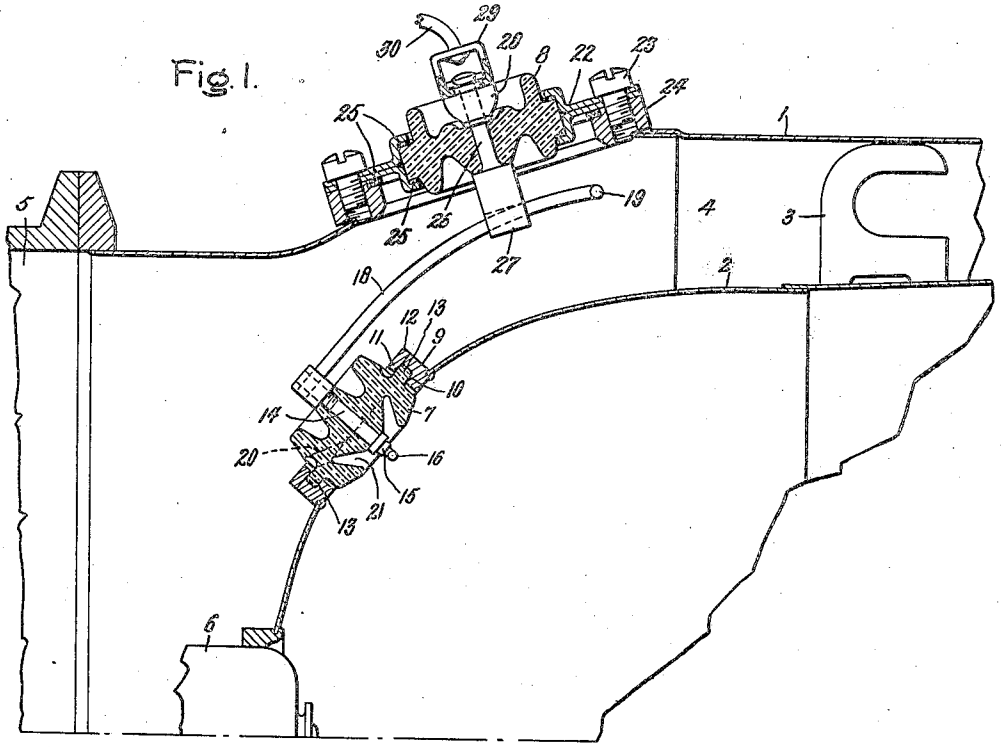
July 9, 1946. C. F. HEATH 2,403,860

COMBUSTION UNIT

Filed June 22, 1944

Fig. 1.



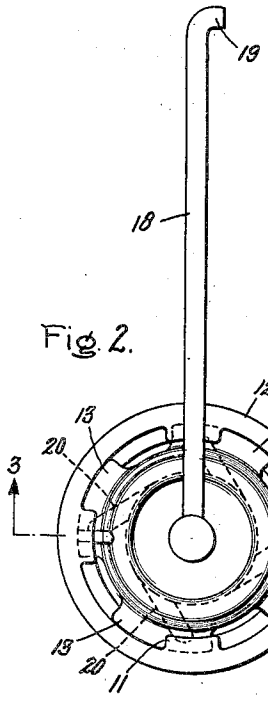


Fig. 2.

Fig. 4.

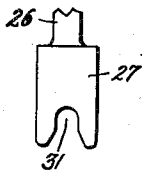
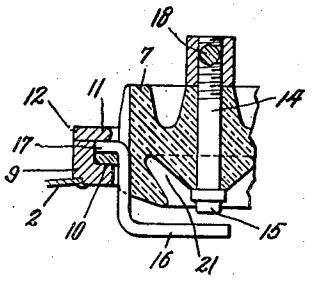


Fig. 3.



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UNITED STATES PATENT OFFICE

2,403,860

COMBUSTION UNIT

Charles F. Heath, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

Application June 22, 1944, Serial No. 541,605

5 Claims. (Cl. 175—115)

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The present invention relates to combustion units such as are used in connection with gas turbine power plants for supplying hot gases to the turbine wheel, and especially to such combustion units which comprise inner and outer tubular casings spaced to provide an annular chamber to which air for combustion is supplied and from which chamber the air flows through openings to the interior of the inner casing. Such combustion units ordinarily utilize an ignition plug for starting combustion.

