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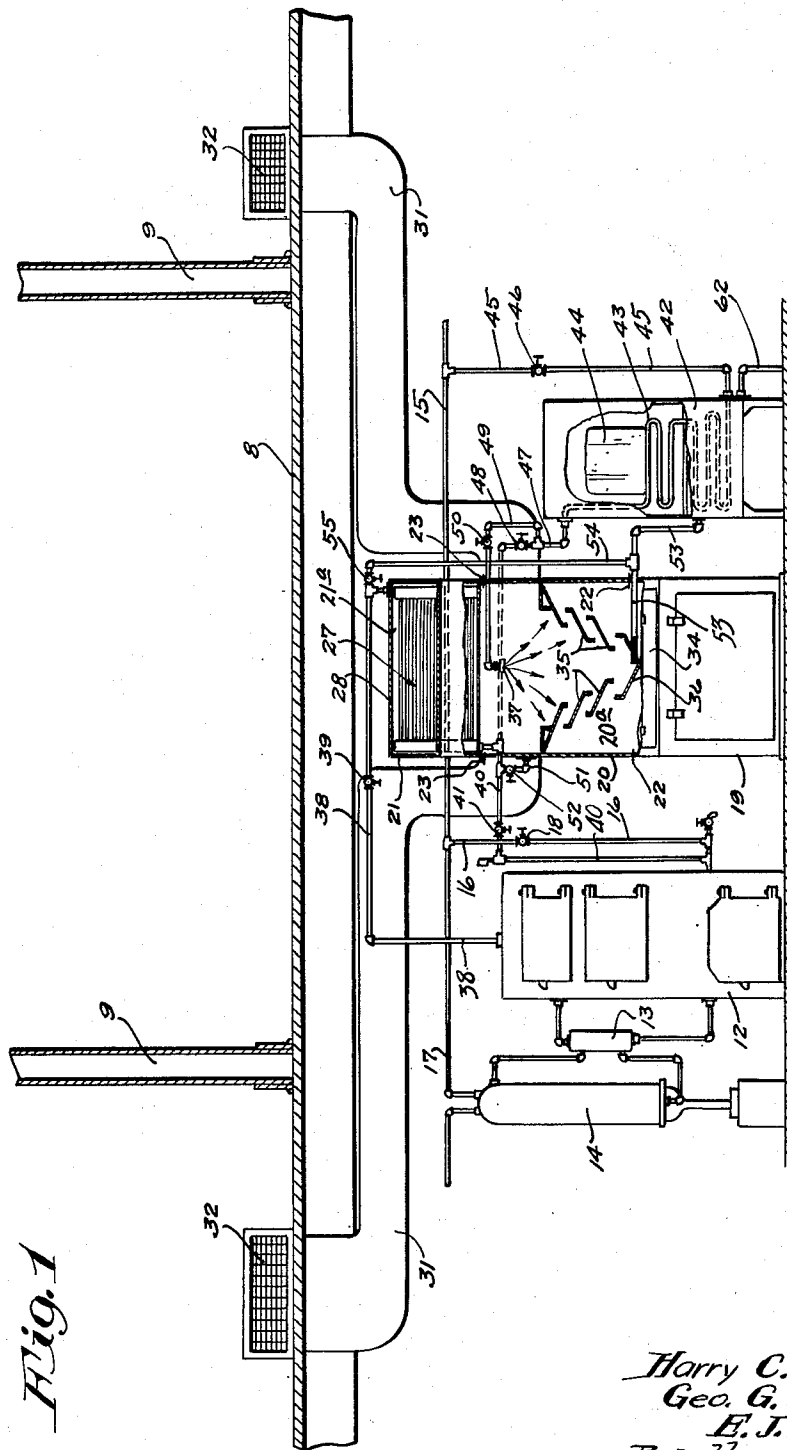
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2,012,547

