



June 12, 1928.

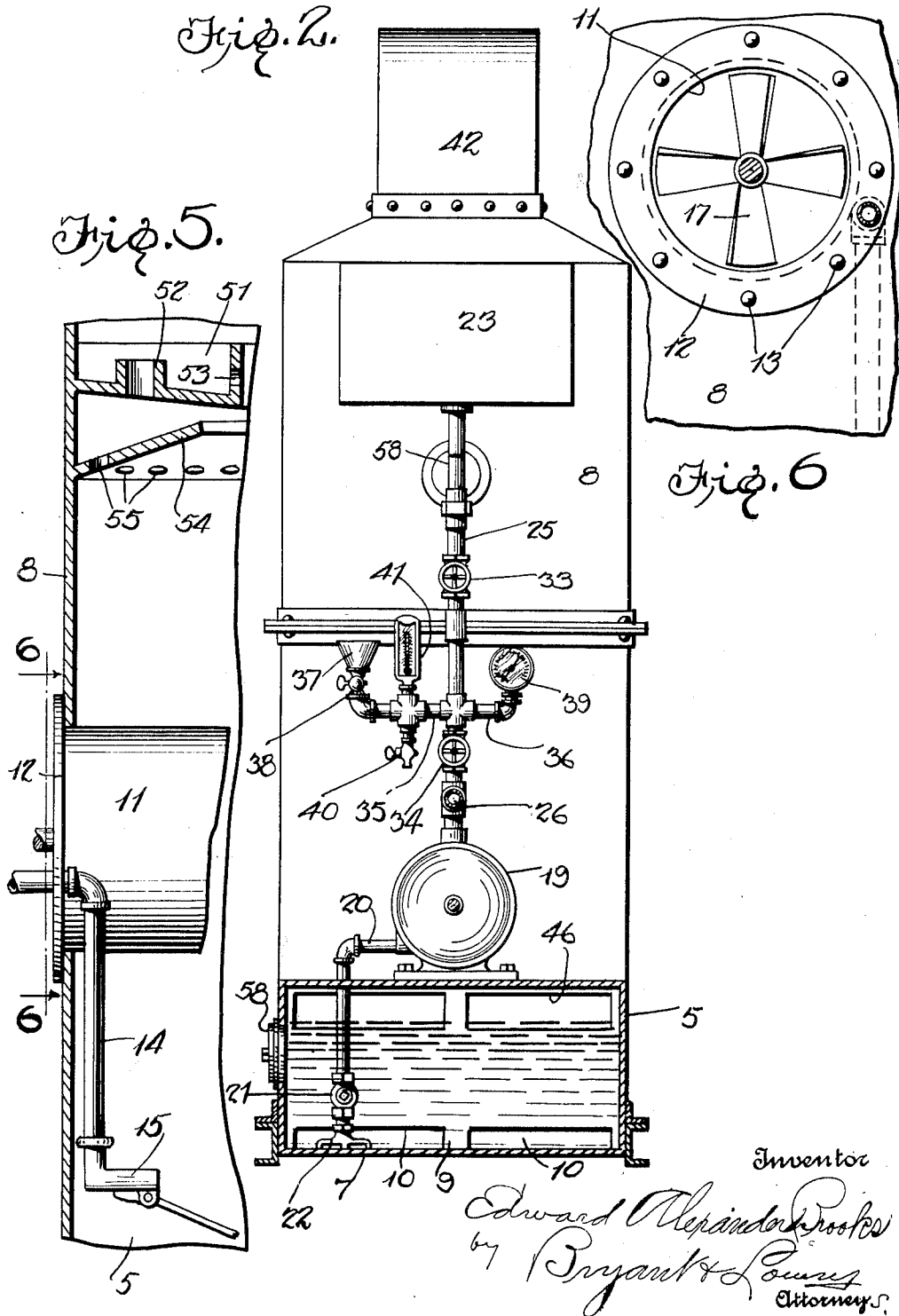
1,673,732

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COOLING DEVICE

Filed Aug. 19, 1926

3 Sheets-Sheet 2



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*Fig. 3.*

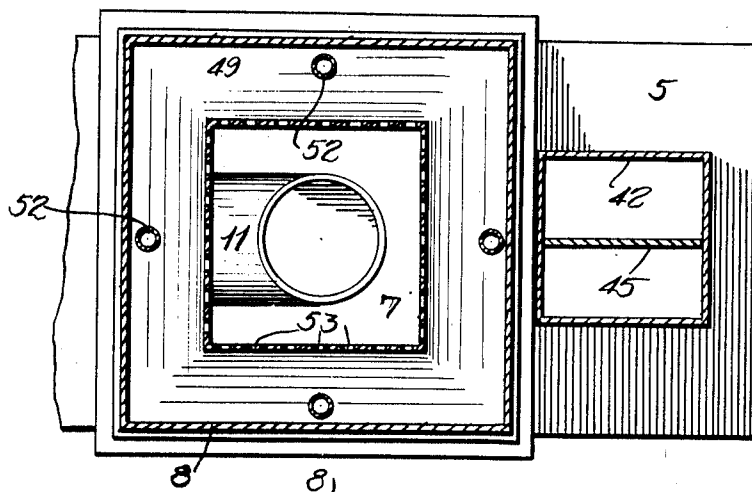


*Fig. 4.*

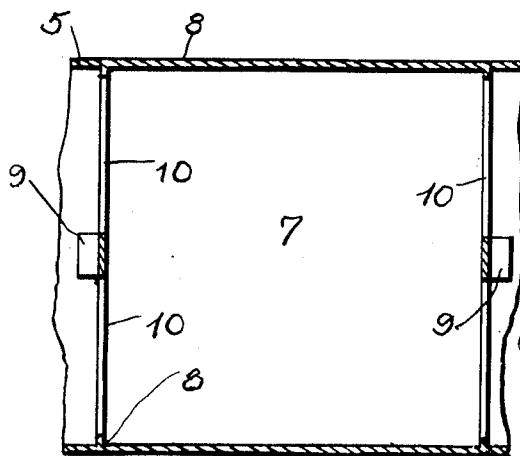
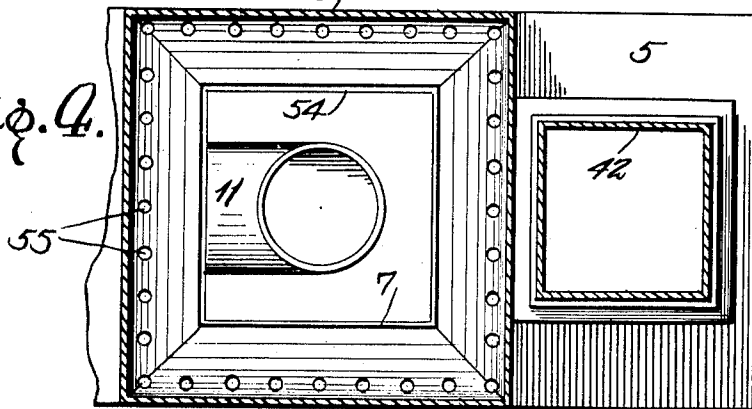


*Fig. 7.*

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## UNITED STATES PATENT OFFICE.

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## COOLING DEVICE.

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This invention relates to cooling devices, and has more particular reference to an improved apparatus for cooling, humidifying and washing air prior to its delivery to a  
5 desired point or desired points of use.

The present invention has more particular reference to a cooling apparatus of that type in which outside or atmospheric air is forced past jets of water for being cooled,  
10 humidified and washed, and then forcibly supplied to a desired point or desired points, such as beneath a chopping block and other store furniture, or to rooms of a building, such as dwellings, theaters and the like.

15 A specific object of the invention is to provide a cooling apparatus of the above kind which is extremely simple and durable in construction as well as efficient in operation.

