroke. As the shaft 25 is rotated the valve will be brought to the position shown in Fig. 6 of the drawings in which position its portion between the branch 20 of the passage 19 and the upper end of the valve will close the port 10, thereby allowing the steam to expand within the cylinder in the usual manner. On the up stroke of the piston, the cam will lift the valve 18 to the position shown in Fig. 4 of the drawings, and steam will pass from the cylinder through the port 10 and passage 19 to the pipe 23. While the shaft 25 may be employed in driving various small machines it is here shown as employed in driving a fan the blades of which are indicated by the numeral 45, the said blades radiating from a hub 46 fixed upon the said shaft. The fan is preferably inclosed within the usual form of wire fender 47 including the usual annular frame 48 and supported by this frame and extending preferably in a zig-zag manner, as shown in Fig. 2 of the drawings, is an extension of the pipe 23, the said extension being indicated by the numeral 49. At one end the extension is connected with the pipe 23 by a coupling 50 and the other end of the pipe 49 leads into the base 1 of the casing for the motor, as indicated at 51. It will be understood that as the fan rotates the coils of the pipe 49 will be cooled and, consequently, the steam exhausting from the engine and entering the said coils will be condensed and returned to the water reservoir comprising the casing of the device. In order to confine the heat from the burner and thereby more effectually heat the coils 14, an approximately conical hood 52 is disposed upon the plate 4 and incloses the said burner and motor, as well as the coils 14. This hood also serves to provide against heating of the condensing coils 49 due to heat radiation from the burner.

The coils 14 communicate with a pipe 53 which extends downwardly through the plate 4 and which is connected by the coupling shown in Fig. 10 with a pipe 54. This coupling includes a sleeve 55 which is fitted to the adjacent ends of the pipes 53 and 54 and is secured thereto by welding or otherwise. This sleeve at its ends is exteriorly tapered, as at 56, and rotatably fitted upon the pipe 54 is one section of the coupling, indicated by the numeral 57, the said section being interiorly threaded, as at 58, and having its bore contracted, as at 59, to bear against the lower tapered end of the sleeve 55. The other section of the coupling is indicated by the numeral 60, and the same is exteriorly threaded and fitted into the upper end of the section 57. The section 60, as in the case of the section 57, is interiorly reduced, as at 61, to bear against the upper end of the sleeve 55. The upper end of the pipe 54 constitutes a seat for a ball valve 62 and this valve, as will be understood by reference to the drawings, permits of the passage of water, upwardly into the pipe 54 and into the pipe 53 but prevents back flow of the water. In order that when the ball valve 62 is raised and contacts the lower end of the pipe 53 the flow of water will not be interfered with, the said lower end of the pipe 53 is notched or serrated, as at 63.

In order that water may be supplied to the coils 14, means is provided for taking water from the water reservoir comprising the casing of the device and delivering the same to the said coils through the pipes 54 and 53 and this means will now be described. A standard 64 extends downwardly from the bottom wall of the crank casing heretofore described and supports at its lower end a head which is indicated by the numeral 65 and this head is formed with a passage 66 into one end of which is fitted the lower end of the pipe 54, the pipe having its said end notched or serrated, as at 67, and the passage being formed inwardly of its said end with a valve seat 68 for the ball check valve 69 which works between the said seat and the said end of the pipe 54 and prevents back flow of water through the said pipe. The said end of the passage 66 opens through the upper face of the head 65 and the other end of the passage opens through the periphery of the head and is closed by means of a threaded plug 70, the plug being provided at its inner end with a finger 71 which projects in the path of and constitutes a stop for a ball check valve 72 normally resting upon a seat formed in a branch lead-

ing from the said passage 66, this branch being indicated by the numeral 73. By reference to Fig. 1 of the drawings it will be observed that the head 65 is located within the hollow base 1 of the casing and it will also be observed by reference to the said figure that the branch 73 from the passage 66 extends diametrically of the head and that there is threaded into the underside of the head a plug 74 having an inlet passage 75 communicating with the branch 73, the plug being provided with a valve seat 76 upon which normally rests a ball check valve 77. Threaded into the upper face of the head 65 at a point immediately above the valve 72 is the lower end of a tubular pump cylinder 78 and working within the cylinder is a relatively long piston 79 to the upper end of which is pivotally connected the lower end of a pitman 80. The pitman at its upper end is provided with an eccentric strap 81 which coacts with an eccentric 82 fixed upon the shaft 25. It will now be understood that upon rotation of the shaft 25 in the operation of the device the piston 79 will be reciprocated and water will be drawn into the passages 73 and 66 and forced therefrom, upon each down stroke of the piston, through the pipes 54 and 53 into the coils 14, where it will be converted into steam for operating the piston 9 as heretofore described.