AIR CONDITIONING APPARATUS

Filed March 30, 1934

4 Sheets-Sheet 1



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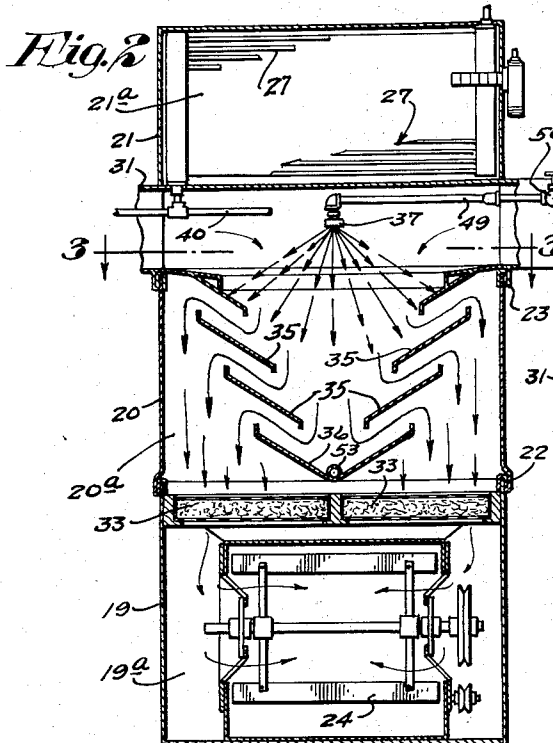
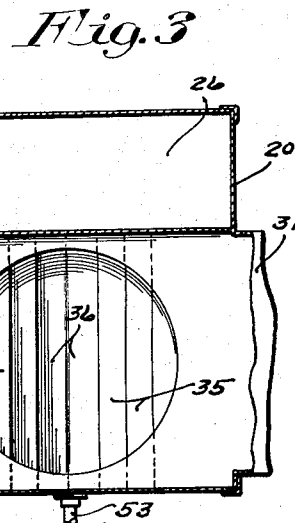
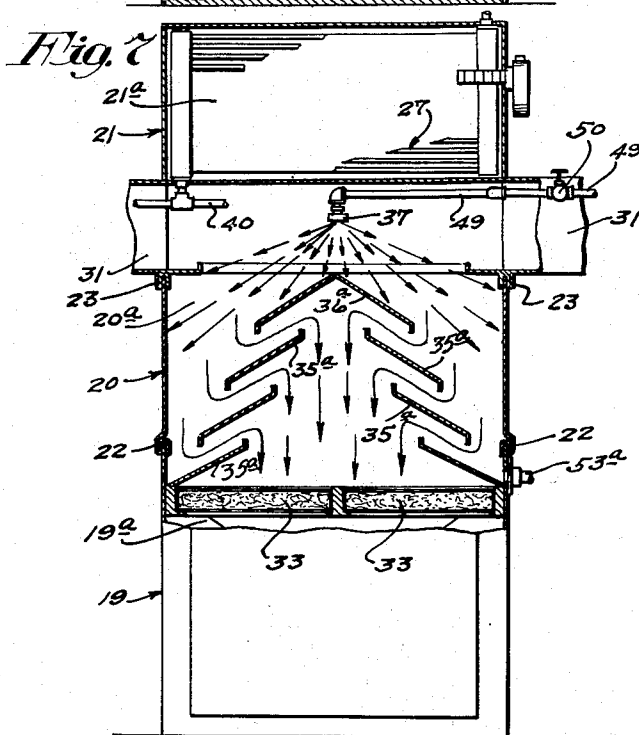
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4 Sheets-Sheet 2