20 A more specific object is to provide a cooling apparatus of the above kind wherein a most efficient means is provided for effecting the contact of the air to be washed and the water jets, whereby a most thorough  
25 cooling, humidifying and cleaning of the air is effected.

A further object is to provide a cooling apparatus of the above kind wherein provision is made for supplying a part, such  
30 as an excess part of the air which has already been once cooled, humidified and washed in the apparatus, back to the air inlet thereof for mixing with additional air from the outside or atmosphere and passing with  
35 the latter again through the water and air contact chamber, whereby the air ultimately supplied from the apparatus to the point of use is brought to a cooler temperature than would be the case were none of the already  
40 cooled, humidified and washed air returned to the air inlet of the apparatus.

Another object is to provide an apparatus of the above kind wherein the cooling water is pumped in a circuit so as to be used over  
45 and over whereby the apparatus may be operated for a long period of time without requiring a constant supply of additional water, and whereby the slight amount of water removed from the apparatus by evaporation and comingling with the outgoing  
50 air will only require replenishment of the water supply in the circuit at infrequent intervals.

A further object is to provide a construc-

tion wherein the liquid circuit pump and 55 air forcing fan may be conveniently actuated by a single motor with the pump and motor situated for ready access for repairs and attention, and wherein means is provided for automatically priming the pump so located  
60 so that the apparatus will immediately function when the pump and fan are placed into operation subsequent to any cessation of operation of the apparatus.

Still another object is to provide an ap- 65 paratus in which connections may be readily made for placing a condenser or refrigerating coil in the liquid circuit between the outlet nozzle of the water conducting pipe and the pump so as to utilize the fluid or  
70 water circuit for other purposes or to reduce the temperature of the water to lower than normal temperature whereby the cooling action of the air is enhanced when passing through the apparatus. Another object is 75 to provide an improved arrangement of superimposed drip pans for furnishing jets of water through which and past which the air is forced for the cooling, humidifying and washing operation, whereby such oper- 80 ation is effected in a most practical and thorough manner.

Still another object is to provide means whereby a closed elevated tank may be employed to contain the supply of priming fluid 85 or water for the pump, and whereby the pump may be utilized to maintain or provide a supply of water in the elevated tank ready for use as occasion may require.

Other objects will become apparent as the 90 nature of the invention is better understood, and the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and claimed. 95

In the drawings, wherein like reference characters indicate corresponding parts throughout the several views—

Figure 1 is a view of a cooling device constructed in accordance with the present in- 100 vention, partly in central vertical longitudinal section, partly in side elevation and partly broken away;

Figure 2 is a vertical transverse section taken upon line 2—2 of Figure 1;

Figure 3 is a fragmentary horizontal section taken upon line 3—3 of Figure 1 with parts omitted;

Figure 4 is a view similar to Figure 3 taken upon line 4—4 of Figure 1;

Figure 5 is an enlarged fragmentary vertical longitudinal section taken through a portion of the upright housing and the water reservoir;

Figure 6 is a fragmentary transverse section taken upon line 6—6 of Figure 5; and

Figure 7 is a fragmentary horizontal section taken upon line 7—7 of Figure 1.

Referring more in detail to the drawings, the form of the apparatus shown embodies a hollow base 5 forming a water reservoir and preferably having a drain cock 6 at one end as well as provided with a bottom wall 7 which slopes downwardly toward this end so as to facilitate complete drainage of water and sediment from the reservoir 5 if desired. The hollow base or water reservoir 5 is provided with a central top opening in registry with which is mounted an upwardly projecting upright housing 8, the intermediate portion of the interior of which forms a water and air contact chamber as will become apparent. As shown clearly in Figures 1 and 2, walls of the housing 8 extend downwardly in the reservoir 5 and are provided with feet 9 engaging the bottom wall 7 of the reservoir 5, said walls of the housing 8 being provided with bottom elongated notches 10 at opposite sides of the feet 9 which provide communication between the reservoir 5 and the lower portion of the housing 8 whereby the water will maintain the same level within the lower part of the housing 8 as it maintains within the reservoir 5, as indicated in Figure 1.