My invention relates more particularly to the ignition plug for such a combustion unit and has for its object to provide an improved ignition plug arrangement which is simple in structure, easily installed and which can be readily removed and replaced.

For a consideration of what I believe to be novel and my invention, attention is directed to the following specification and to the claims appended thereto.

In the drawing:

Fig. 1 is a sectional view of a part of a combustion unit provided with an ignition plug structure embodying my invention; Fig. 2 is a top plan view of one of the members of the ignition plug; Fig. 3 is a detail view taken on line 3—3, Fig. 2, and Fig. 4 is a detail vew of a connector.

Referring to the drawing, 1 indicates the outer casing and 2 indicates the inner casing of a combustion unit. Casings 1 and 2 are held in spaced relation to each other by suitable spacers, one of which is indicated at 3 to provide an annular air chamber 4. Air is supplied to air chamber 4 through a conduit 5 and from chamber 4 it passes through suitable openings to the interior of casing 2 where combustion takes place. A fuel nozzle for supplying fuel to the combustion unit is indicated at 6. The construction so far described is shown only by way of example and is to be taken as typical of any suitable double walled combustion unit construction.

The ignition plug comprises an insulator member 7 supported in an opening in inner casing 2 and an insulator member 8 supported in an opening in outer casing 1. Insulator member 7 is arranged so that it may be readily attached to and removed from casing 2. To this end, there is provided in the opening in casing 2 an insulator holder comprising a metal ring 9 which may be welded to casing 2 and is provided with an inwardly projecting shoulder 10 and, spaced from such shoulder, a series of inwardly projecting ears 11. Ears 11 may be carried by a ring 12 which is suitably welded in position. The insulator member 7 is provided on its periphery with a series of circumferentially spaced ears 13 which are adapted to engage under ears 11. Thus, the insulator member may be inserted into the holder by passing the ears 13 between adja-

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cent ears 11 and turning the insulator to bring the ears 13 under the ears 11. Thus ears 13 are clamped between ears 11 and shoulder 10. Extending through insulator member 7 is a metal post 14, the inner end of which forms an electrode terminal 15. Adjacent electrode terminal 15 is a second electrode terminal 16 which is suitably fastened to the side of the insulator as is indicated at 17 in Fig. 3. Thus, when the insulator member 7 is in place in its holder, electrode terminal 16 is grounded on the metal ring 9. Attached to the outer end of post 14 is a flexible conductor rod or connector 18 which may be attached to the post in any suitable way and which is provided with an angularly turned end 19 to form a stop. In the present instance, post 14 is shown as being held in position by a nut threaded onto its outer end and the end of rod 18 is fastened in an opening through the nut and post. In insulator member 7 are a plurality of tangentially arranged openings 20 through which air is supplied to a recess 21 in the insulator member 7 to provide a swirl of air around the parts to cool the parts, particularly the electrode points, effect an improved distribution of combustible gases with respect to the points, and prevent the deposition of carbon particles or other foreign matter on the insulator member. Thus when starting up, air will flow through openings 20 to scour the pocelain surfaces of carbon particles which may have become deposited thereon but at the same time such swirl of air will not prevent combustible mixture from reaching the ignition points.

Insulator member 8 is carried by a suitable metallic holder 22 which is attached by a ring of studs 23 to a ring 24 which is suitably attached to the edge of the opening in casing 1. Gaskets between the several parts are indicated at 25. Extending through insulator member 8 is a metal post 26 which on its inner end is provided with a head 27 which takes against insulator member 8 on the one side and on its outer end with a head 28 which takes against the insulator member 8 on the other side. Connected to head 28 is a suitable connector 29 to which an ignition wire 30 is connected. Head 27, as shown particularly in Fig. 4, is provided with a recess 31 adapted to fit over the connector rod 18 to form an electrical connection between post 26 and post 14. Rod 18 has some flexibility and the arrangement is such that head 27 presses down on the rod, thus putting the rod under tension to form a good electrical connection. At the same time rod 18 can slide through the head. This arrangement permits the inner and outer casings 1 and 2 to expand and contract relatively to each other without affecting adversely the electrical connection or putting a strain on any of the parts. In other words, rod 18 forms a yieldable connection be-

tween the two ignition plug members. In this connection, it will be understood that combustion units of this type operate at relatively high temperatures and that there may be considerable relative expansion between the two casing members.