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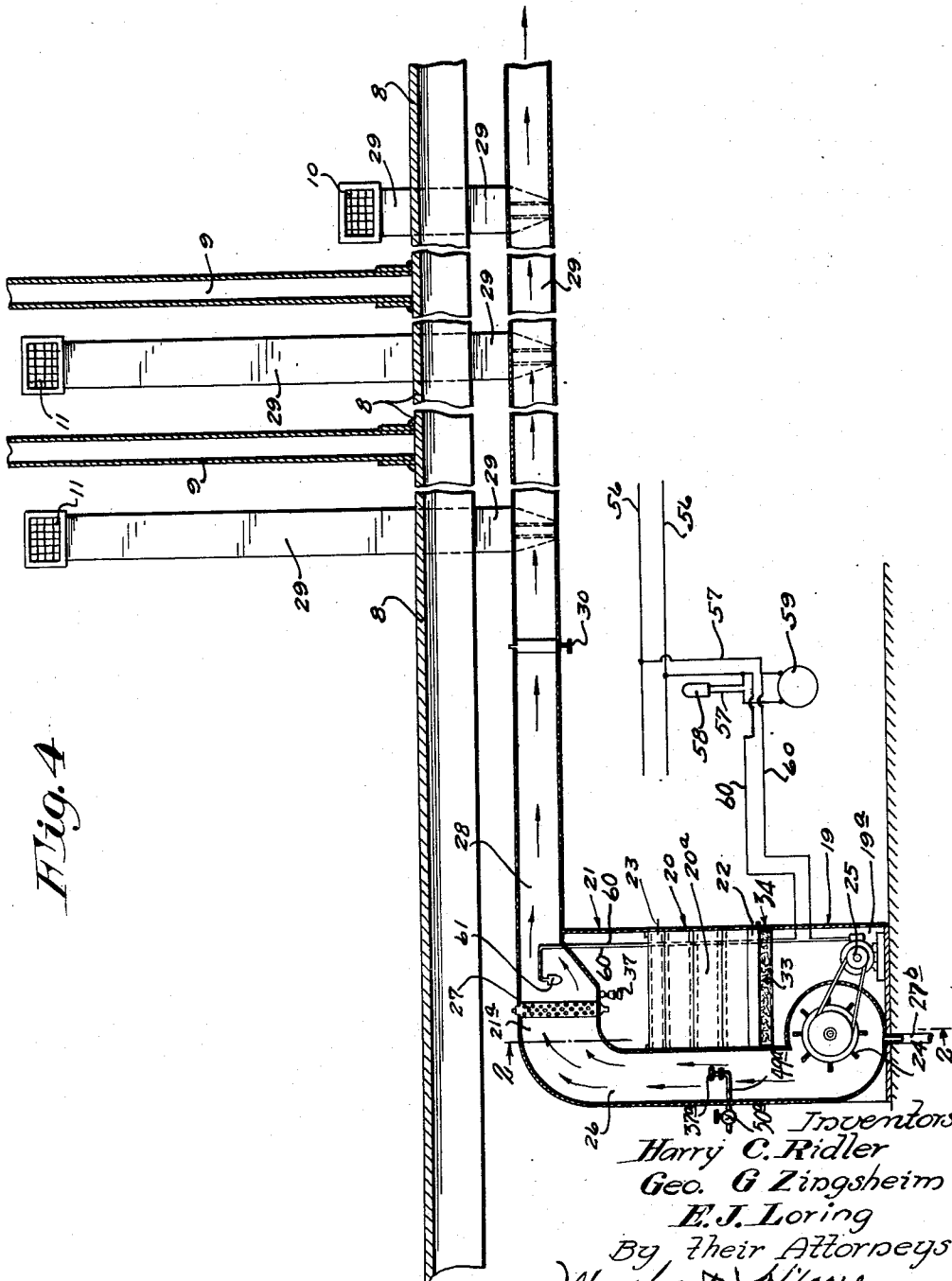
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4 Sheets-Sheet 3