The rear wall of the housing 8 is provided with an air inlet opening adjacent to but slightly above the top of the reservoir 5, and secured in this opening is the outer end of a fan casing 11 in the form of a relatively large elbow with its inner end directed upwardly in the lower portion of the housing 8. The fan casing 11 is preferably secured in place by providing an annular flange 12 upon the outer end of the horizontal outer portion thereof, said flange being secured in contact with the outer surface of the rear wall of housing 8 by riveting or the like as at 13. In places where a city water supply is available, a water supply pipe 14 may be extended through the flange 12 and the rear wall of housing 8 and provided with a depending end portion equipped with a valve 15 below the desired water level in the reservoir 5, said valve 15 being automatically operable by a float 16 for maintaining a constant level of water within the reservoir 5 in an obvious manner. Naturally, when such city water supply is not available, the reservoir 5 may be provided with a suitable filling opening or spout so that the water supply in the reservoir 5 may be replenished when found necessary

through reduction of the water level by reason of evaporation of the water after a long continued use of the apparatus.

The air forcing fan further includes a screw impeller preferably of the radial twisted blade type as shown at 17 and located in the horizontal portion of the casing or elbow 11 as well as fixed upon the inner or forward end of the power shaft of a motor 18 rigidly mounted upon the projecting rear end portion of reservoir 5. This motor is preferably of the electrical type and its power shaft may also constitute the drive shaft of a rotary pump 19 of conventional form disposed between the motor and the fan 17 and having its casing rigidly mounted upon the reservoir 5 as shown. The inlet of the pump 19 is connected to a pipe 20 which extends downwardly through the top wall of the reservoir 5 and depends below the water level where it is equipped with a suitable foot valve 21 and strainer 22, and suitably mounted above the motor 18 and pump 19 rearwardly of and adjacent the top of the housing 8 is an elevated closed tank 23 having a bottom inlet controlled by a float valve 24 and connected with the outlet of pump 19 by means of a piping generally indicated at 25. Extending from the pipe connection 25 near the lower end of the latter and adjacent the pump 19 is a branch piping 26 that also opens into the bottom of tank 23 and which is equipped with a manually operable shut off valve 27 and a check valve 28 disposed between the piping 25 and the valve 27. The check valve 28 is arranged to prevent flow of the water from the pump upwardly through the branch piping 26 into the tank 23, although permitting free flow of water from tank 23 to pump 19 when the shut off valve 27 is opened. For safety purposes, the tank 23 may be provided with an overflow pipe 29 which depends so as to discharge into the reservoir 5.

The pipe connection 25 is provided with a branch 30 at a point between the branch 26 and the tank 23 and adapted to be connected with the inlet side of a condenser or refrigerating coil, not shown, if desired, the other end of such coil being, in such instance, connected with an outlet pipe 31 extending into the upper end portion of the housing 8 and terminating in a downturned free end equipped with a suitable spraying device or nozzle 32 centrally of the chamber within the housing 8 for supplying the necessary jets of water in a manner that will be presently described, for effecting cooling, humidifying and washing of the rising air discharging upwardly from the fan casing 11. However, it is apparent that the branch 30 may be directly connected with the pipe 31 if desired.

A shut off valve 33 is arranged in the

pipe connection 25 between the tank 23 and the branch 30, while a further shut off valve 34 is provided in the pipe connection 25 between the branch 30 and the branch 26. Further lateral branches 35 and 36 are provided in the pipe connection 25 between the branch 30 and the shut off valve 34 and the branch 35 has an upturned outer end equipped with a priming cup 37 and a shut off valve 38, while the branch 36 connects with the inlet of a pressure gage 39. As shown clearly in Figure 2, the intermediate portion of the branch 35 may be equipped with a bottom drain cock 40 and placed into communication with a suitable thermometer 41 for obvious purposes.

