

**July 10, 1945.**

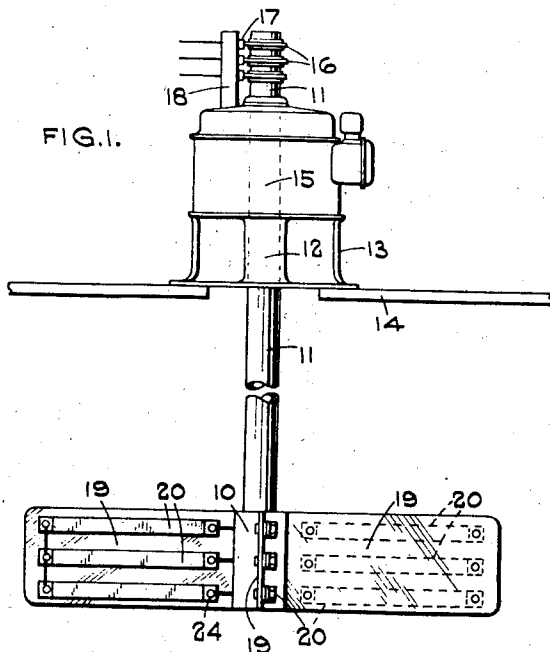
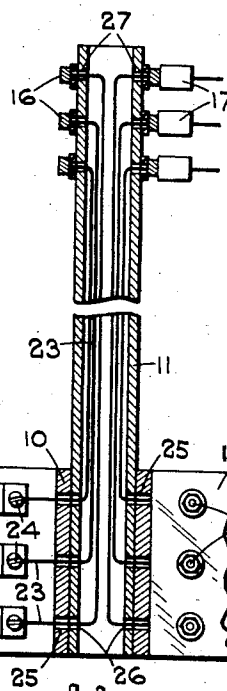
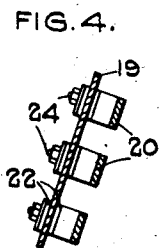
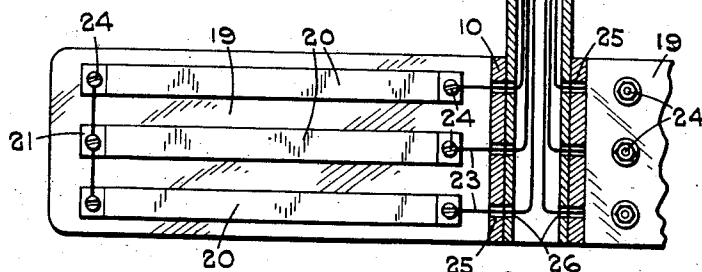
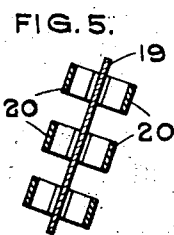
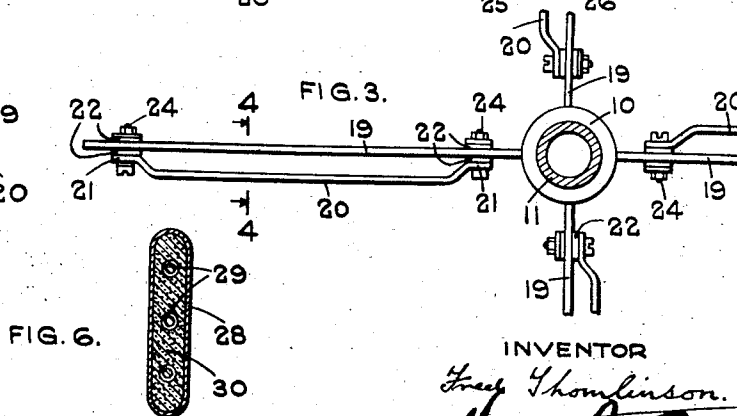
F. THOMLINSON