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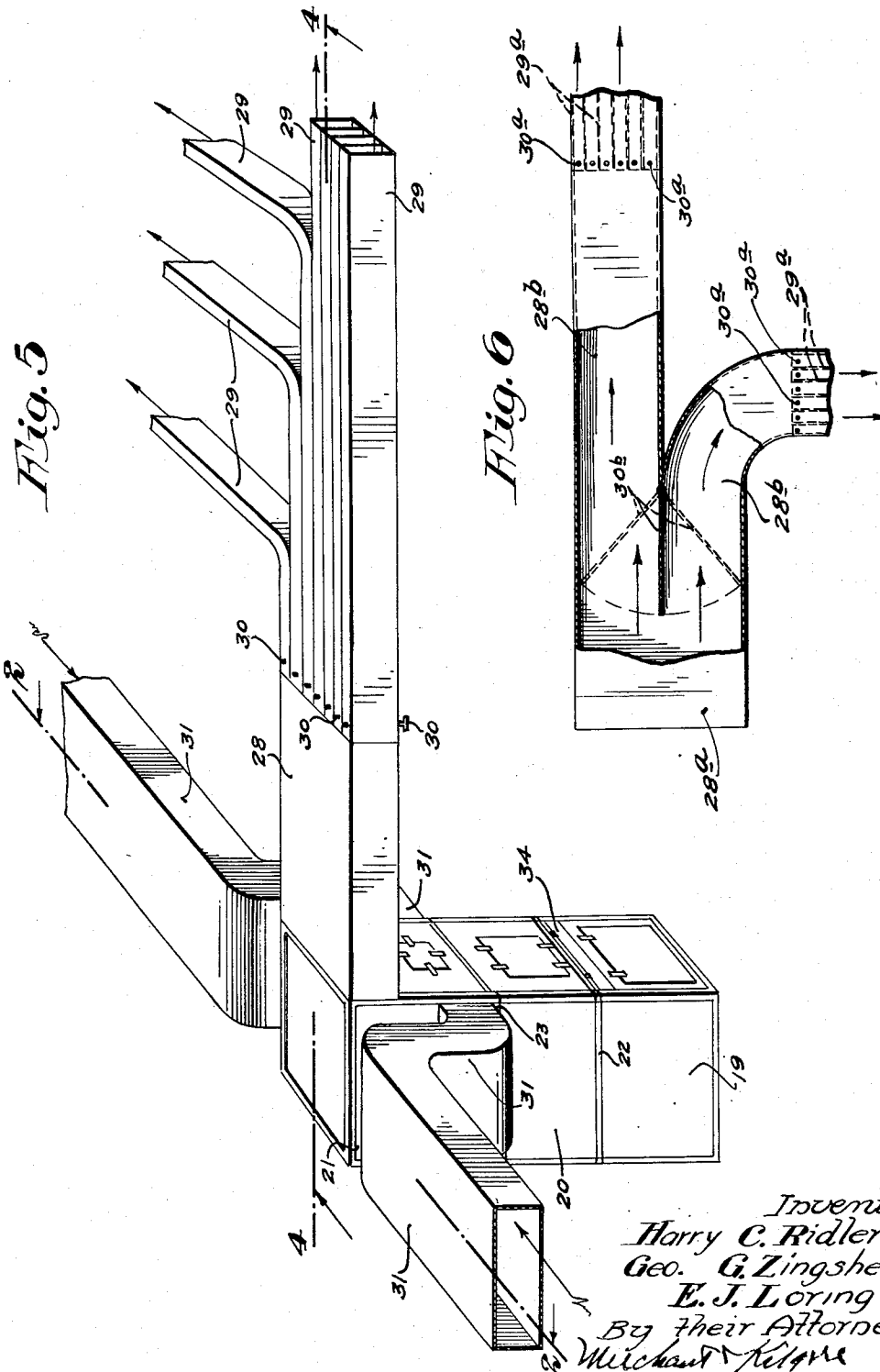
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UNITED STATES PATENT OFFICE

2,012,547

AIR CONDITIONING APPARATUS

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3 Claims. (Cl. 257—8)

Broadly considered, our invention provides a highly efficient apparatus for changing the temperature and humidity of dwellings and other enclosures or habitations. It involves a temperature producer, a heat exchange unit connected thereto, a vaporizer or humidifier proper, and air circulating means in novel co-operative relation and connection. The heat exchange unit, the vaporizer and the air circulating means, as a feature of the invention, are assembled as a self-contained air conditioning unit which preferably involves also an air filter.