The top of the housing 8 is provided with a central air outlet opening to which is connected one end of an air conduit 42 having a branch 43 equipped with a damper 44 and adapted to be connected to a desired point of discharge such as to a register beneath a chopping block or other store furniture or to a register or registers within the rooms of a dwelling, theater or the like. The air conduit 42 depends past the branch 43 and opens at its lower end through the top of the projecting forward portion of reservoir 5 as clearly shown in Figure 1 and is equipped with a damper 45, while suitable provision is made for permitting the air to pass from the conduit 42 across the top of the water in the reservoir 5 and then outwardly through the top of reservoir 5 directly beneath the outer or inlet end of fan casing 11. The passage of the air may be permitted either by forming the housing 8 of lesser width than the reservoir 5 so that the air may pass the sides of the lower end of housing 8 within the reservoir 5, or suitable slots or openings 46 may be provided in the walls of housing 8, as shown. The outlet for the air through the top of reservoir 5 is indicated at 47 in Figure 1, and a suitable deflector plate 48 is preferably provided at the rear side of this opening so that the air will be properly directed to the inlet end of fan casing 11 for being drawn into the latter together with outside air upon operation of fan 17.

As before mentioned, the portion of the interior of housing 8 between the fan casing 11 and nozzle 32 forms a contact chamber where the air comes in contact with jets or streams of water for being cooled, humidified and washed. In order to thoroughly effect this cooling, humidifying and washing operation, the intermediate portion of the housing 8 is equipped with internal continuous flanges in spaced superimposed relation and specially constructed to provide a series of superimposed overflow pans 49, 50 and 51 which progressively increase in width in a downward direction and upwardly through the centers of which the air passes in its

travel from the fan casing 11 to the air conduit 42. The spray nozzle 32 is of a type to cause the water to be sprayed outwardly in all directions directly into the uppermost drip pan 49, and as the pans 49, 50 and 51 are provided with continuous series of bottom overflow outlets 52, the water will successively pass in jets from one pan to another in a downward direction. The inner walls of the pans 49, 50 and 51 are also provided with continuous series of openings 53 through which the water will pass from the several pans in inwardly converging jets so as to present a series of superimposed curtains of water through which the air must pass in traveling to the conduit 42. By this arrangement it will be seen that the air will be thoroughly cooled, humidified and washed, the water ultimately finding its way back into the reservoir 5. A gutter 54 of continuous or annular form is provided on the interior of housing 8 directly beneath the lowermost pan 51 for receiving the water from the bottom overflow openings of the latter, and this gutter 54 is provided with a series of perforations 55 adjacent the walls of housing 8 so that the water will flow down these walls in addition to overflowing the inner edge of the gutter for presenting curtains of water which have a final cooling effect on the housing and in general upon the air within the lower portion of the interior of said housing.

With the construction above described, it is apparent that some water will find its way into the outlet end of the fan casing 11, and in order to prevent this water from passing outwardly through the inlet end of fan casing 11 the bottom of the latter is provided with one or more openings as at 52 so that the water will drain therefrom into the reservoir 5.

Suitable baffling means is provided within the top of housing 8 for removing free moisture from the air prior to its passage into the conduit 42 after being cooled, humidified and washed and as shown, this means preferably consists in a plurality of uniformly spaced vertically arranged baffle plates 57 of zig-zag form.

The housing 8, reservoir 5 and tank 23 may be provided with suitable hand holes closed by covers 58 and arranged for permitting ready access to nozzle 32 and adjacent parts, foot valve 21 and strainer 22 and float valve 24.