It will be noted that in the present instance, the opening in the inner casing 2 is out of line with the opening in the outer casing 1. The opening in the inner casing 2 is positioned at a point in the casing to provide for the most advantageous ignition. The opening in the outer casing 1 is larger than the opening in the inner casing 2. By removing the studs 23, the insulator member 8 may be removed from its position in the opening in casing 1. Upon being removed, the head 27 is lifted away from engagement with the connector rod 18. The insulator member 7 may be removed through the opening in the casing 1, it being necessary merely to reach through the opening, turn the insulator member 7 to bring ears 13 from under the ears 11 and lift the insulator member out. With this arrangement, it will be seen that the insulator member 7 can be quickly and easily removed for cleaning or replacement. While in the present instance, the two insulator members 7 and 8 are shown as being out of alignment, they may in some instances be mounted in alignment, if found desirable.

In operation, the air in the annular air chamber 4 is at somewhat higher pressure than that which obtains inside casing 2. This difference in pressure causes a continuous flow of air through the tangential openings 20 into the recess 21. This sets up a swirl of air around recess 21 and around the ignition points, the ignition points being at the center of the swirl. As pointed out above, this serves to cool the ignition plug parts and keep the insulator parts scoured free from deposits of carbon or other foreign matter. At the same time, since the ignition points are somewhat below and at the center of the swirl of air, the swirl of air does not prevent combustible mixture from reaching the ignition points.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a combustion unit, spaced inner and outer casings, each provided with an opening, the opening in the outer casing being out of alignment with the opening in the inner casing, an ignition plug member mounted in the opening in the inner casing having a post extending through it, the inner end of which forms an electrode terminal, an ignition plug member mounted in the opening in the outer casing and having a conducting post extending through it, a flexible rod connected to one of said posts and biased toward the other post by reason of its flexibility, and means forming a sliding connection between the flexible rod and said other post for electrically connecting the posts together.

2. In a combustion unit, spaced inner and outer casings, each provided with an opening, the opening in the inner casing being out of alignment with the opening in the outer casing, an ignition plug member removably mounted in the opening in the inner casing having a post extending through it, the inner end of which forms an electrode terminal, an ignition plug member mounted in the opening in the outer casing and having a conducting post extending through it, and a flexible rod connected to the first-named post and extending across the inner side of the plug member mounted in the outer casing, the flexibility of the rod biasing it outwardly toward such plug member, the second-named post having at its inner end a head provided with a slot which fits over said flexible rod whereby the flexible rod is yieldably and slidably connected with said second-named post.

3. In a combustion unit, spaced inner and outer casings, each provided with an opening, said openings being out of alignment with each other, an ignition plug mounted in the opening in the inner casing having a post extending through it, the inner end of which forms an electrode terminal, an ignition plug member mounted in the opening in the outer casing and having a conducting post extending through it, a yieldable conductor rod connected at one end to the outer end of the first-named post and having a free end which extends to a position in line with the opening in the outer casing and biased toward said opening by reason of its inherent resiliency, the inner end of the conducting post carried by the outer casing having a head which is pressed into engagement with said rod at a point short of the end of the rod to make sliding engagement with the rod.

4. In a combustion unit, spaced inner and outer casings, each provided with an opening, said openings being out of alignment with each other, an ignition plug mounted in the opening in the inner casing having a post extending through it, the inner end of which forms an electrode terminal, an ignition plug member mounted in the opening in the outer casing and having a conducting post extending through it, a yieldable conductor rod connected at one end to the outer end of the first-named post and having a free end which extends to a position in line with the opening in the outer casing and biased toward said opening by reason of its inherent resiliency, the inner end of the conducting post carried by the outer casing having a head which is pressed into engagement with said rod at a point short of the end of the rod to make sliding engagement with the rod, the opening in the outer casing being larger than the first-named ignition plug whereby it may be inserted and removed through such opening.

5. The combination with a combustion chamber having spaced inner and outer walls which define an air chamber from which air flows to the interior of the inner wall, of an ignition plug member mounted in an opening in the inner wall comprising an insulator, electrode points on the inner side of the insulator, walls of the insulator being shaped to define an angularly extending annular recess extending rearwardly of the electrode points, and tangential passages which extend through the insulator and communicate with said recess through which air flows from said air chamber to provide a swirl of air around the electrode points.

CHARLES F. HEATH.