In the complete and preferred form of the apparatus, two types of temperature producers are employed, to wit: a furnace for operation in cold weather to deliver hot heat exchange medium to the heat exchange unit, and a refrigerator or cooler for use in hot weather to deliver a cold cooling medium to the heat exchange unit. Under the action of the air-circulating medium, such as a fan or blower, air circulated through heat exchange unit or radiator in cold weather or when the furnace is in action, will be warmed and caused to absorb moisture in the vaporizer, the air will be filtered from dust and washed; and warm or hot and clean moist air will be delivered to the room or dwelling. When the refrigerator or cooler is in action, air will be cooled and filtered and where there is too great humidity in the atmosphere, the humidity of the air can be reduced by condensation.

The nature of the above noted features will be amplified and various other novel features involved in the assembly or plant will be more fully disclosed in the following description in connection with the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a view partly in vertical section and partly in full elevation and with some parts broken away, illustrating the complete apparatus;

Fig. 2 is a vertical section taken approximately on the line 2—2 of Fig. 4;

Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 2;

Fig. 4 is a vertical section taken approximately on the line 4—4 of Fig. 5, showing also the floor and some of the equipment of the building, in the basement of which the apparatus proper is installed;

Fig. 5 is a perspective with parts broken away and some parts removed illustrating a novel arrangement of air ducts or conduits and their connection to the air conditioning unit;

Fig. 6 is a fragmentary view partly in plan and partly in section showing a slight modification in the arrangement of the air delivery trunk and its branches; and

Fig. 7 is a view corresponding to Fig. 2, but illustrating a slightly modified construction.

The apparatus is preferably placed in the basement of a dwelling. Of the parts of the dwelling illustrated, the numeral 8 indicates the floor of the first story or ceiling of the basement, the numeral 9 indicates room partitions and the numerals 10 and 11 indicate hot air registers of different rooms. A furnace or heater which may be assumed to be of the steam boiler type is indicated as an entirety by the numeral 12. This boiler or heater 12 is connected to a hot water heater 13 which, in turn, is connected to a hot water supply or house service tank 14; said elements 13 and 14, however, constitute no essential parts of the present invention.

As shown, the numeral 15 indicates a water supply pipe connected to a source of water supply, and by branch pipes 16 and 17 connected respectively to the boiler 12 and to the hot water supply 14. In branch pipe 16 is a valve 18. The casing of the air conditioning unit is preferably made up of three sections 19, 20 and 21, superimposed one upon the other and united by interlapping joints 22 and 23, so that the said elements may be separated for the purpose of shipping. These several sections and the partition structures separating the same form three chambers 19^a, 20^a and 21^a. In the lower chamber 19^a is a fan or blower 24 driven by a small electric motor 25. The casing of the blower 24 has a vertically extended air discharge spout 26 that leads into the back of the upper chamber 21^a and delivers air to and through the element or heat exchange unit 27. This heat exchange unit is preferably of the high efficiency type usually designated as the copper tube and fin type; and it is extended completely across the chamber 21^a so that all of the air from the blower must pass through the same.

From the delivery side of the chamber 21^a, an air trunk 28 is extended to a point or points where it is connected to a plurality of branch air delivery pipes 29 that extend to the various air delivery registers 10 and 11. At or close to points where the branch pipes 29 join the air trunk 28, each of said pipes is provided with its own damper or check valve 30.

Opening into the top of intermediate chamber 20^a, as shown through each side thereof, is an

air delivery trunk or pipe 31 which, as shown, leads from air return registers 32. Applied to the top of the lower section 19 and affording a partition between the chambers 19^a and 20^a, is a horizontal shelf or partition in which is mounted air filters 33. These filters are of a suitable coarse fibrous material such as spun glass or the like preferably contained in perforated metal casings and made removable from said shelf through a hinged door 34 in the front wall of section 19.