In operation, the reservoir 5 is nearly filled with water and valves 33 and 34 are opened along with valve 38, water being admitted into the priming cup 37 and the motor 18 being placed into operation to drive the pump 19 as soon as the water has flowed from the priming cup 37 to the pump and the valve 38 closed. The water will then be pumped from reservoir 5 into the elevated

tank 23 until it reaches a predetermined level within said tank 23, whereupon the float will close valve 24. If, due to defective operation of float valve 24, an excessive amount of water is supplied to tank 23, the same will return to reservoir 5 by way of overflow pipe 29. As soon as tank 23 has been filled with water, the valve 33 will be closed and the water will be forced to flow through branch 30 so as to ultimately find its way to outlet pipe 31 and be sprayed by nozzle 32 into the uppermost pan 49 within housing 8. The overflowing of the water from one pan to another and to the gutter 54, as well as the flowing of the water from the pans through the openings 53 in jets, will then take place, and the air will be forced upwardly through the jets and sprays of water by the fan 17 drawing the air from the outside and forcing it through the fan casing 11. As the water finds its way back to the reservoir 5 after performing its cooling, humidifying and washing functions, the same water is used over and over by being pumped in a circuit through the use of pump 19. In this way the apparatus may function for a long period of time without requiring an additional supply of water and when the pipe 14 and float valve 15 are employed the water supply in reservoir 5 will be automatically replenished when necessary by reason of reduction of the water level within reservoir 5 due to the slight amount of evaporation which will take place during such continued use of the apparatus. Where the supply of air to the conduit 42 is greater than the demand, the damper 44 may be adjusted so as to shunt any desired portion of the cooled air back into the reservoir 5 for ultimately finding its way to the inlet of fan casing 11 where it will mix with the required amount of additional outside air to pass again through the contact space in the housing 8. In such instance, the outside air will be slightly reduced in temperature and humidified by contact with the returned air which has already been once cooled, humidified and washed and the effective action of the apparatus is thereby enhanced to a desirable degree. It is further noted that the damper 45 may be positioned so as to limit the amount of air shunted from conduit 42 back to the inlet of fan casing 11 by way of reservoir 5, thereby insuring the delivery of the required amount of air to the point of discharge through the branch 43. Should the apparatus be rendered inoperative the water will drain from pump 19 and in order to prime the pump 19 upon again starting the apparatus into operation, the valve 27 will be opened for permitting a required amount of water to flow to the pump 19 for priming purposes from the elevated tank 23 and past check valve 28.

It is noted that the present apparatus pro-

vides for the natural downwardly flowing and falling of the water from the supply pipe 31 into the reservoir 5 and flow of the air past the water from the fan casing 11 in an opposite direction. This condition in connection with the manner of allowing the water to overflow and pass from the pans in jets, results in a most efficient washing, humidifying and cooling action upon the air.

From the foregoing description it will be seen that the apparatus is extremely simple and durable and may be operated for a long period of time at a minimum expense and with a minimum amount of attention while effectively performing the desired functions.

It is believed that the construction and operation as well as the advantages of the invention will be readily understood and appreciated by those skilled in the art, and minor changes may be made without departing from the spirit and scope of the invention as claimed.

What I claim as new is:—

1. A cooling device of the character described including a water reservoir, an upright housing rising from the intermediate portion of said reservoir and communicating with the latter at its lower end, said housing having an air inlet in the lower part thereof and provided with an air outlet at its upper end, an air conduit connected to the outlet of the housing and having a depending branch opening into one end of the water reservoir and a further branch adapted to extend to a point of air discharge, said water reservoir having an air outlet near its other end directly below and adjacent the air inlet of the housing, means to pump water from the reservoir and spray the same downwardly in the housing above the air inlet of the latter, and means to draw air into the housing and force the same into and through the air conduit.

2. An air cooling device comprising a housing having an air inlet and an air outlet conduit, a water reservoir into which the lower end of the housing opens, means for shunting a desired portion of air from the air outlet conduit into and through the water reservoir to the air inlet of the housing, means for spraying water in the path of air passing through the housing including a pump receiving its water supply from the water reservoir, and means to force air into and through the housing.