In starting the motor, or in other words, in the initial operation of the device, it becomes necessary to manually elevate water from the water reservoir to the coils 14 and this is accomplished through the manual operation of the auxiliary pump shown in Fig. 1 of the drawings, which pump includes a cylinder 83 having its lower end in communication with the branch passage 73 and mounted for reciprocation in the cylinder is a piston 84 to the upper end of which is connected a rod 85 which reciprocates through a suitable packing gland 86 upon the plate 4, the rod being provided at its upper end with a finger knob 87. Normally the piston 84 is held in elevated position by means of a spring 88 which bears at its lower end at the lower end of the cylinder 83 and at its upper end against the upper side of the said piston 84. The cylinder is provided with a number of water inlet openings 89 and it will be understood that water may enter the cylinder through the openings as also through the passage 75 and that when the piston 84 is moved on its downward stroke the water will be elevated to the coils 14 through the pipes 54 and 53.

In order that the steam cylinder 6 may be maintained in heated condition and thereby provide against condensation of steam entering the said cylinder, the boss 5 is formed with any desired number of passages 90 which open at their lower ends at the exterior surface of the boss and at their upper ends through the upper ends of the said boss, or in other words, through the head 8. As the lower ends of these passages are located relatively close to the jets of flame issuing from the openings 12 of the burner of the device, the heated air from the burner will pass upwardly through the said passages and will heat the walls of the cylinder and also the walls of the casing 4 for the valve 18.

It will be understood that the cylinder and cylinder head constitute the boiler or a part of the boiler. It will also be understood that the pressure generated in the coil 14 operates the valve on its downward stroke and if there is no pressure in the coil 14 and the engine is rotated then the cam will raise the valve to its highest position and open the exhaust port which will then remain open until pressure is generated in the cylinder head and the said coil.

It will be observed that with the present apparatus it is unnecessary to employ a steam gage, a water gage, or safety valve and that no hand throttle valve is necessary.

Having thus described the invention, what is claimed as new is:

1. In a device of the class described, a hollow casing constituting a water reservoir, a cap plate for the casing, a steam motor upon the cap plate including a cylinder, a valve chamber, a valve within the chamber, a piston working in the cylinder, a shaft mounted below the said plate and having operative connection with the piston and with the valve for actuating the latter, a generating coil surrounding the said piston and valve chamber, a heater for the coil also surrounding the cylinder and valve chamber and carried by the said plate, a pump supported from the plate and housed within the water reservoir, means for actuating the pump connected with said shaft, and a supply pipe leading from the pump to the said generating coil.

2. In a device of the class described, a hollow casing constituting a water reservoir, a cap plate for the casing, a steam motor upon the cap plate including a cylinder, a valve chamber, a valve within the chamber, a piston working in the cylinder, a shaft mounted below the said plate and having operative connection with the piston and with the valve for actuating the latter, a generating coil surrounding the said piston and valve chamber, a heater for the coil also surrounding the cylinder and valve chamber and carried by the said plate, a pump supported from the plate and housed within the water reservoir, means for actuating the pump connected with said shaft, a supply pipe leading from the pump to the said generating coil, a condensing coil extending from the exhaust from the valve

chamber to the said water reservoir, and a cooling device driven by the said shaft for cooling the said condensing coil.

3. In a motor of the class described, a cylinder provided with an inlet and exhaust passage, a valve chest, a piston working in the cylinder, a shaft driven from the piston, a valve working in the said chest and designed to control the said inlet and exhaust passage and having an exhaust passage therethrough designed to communicate with the exhaust passage from the cylinder, means for admitting steam to the valve chest, the valve being actuated in one direction by the steam pressure within the chest, and means actuated by the shaft for moving the valve in the opposite direction.

4. In a motor of the class described, a hollow casing constituting a water reservoir, a steam motor supported upon the casing, a generator for supplying steam to the motor also located upon the casing, a shaft extending into the casing and driven by the motor, a head supported within the lower portion of the casing in position to be wholly submerged in the water in said casing, a pump cylinder upon the head, a piston working in the cylinder and operatively connected with the shaft, the head being formed with a water inlet passage communicating with the pump cylinder, a pipe leading from the head to the generator and also communicating with the said passage, a second pump cylinder mounted upon the head and communicating with the passage, a piston working in said cylinder and having a rod extending through the top of the casing, and a hand piece upon the rod.

In testimony whereof we affix our signatures.

CALVIN C. WILLIAMS. [L. S.]
JUDSON WILLIAMS. [L. S.]