Located in the chamber 20^a below the air return or delivery pipes 31 are overlapping oblique baffles 35 that deliver drippings to a pan-like structure 36. Located in the upper central portion of compartment 20^a is a water spraying nozzle or head 37 which, when operated, delivers a spray of water downward onto the baffles 35.

The top of the boiler 12 is connected to one end of the heat exchange unit or radiator 27 by a steam pipe 38 in which is a valve 39. The other end of said radiator or element 27 is connected to the lower portion of the boiler 12 by a condensed water return pipe 40 in which is a valve 41.

The refrigerator to be employed may take various different forms but, as shown, is of the type comprising a water-tight casing 42 through which is extended a cooling coil or pipe 43 that is adapted to support a cake of ice 44. The receiving end of this coil 43 is connected to the water supply pipe 15 by a pipe 45 in which is a valve 46. The delivery end of coil or pipe 43 is connected to the lower portion of radiator or element 27 through a pipe 47 in which is a valve 48. The spraying head 37 is connected to the pipe 47 below valve 48 by means of a branch pipe 49 in which is a valve 50.

For the draining of the radiator or element 27, there is shown a short pipe 51 that taps the pipe 49, is provided with a valve 52 and which when said valve is open, delivers the drained water onto one of the upper baffle plates 35. From the bottom of the pan 36, an overflow pipe 53 leads to the lower water-containing compartment of the refrigerator casing 42. The delivery end of the pipe 38 is connected to the drain pipe 53 by a cold water return pipe 54 in which is a valve 55.

In the preferred arrangement, we have shown an arrangement whereby the circulation of air from the fan 24 through the radiator or heat exchange unit 27 will be automatically controlled and timed in respect to the action of an oil burner used in connection with the boiler or heater 12. In this arrangement, see Fig. 4, electrical supply leads are indicated by the numeral 56. These leads, by a shunt circuit 57, are connected through a room thermostat 58 to an electrical motor 59, which will be utilized to operate the oil burner. The fan motor 25 is supplied with current through a shunt circuit 60 connected across the leads of the shunt 57. The shunt circuit 60 includes a thermostat 61 located in the air conduit 28 just back of and close to the radiator 27. This thermostat 61 is or may be of the well known type such as sold by the Minneapolis Honeywell Regulator Company, at Minneapolis, Minnesota, and which will close the shunt 60 and supply current to motor 25 when and only when the shunt 57 is closed by thermostat 58. 62 indicates a drain pipe leading from the lower part of the refrigerator 32.

The use of the apparatus illustrated as the heating and humidifying system, is as follows:

The heat exchange element 37 (then acting as

a heat radiator) will usually be of a capacity sufficient for heating the entire house, building or unit to be supplied with heat therefrom. To set the apparatus for heating and humidifying, valves 39, 46, 50 and 41 should be opened, and valves 55, 48, 52 and 18 should be closed. At such time, the refrigerator 42 should be freed from ice or other cooling influence, inasmuch as in the arrangement described, its coil 43 simply acts as a conducting medium for water supplied to the spraying nozzle 37. When the apparatus is set and operating as above indicated, steam will be delivered through pipe 38 and through radiator 27, and condensed water will be conducted back to the water compartment of the boiler 12 through pipe 40. The air drawn by the fan through air pipes 31 will be passed through the spray of water from nozzle 37 and washed clean and moistened thereby, and will then be forced through radiator 27 and heated by the latter so that the air delivered through air pipe 28 and its branches 29 will not only be raised to a proper degree of temperature to heat the rooms, but will carry with it vapor to the various room registers. It will be noted that the fan 24 draws air downward through vaporizer between the baffles 35 and through the filter 34. Hence, when the spray is produced from the nozzle 37, the air will be moist and regardless of whether or not the spray is produced, the air will be cleared of dust by the filter.