**2,380,346**

APPARATUS FOR HEATING AIR OR OTHER FLUID

Filed May 27, 1943

2 Sheets-Sheet 1



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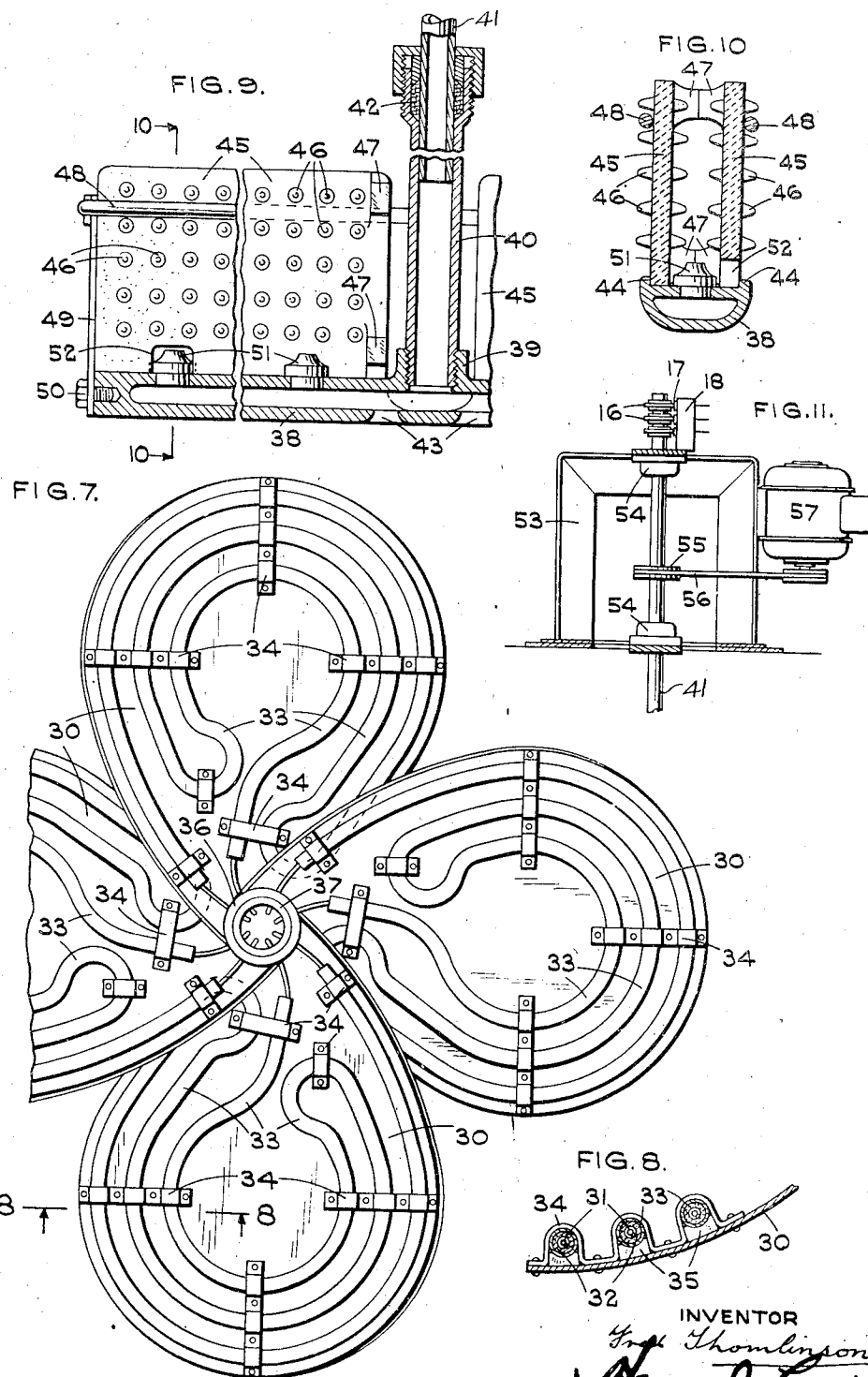
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APPARATUS FOR HEATING AIR OR OTHER FLUID

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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

2,380,346

APPARATUS FOR HEATING AIR OR  
OTHER FLUID

Fred Thomlinson, Langley, England

Application May 27, 1943, Serial No. 488,661  
In Great Britain June 5, 1942

5 Claims. (Cl. 219—42)

This invention relates to heating appliances and can be applied to appliances for heating buildings or for heating ovens or furnace chambers for the heat treatment of metals or similar purposes.

