Feb. 27, 1934. C. F. KETTERING 1,948,818

METHOD AND MEANS FOR MAKING AIR COOLED CYLINDERS

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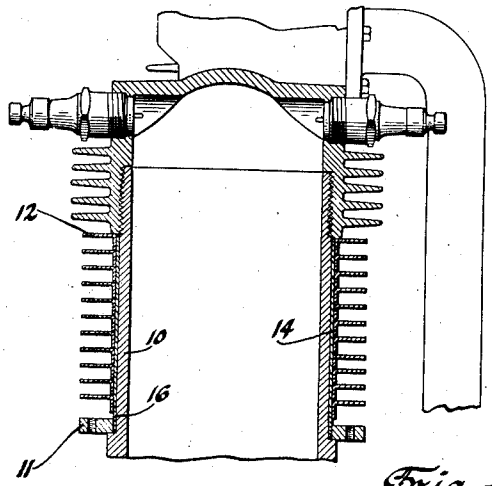

Fig. 1

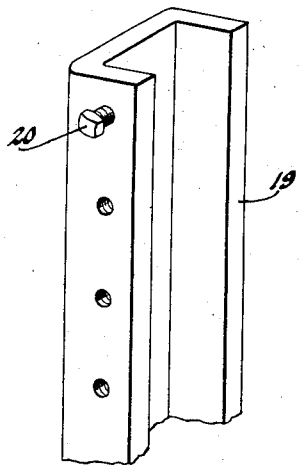

Fig. 6

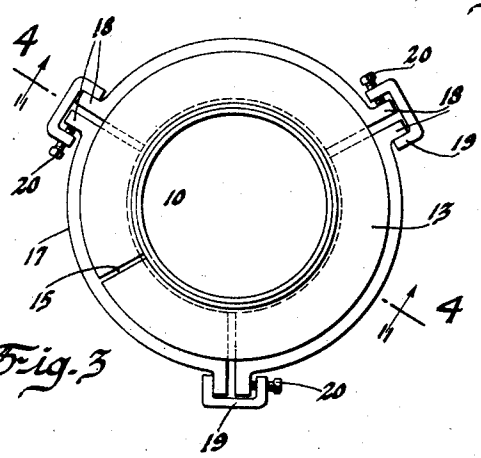

Fig. 3

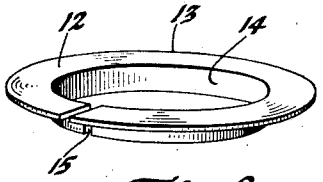

Fig. 2

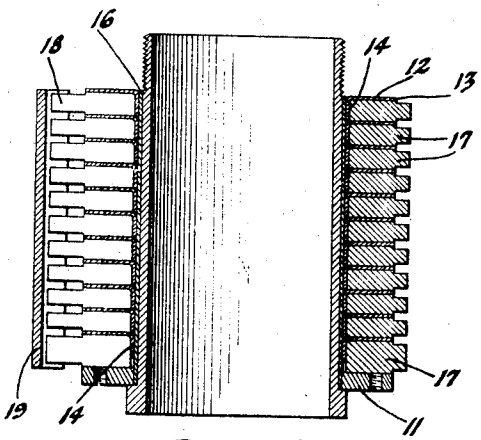

Fig. 4

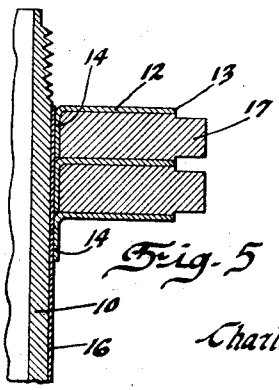

Fig. 5

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METHOD AND MEANS FOR MAKING AIR COOLED CYLINDERS

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Serial No. 482,005

5 Claims. (Cl. 113—99)

This invention relates to the art of making air-cooled cylinders and more particularly to the bonding of annular heat dissipating elements of high heat conductivity to cylinders of internal combustion engines.

In the accompanying drawing in which like reference characters indicate like parts throughout the several views,—

Fig. 1 is a section thru an air-cooled cylinder of a standard aviation engine;

Fig. 2 is a detached view of one of the heat dissipating elements utilized in this invention;

Fig. 3 is a plan view of a cylinder with heat dissipating elements assembled and with clamps for temporarily holding the elements in place;

Fig. 4 is a vertical section on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary vertical section on a larger scale than Fig. 4; and

Fig. 6 is a view of a device for setting and locking the clamps.

In this invention it is contemplated applying annular heat dissipating elements of high heat conductive material such as copper to steel or iron cylinders such as the cylinders of radial air-cooled airplane engines in a manner to provide an uninterrupted metallic path for heat from cylinder to elements over the entire area between cylinder and elements.