If additional air washing and humidifying action is desired, such may readily be obtained by placing a suitable spray nozzle 37^a in the discharge spout 26 leading from the fan 24 to the heat exchange unit 27. This spray nozzle 37^a may be supplied with water from any suitable source through a delivery pipe 49^a having interposed therein a suitable control valve 50^a. Excess water from the nozzle 49^a will flow into the bottom of the fan casing and be drained off through a suitable drain pipe 27^b.

When the apparatus is to be used in hot weather for introducing cooled air into the rooms, the furnace will, of course, be out of action and by means of ice or otherwise, low temperature will be produced in the refrigerator 42. At such time, valves 46, 48 and 55 must be opened, and valves 18, 41, 39 and 50 should be closed. When the valves are thus adjusted, the water supply under pressure from pipe 15 through pipe 45 will be forced through coil 43 and pipe 47 to the lower portion of the temperature exchange unit 27, will be thence forced through the said element 27 and caused to flow out through pipes 54, 53 and drain pipe 62. Under the action that will then be produced, air drawn to the fan 24 from the air trunk 31 will be forced through heat exchange element 27 which then acts as a temperature reducer to cool the air, and from thence through the air delivery trunk 28 and its branches 29 to the several rooms. Under his cooling action, if the atmosphere air is heavily laden with moisture, a part of the moisture at least will be precipitated onto the baffles 35 and will be drained off through pipes 53 and 62. Thus it will be seen that air cooled and de-humidified, may be delivered and properly controlled by this apparatus during hot weather. If additional washing of the air is required even in hot weather, then valve 50^a will be opened, thereby delivering a spray or water to the cooled air delivered to the element 27. By regulation of the dampers or valves 30, the proportionate delivery of air both in hot and cold weather may be readily accomplished.

Fig. 5 shows a very convenient arrangement of said dampers in alignment and within reach from a single point.

Fig. 6 illustrates a slight modification in which the air delivery trunk 28^a is provided with two main branches 28^b and these in turn connected into mutual branch air delivery tubes 29^a equipped with individual dampers at 30^a. The air supply to main branches 28^b is controlled by a main damper 30^b.

The arrangement illustrated in Fig. 7 is like that described, except that the baffles 35^a and 36^a are in reverse arrangement in respect to the arrangement shown in Fig. 2. In this latter noted arrangement water dripping onto the lower baffle is carried off through a drain pipe 53^a.

What is claimed is:

1. An air conditioning apparatus comprising a casing having upper, lower and intermediate chambers, a heat exchange element in said upper chamber, means for evaporating water in said intermediate chamber, a blower in said lower chamber having an intake connected to draw air into and downward through said intermediate chamber and having an air discharge leading to said heat exchange element, said upper chamber having an air outlet, and a plurality of overlapping baffles within said intermediate chamber, the latter having a drain connection for carrying off surplus water.

2. An air conditioning apparatus comprising a casing having upper, lower and intermediate

chambers, a heat exchange element in said upper chamber, means for evaporating water in said intermediate chamber, a blower in said lower chamber having an intake connected to draw air into and downward through said intermediate chamber and having an air discharge leading to said heat exchange element, said upper chamber having an air outlet, and an electric motor for driving said blower, and a controlling circuit for said motor including a thermostat located in the air outlet from said upper chamber and subject to the air acted upon by said heat exchange element.

3. An air conditioning apparatus comprising a casing made up of upper, lower and intermediate chamber-forming sections, a heat exchange element in the upper of said chamber-forming sections, means for evaporating water within said intermediate chamber-forming section, a plurality of overlapping baffles in the intermediate chamber-forming section operatively arranged to collect condensed water and being provided with means for draining collected condensed water, a blower located in the lower chamber-forming section having an intake connected to draw air into and downward through said intermediate chamber and having an air discharge leading to said heat exchange element, said upper chamber having an air outlet.

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