In connection with heating appliances, it has hitherto been usual to employ one or more fans, blowers or impellers adapted to propel a fluid, which in many cases was air and in some cases was liquid, the fluid being propelled past and in contact with one or more heating elements so that the fluid became heated thereby and was then used for heating or in some cases for quenching purposes.

The object of the present invention is to provide an improved construction of heating appliance.

According to the present invention I provide apparatus for heating air or other fluid comprising a rotary impeller with which heating means are incorporated.

The rotary impeller may for instance be formed with blades arranged around a hub and electrical heating elements may be mounted on or in the blades.

Such heating elements may be provided with offset feet which are clamped to the exterior surface or surfaces of the blades with the body of each heater spaced away from the surface of the blade so that the fluid to be heated can circulate between the surface of the blade and the surface of the heater.

The hub carrying the blades may be attached to a hollow shaft and the contactors for taking the currents to the heating elements may extend through openings in the hub and in the shaft and along the exterior of the shaft to contacts of ring form mounted on the exterior shaft.

In another arrangement electrical heating elements mounted on the blades may be clamped between blocks engaging the surfaces of the blades and clips which embrace the elements and are secured to the blades.

In another arrangement wherein the blades are adapted to be heated by gas burners, the impeller may comprise a hollow body having a plurality of hollow projecting arms, each carrying one or more refractory members which form the blades and means may be provided for feeding gaseous fuel to the hollow body and to burners situated in the arms near the refractory members. A non-rotating supply pipe for gas or air may be provided supplying the gas or air to the rotating shaft of the impeller.

When used for heating a building an impeller

may be used having flat or curved blades adapted to produce radial flow of the air or an impeller may be used having helical blades adapted to produce axial flow of the air or fluid and in such an arrangement the heated air may be fed into ducts which extend throughout the building and are provided with outlets at selected positions.

If the apparatus is used for heating liquids, the impeller may operate in a tank containing the liquid.

Referring to the drawings:

Figure 1 is a view in side elevation showing one construction.

Figure 2 is a view on a larger scale showing the same construction partly in section.

Figure 3 is a plan view.

Figure 4 is a section on line 4—4 of Figure 3.

Figure 5 is a section similar to Figure 4 but showing a further construction.

Figure 6 is a transverse section of one of the blades showing another construction.

Figure 7 is an end view showing another form of impeller.

Figure 8 is a sectional view on line 8—8 of Figure 7.

Figure 9 is a sectional view showing a gas heated impeller.

Figure 10 is a sectional view on line 10—10.

Figure 11 is a view showing an alternative form of drive.

In the construction shown in Figures 1 to 4, the impeller is provided with a hollow hub 10 which is mounted on a hollow shaft 11. The shaft 11 extends through a bearing 12 in a circular bracket 13 supported on a suitable fixture 14. Mounted on the bracket 13 is the body of an electrical motor 15, the armature of which is mounted on or coupled to that part of the shaft 11 which extends through the body.

The shaft 11 extends above the motor body and is provided with three slip rings 16 which form rotating contacts.

Stationary brush contacts are provided at 17 mounted on a bracket 18 secured to the motor casing.

The hub 10 is provided with four flat radial blades 19 and to one side of each of these is fixed a strip 20 of resistance material. These strips 20 are provided with offset feet 21 at their ends so that the greater part of the strip 20 is spaced away from the blade 19.

The strips 20 are insulated by suitable washers 22 from the blades 19 but conducting wires 23 are provided secured to insulated pins 24 which are in contact with the ends of the strips 20.

The conducting wires are taken through holes 25 in the hub 10 and holes 26 in the shaft 11 and thence along the interior of the shaft and through holes 27 to the ring contacts 16.

If heating elements are provided on one side only of each blade it is preferably the leading side in direction of rotation.

Electrical heating elements may however be provided on both sides of the blades 19 as shown in Figure 5.

A further modification is shown in Figure 6 wherein the blades 28 are of hollow form and contain resistance windings 29 embedded in a suitable composition 30. In such a construction the conducting wires are taken through the hub and the hollow shaft as described with reference to Figures 1 to 4.