In the drawing, 10 represents a cylinder barrel or body, 11 a radially extending flange at the lower end thereof whereby the cylinder may be secured to an engine crankcase or base; 12 circumferentially extending annular heat dissipating elements of copper or the like. Each element, which is of ring-like form, is composed of a radially extending heat dissipating flange or fin 13, substantially at right angles to a generally cylindrical base flange 14 by which the element may be bonded to the cylinder. Ring-like element 12 as originally formed is divided as at 15 so that it may be contracted circumferentially into close contact with the cylinder when applied thereto. These elements may be formed from thin sheet metal by a die-pressing and cutting operation and thereafter, or at any time before bonding, severed to produce the slit 15.

In order to bond these elements to the cylinder barrel the base flanges may be coated with flux and the elements threaded over the barrel which may have been coated previously with a suitable brazing material. The preferred brazing material is a thin sheet 16 of brass or the like which has been wrapped around the barrel as illustrated.

As shown in Fig. 4, a combined spacing means and clamp 17 may be placed upon the flange 11 after the brazing material has been applied to the barrel. This clamp is preferably a contractible annular clamp shown as consisting of three segments, each of which is provided with an end lug 18 by means of which the segments may be drawn together to apply pressure upon an annular heat dissipating element.

Either before or after the placing of the clamp on the flange 11 the first (lower) heat dissipating element is placed around the cylinder with the base flange 14 in contact with the brazing material and extending between the cylinder and the inside surface of the clamp 17 as indicated near the bottom of Fig. 4. After the lower heat dissipating element has been applied the next one above it is similarly applied, another clamp 17 being placed on the top of the heat dissipating flange 13 of the one already assembled; thereafter the next element is placed in the same manner as the one beneath it. Thus proceeding, all of the elements are assembled with the cylinder barrel and the clamps, the clamps completely filling the spaces between the flanges 13. Thereafter each clamp is set up so as to bind the heat dissipating elements firmly to the barrel.

As shown in the drawing, channel members 19 embrace the several pairs of lugs on the segments of the clamps. Each channel member is provided with set screws 20 each screw adapted to bear upon one lug of a segment in such a manner that when said set screws are screwed in the adjacent lugs 18 of adjacent segments are drawn together whereby the annular clamp is contracted and the split ring-like heat dissipating element is bound firmly to the cylinder.

The assembly of the heat dissipating elements, cylinder, brazing material and flux, is now very firmly and rigidly united so that the heat of the furnace to which it is to be subjected in order to complete the bond cannot distort or cause displacement in any way of the elements with respect to one another and to the cylinder.

The whole assembly may be dipped if desired into a fluxing bath to protect against possible oxidation in the heating furnace.

The heating furnace is preferably one which utilizes heat radiantly and is as free as possible from combustion products. The assemblies as described are charged into this furnace and heated to a temperature of, say, 1800° F. sufficient to heat the iron cylinder and heat dissipating elements to a red heat and fuse the brazing material in order to produce the bond. The process

of brazing in general is that described in patent granted to C. F. Kettering, May 1, 1928, #1,668,508.

I claim:

1. A method of bonding split annular heat dissipating elements to a cylinder, each element having a heat dissipating flange and a base flange at an angle thereto, which consists of applying said elements to a cylinder with brazing material and flux interposed, clamping each element to the cylinder independently of the others, then heating the assembly to a temperature sufficient to fuse the brazing material.

2. A method of bonding split annular heat dissipating elements to a cylinder, each element having a heat dissipating flange and a base flange at an angle thereto, which consists of applying said elements to a cylinder with brazing material and flux interposed, clamping each element to the cylinder independently of the others and filling the space between the heat dissipating flanges, then heating the assembly to a temperature sufficient to fuse the brazing material.

3. A method as defined in claim 1 in which each element is clamped by means of a divided clamp proportioned to fill the space between adjacent heat dissipating flanges.

4. Means for clamping a plurality of heat dissipating elements to a cylinder in preparation for a brazing operation, said means comprising a plurality of annular clamps, each clamp consisting of a divided ring having a radial lug projecting outward from each of the adjacent ends, in combination with a channel member constructed and arranged to embrace alined pairs of lugs of all of the clamps when the latter are arranged adjacent one another in axial alinement with the lugs of the several clamps cut substantially by a plane that includes the axis of the several annular clamps, and a plurality of adjustable devices carried by the channel member, each adjustable device being constructed and arranged in cooperation with the channel member to force the radial lugs of one of the individual clamps toward each other and thereby contract said clamps independently.

5. Means for clamping a plurality of heat dissipating elements to a cylinder in preparation for a brazing operation, said means comprising a plurality of annular clamps, each clamp consisting of a divided ring composed of a plurality of arcuate segments, each segment having a radial lug projecting outward from each end, in combination with a plurality of channel members equal in number to the segments, constructed and arranged to embrace alined pairs of lugs of all the clamps when the latter are arranged adjacent one another with the lugs of each clamp cut substantially by planes that include the axis of the several clamps, and a plurality of adjustable devices carried by each channel member, each adjustable device in each of the several clamps, respectively, being constructed and arranged in cooperation with the several channel members to force the radial lugs of one of the individual clamps toward each other and thereby contract said clamps independently.

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