3. A cooling device including a housing having an air inlet and an air outlet, means for forcing air through the housing, a water reservoir, means for pumping water from the reservoir and spraying it in the housing in the path of the air, an air outlet conduit connected to said air outlet, and manually adjustable means for shunting any desired portion of the air from the air outlet con-

duit through the water reservoir back to the air inlet.

4. A cooling device including an upright housing having a bottom air inlet and a top air outlet, means for forcing air through the housing, a base for the housing forming a water reservoir, means for pumping water from the reservoir and spraying it in the housing in the path of the air, an air outlet conduit connected to said air outlet, means for shunting a desired portion of the air from the air outlet conduit through the water reservoir back to the air inlet, and means to regulate the amount of air passing through the air outlet conduit and the amount of air shunted to the air inlet.

5. A cooling device including a housing having a top air outlet and a lower air inlet, means for forcing air upwardly through the housing, means for spraying water in outwardly radiating jets in the housing above the air inlet, a plurality of overflow pans arranged in spaced superimposed relation in the housing beneath the spraying means so that the jets of water pass from the latter into the uppermost overflow pan, said pans being of open annular form to provide an air passage therethrough and having water outlet openings in the inner walls thereof for providing inwardly converging jets of water in said air passage.

6. A cooling device including a housing having a top air outlet and a lower air inlet, means for forcing air upwardly through the housing, means for spraying water in outwardly radiating jets in the housing above the air inlet, a plurality of overflow pans arranged in spaced superimposed relation in the housing beneath the spraying means so that the jets of water pass from the latter into the uppermost overflow pan, said pans being of open annular form to provide an air passage therethrough and having water outlet openings in the inner walls thereof for providing inwardly converging jets of water in said air passage, said air forcing means including a fan having a casing of elbow form fixed at its outer end in registry with the air inlet and having its inner end directed upwardly centrally of the housing.

7. A cooling device including a housing having a top air outlet and a lower air inlet, means for forcing air upwardly through the housing, means for spraying water in outwardly radiating jets in the housing above the air inlet, a plurality of overflow pans arranged in spaced superimposed relation in the housing beneath the spraying means

so that the jets of water pass from the latter into the uppermost overflow pan, said pans being of open annular form to provide an air passage therethrough and having water outlet openings in the inner walls thereof for providing inwardly converging jets of water in said air passage, said air forcing means including a fan having a casing of elbow form fixed at its outer end in registry with the air inlet and having its inner end directed upwardly centrally of the housing, a water reservoir, said housing opening at its lower end into said reservoir, and a bottom water drain opening in the fan casing to permit water to pass from the latter into the reservoir.

8. A cooling device including a housing having a top air outlet and a lower air inlet, means for forcing air upwardly through the housing, means for spraying water in outwardly radiating jets in the housing above the air inlet, a plurality of overflow pans arranged in spaced superimposed relation in the housing beneath the spraying means so that the jets of water pass from the latter into the uppermost overflow pan, said pans being of open annular form to provide an air passage therethrough and having water outlet openings in the inner walls thereof for providing inwardly converging jets of water in said air passage, said air forcing means including a fan having a casing of elbow form fixed at its outer end in registry with the air inlet and having its inner end directed upwardly centrally of the housing, a pump for supplying water to the spraying means, and a motor having a horizontal power shaft directly operating the pump and fan.

9. A cooling device including a reservoir, a housing rising from and communicating with the reservoir and having a lateral air inlet, an air outlet conduit communicating with the top of the housing, a motor mounted on the reservoir and having a power shaft, a fan on the power shaft within the air inlet, a water pump mounted on the water reservoir and driven by said power shaft, a water inlet pipe for the pump extending into the reservoir, and means connected to the outlet of the pump for spraying water into the housing, and an air inlet pipe projecting inwardly and upwardly from the lateral air inlet and having a bottom water drainage opening, said air inlet pipe opening upwardly directly beneath the water spraying means.

In testimony whereof I affix my signature.  
EDWARD ALEXANDER BROOKS.