The further construction shown in Figure 7 wherein the impeller is provided with blades 30 of helical form so as to provide an axial flow. In this construction helical resistance windings are used suitably insulated by material 32 and enclosed in metal or other casings 33. The heating elements are wound into looped form as shown in Figure 7 and are attached to one side of the blade by clips 34, spacing blocks 35 being placed between the elements and the blade so that the air or other fluid can circulate completely around the elements.

In this construction the conducting wires for the elements are taken through the hub 36 of the impeller and along a hollow shaft 37 to slip rings as described with reference to Figures 1 to 4.

A further construction shown in Figures 9 and 10 wherein the impeller comprises a hollow metal body having four hollow arms 38 at the junction of which is a hub 39 to which a rotary hollow shaft 40 is attached.

A non-rotating pipe 41 is provided for feeding a mixture of gas or air to the rotating shaft 40, a stuffing box 42 or similar device being provided to prevent leakage between the two pipes.

The underside of the hollow blades 38 may be provided with auxiliary air openings 43.

On the upper side of each blade 38, two spaced ribs 44 are provided against which are placed vertical refractory members 45, these members having integral heat radiating projections 46.

The members 45 may further be provided with integral projections 47 on their inner sides so that they can be clamped together by external bands 48 which extend around plates 49 secured by screws 50 to the ends of the arms 38.

Along the upper side of each arm 38 burner nozzles 51 are provided so that the refractory elements 45 may be heated thereby. One or more additional air inlets 52 may be provided in the refractory elements where desired.

Figure 11 illustrates an alternative method of driving the shaft carrying the impeller which may either be the shaft 11 or the shaft 37 or the shaft 40. In the construction shown in Figure 11, a frame like bracket 53 is provided having bearings 54 in which the shaft can rotate and the shaft is provided with a driving pulley 55 driven

by a belt 56 from an electric motor 57 mounted on the side of the bracket.

In the construction shown in Figure 11, the upper end of the shaft is provided with the slip rings as used with electrical heating but of course if this arrangement is used with a gas fire heated impeller then the gas supply pipe 41 will be taken into the upper bearing 54 and will deliver the mixture of gas and air into the upper end of the shaft.

What I claim then is:

1. A heater for air or other fluid comprising a rotary impeller having a hub and blades projecting from said hub and electric resistance heating elements mounted on the blades, said heating elements being of strip form with integral offset feet at their ends secured to the blades, said feet spacing said elements intermediate their ends from the blades on which they are mounted, and said elements having the entire surface of the spaced portion exposed to the surrounding fluid.

2. A heater for air or other fluid comprising a rotary impeller having a hub, and blades projecting from said hub, and electric resistance heating elements mounted on the blades, said elements being spaced intermediate their ends from the blades on which they are mounted, and having the entire surface of the spaced portion exposed to the surrounding fluid.

3. A heater for air or other fluid comprising a rotary impeller having a hub, and blades projecting from said hub, and electric resistance heating elements mounted on the blades, said elements having integral feet at their ends securing them to the blades, said feet spacing said elements intermediate their ends from the blades on which they are mounted, and said elements having the entire surface of the spaced portion exposed to the surrounding fluid.

4. A heater for air or other fluid comprising a hollow shaft, slip rings on said hollow shaft, a rotary impeller having a hub mounted on said shaft and blades projecting from said hub, electric resistance heating elements mounted on said blades, said elements being spaced intermediate their ends from the blades on which they are mounted, and having the entire surface of the spaced portion exposed to the surrounding fluid.

5. A heater for air or other fluid comprising a hollow shaft, slip rings on said hollow shaft, a rotary impeller having a hub mounted on said shaft, and blades projecting from said hub, electric resistance heating elements mounted on the blades, said heating elements being of strip form with integral offset feet at their ends secured to the blades, said feet spacing said elements intermediate their ends from the blades on which they are mounted, said elements having the entire surface of the spaced portion exposed to the surrounding fluid, and current conductors extending through said hollow shaft and connecting the slip rings to the offset feet of said heating elements.

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